



PDNA Professional Development Module

Post Disaster Needs Assessment (PDNA)
Study for India

*under
National Cyclone Risk Mitigation Project (NCRMP)*



Resilient India - Disaster free India

National Institute of Disaster Management (NIDM)
(Ministry of Home Affairs, Government of India)



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(Ministry of Home Affairs, Government of India)

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Post Disaster Needs Assessment (PDNA) Study for India under
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Disclaimer

We welcome receiving information and suggestions on its adaptation or use in actual training situations. The content of this document are solely those of the author(s).

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नित्यानन्द राय
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संदेश

मुझे यह जानकर अत्यंत हर्ष हो रहा है कि राष्ट्रीय आपदा प्रबंधन संस्थान, गृह मंत्रालय ने आपदा से हुए नुकसान का वैज्ञानिक तरीकों से आकलन सम्बन्धी अंतर्राष्ट्रीय स्तर का साधन विकसित किया है।

भारत विश्व में प्राकृतिक आपदाओं से सबसे अधिक प्रभावित होने वाले देशों में से एक है। हमारी भौगोलिक स्थिति कुछ इस प्रकार की है कि आपदाओं का प्रकोप और इसका प्रभाव तीव्र एवं अत्याधिक होता है। हमारे देश में आपदा के पश्चात इससे होने वाले नुकसान का आकलन पारम्परिक तरीके से होता रहा है। इसका सही आकलन वैज्ञानिक तरीके से होना चाहिए।

माननीय प्रधानमंत्री, श्री नरेन्द्र मोदी जी ने एशियन मंत्रीगण सम्मेलन में आपदा प्रबंधन को वैज्ञानिक आधार पर करने हेतु 10 बिंदुओं को चिन्हित किया। अभी हाल ही में राष्ट्रीय आपदा विमोचन दल द्वारा आयोजित कार्यशाला में माननीय गृह मंत्री, श्री अमित शाह जी, ने उन्हें दोहराते हुए सभी प्रतिभागियों से उसे सुनिश्चित करने तथा इन नीतियों पर कार्य करने को कहा।

मुझे विश्वास है कि वर्तमान प्रकाशन, जो चार भागों में प्रकाशित हो रहा है, का लाभ प्रत्येक राज्य और केंद्र के मंत्रालयों को मिल सकेगा। इस प्रकाशन को आकलन हेतु संदर्भ स्वरूप प्रयोग में लाया जा सकता है। वर्तमान में देश के कुछ राज्यों में इस विधि को आपदा के पश्चात होने वाले प्रभावों का आकलन किया है और इसके आधार पर दीर्घकालीन पुनर्निर्माण की नीति विकसित करके आगे बढ़े हैं। इस ओर राष्ट्रीय प्रबंध संस्थान का यह प्रयास सराहनीय है।

मैं एक बार पुनः इस अंतर्राष्ट्रीय स्तर का कार्य करने हेतु राष्ट्रीय आपदा प्रबंधन संस्थान को हार्दिक बधाई देता हूँ।

दिनांक : 16 सितम्बर, 2019
स्थान : नई दिल्ली।


(नित्यानन्द राय)



कमल किशोर
सदस्य
Kamal Kishore
Member



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3rd September, 2019

Message



Over the last twenty years, the practice of post-disaster recovery has undergone significant transformation. This change is characterized by three features: first, there is much greater focus on multi-sectoral, comprehensive recovery; second, there is much greater focus on “building back better,” not only in physical terms but also in terms of better socio-economic conditions; and third, there is much greater focus on recovery outcomes rather than on inputs. For example, in the education sector, we measure success in terms of enabling access to a safe and healthy learning environment as opposed to the number of classrooms built.

This transformation in the practice of post-disaster recovery is underpinned by the development of post-disaster assessment methodologies. We have come a long way from assessing only the damages and losses from disasters to assessing the needs of the affected communities. In this context, I congratulate NIDM in systematizing the practice of post-disaster assessments in the form of this volume. This is an important contribution to the practice of disaster risk assessment and ultimately post-disaster recovery.

I am sure this will go a long way in meeting the needs of multiple stakeholders local governments, Non-governmental organizations, academic institutions who are supporting post-disaster recovery in the country.

Kamal Kishore

Foreword



Disaster disrupts development and the dividends of development get seized. For regaining the growth gaps, created due to disasters, long term recovery becomes the only choice. In the light of understanding the disaster impact on economy Post Disaster Need Assessment is required to be done. PDNA also facilitates in understanding the impact of disaster in terms of direct and indirect loss. In resource gap scenario, PDNA is a good tool to be adopted by the states.

National Institute of Disaster Management has developed PDNA tool customized to Indian conditions under the National Cyclone Risk Mitigation Project of Government of India which was implemented by National Disaster Management Authority and funded by The World Bank. I would like to mention that it's a very pragmatic and easy to use tool. NIDM has also developed a user manual and professional development Modules for using the PDNA tool.

This is going to be the new beginning in the area of disaster management impact assessment for understanding the real impact of disaster event holistically. It will not be an exaggeration in saying that this process would help in setting new era of development environment of the disaster affected states in the post disaster scenario and in development planning by the sector.

I complement Prof. Santosh Kumar and Shri Shekher Chaturvedi, NIDM and other team members who have facilitated the process.



Manoj Kumar Bindal

आपदा प्रबंधन महाविचार: पूरा भारत भागीदार

Acknowledgement

Indian states are submitting their memorandum of loss assessment in the post disaster scenario. The assessments are done with a conventional tool while applying across the sectors. The memorandum of the states are based on the direct loss basis which is largely calculated on the replacement cost basis on current price. The memorandum does not cover the indirect loss i.e loss in flow or revenue loss basis (indirect cost). NIDM has completed the tools for calculating indirect loss, opportunity cost loss and its impact on the macro economy of the affected state. The current tool is an improvisation on the international tool initially developed by UNECLAC (United Nation Economic Commission of Latin American Countries). It has been customized to Indian system and procedure and been made easy to use by the officials at the local levels. The study was proposed by NIDM to National Disaster Management Authority and subsequently, examined and proposed by NDMA to Disaster Management Division Division of MHA and The World Bank for its approval and the funding support. The World Bank funded the study and NIDM hired the services of Asian Disaster Preparedness, Bangkok. I got the opportunity of leading and coordinating the study and Shri P. G. Dhar Chakrabarti, the then Executive Director of NIDM guided the team extensively. I am also grateful to subsequent Executive Directors of NIDM Dr. Satendra, Mr. Bipin Mallick, Mr. Sanjeev Jindal, Mr. B. H. Anil Kumar, Ms. Rajini Sekhari Sibal and Maj. Gen. Manoj Kumar Bindal for continuously supporting for its implementation and institutionalization.

NIDM acknowledges the support by all the former members of NDMA Gen. N. C. Vij, Vice Chairman, NDMA, Mr. K. M. Singh, Mr. Vinod C. Menon, Mr. V. K. Duggal for approving the proposal. We extend our thanks to Shri Bramha, the then Additional Secretary of NDMA. NIDM also acknowledges the support provided by Shri S. Vasudeva, Ms. Mamta Kundra, Mr. Pradeep Kumar, Shri Pradhan and Shri S. S. Jain. NIDM also acknowledges the support of Shri R. K. Jain, Shri Kamal Kishore, Gen. N. C. Marwah and Shri D. N. Sharma members of NDMA.

NIDM also acknowledges the support and guidance provided by Ministry of Home Affairs especially Shri R. K. Singh, the then Union Home Secretary and subsequent home secretaries Mr. L. C. Goyal, Mr. Rajiv Goswami and Mr. Rajiv Mahrishi. NIDM also acknowledges Mr. Rajiv Guaba for his support.

NIDM is thankful to the team of The World Bank, Shri Saurabh Dani, Shri Deepak Singh, and Shri Anup Karanth for their continues support in the completion of the study.

Mr. Aslam Parvez, ADPC, and his team members who were engaged for the study and contributed.

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NIDM acknowledges the support and suggestions provided by the Members of Technical Steering committee Mr. M. P. Sethy, Mr. Govindrajan and Mr. T. N. Gupta.

Introduction to the Professional Module

This training module has been developed to train professionals from the central and state level agencies of India, which will be engaged in conducting a post-disaster needs assessment (PDNA). The PDNA will be conducted in accordance with the recently developed methodology contained in the India PDNA Handbook.

This India PDNA Handbook has developed after in depth study of the existing assessment methodology of India i.e. Manual on Administration of State and National Disaster Response Funds. The India PDNA Handbook builds on existing systems in India and an internationally-accepted methodology which has been used worldwide and adopted by the United Nations Development Group (UNDG), the European Union (EU) and the World Bank (WB) which signed a joint declaration¹ in 2008 on Post-Crisis Assessments and Recovery Planning. This new methodology provides a comprehensive picture of damage and loss as well as a framework for recovery.

In order to create a pool of trained officials and professionals on PDNA India, a professional training module has been developed. This module has to be used with PDNA Handbook for optimization of benefits of training module.

The training module has seven chapters covering six learning units and a chapter on introduction to the training module. The training module has used adult learning principles and focuses on application of the PDNA tool. The module has a list of key reference for further reading.

Lastly, this professional module is a work-in-progress as application of PDNA tool will provide new insights as well as case studies. The subsequent version of this module can be informed of these new learning's and case studies.

¹EU, UNDG and World Bank- Joint Declaration on Post-Crisis Assessment and Recovery Planning, 25th September 2008. The UNDP Administrator signed the Declaration on behalf of the UNDG.

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CHAPTER 1

Introduction to the PDNA Professional Development Module

Background

In post-disaster settings, accurate, comprehensive and quick information on damage, loss and need is vital for recovery and reconstruction, especially for planning and programming. At global as well as national levels, efforts are being undertaken to standardize this assessment process and to build required capacity.

Recently, India has developed the India Post-Disaster Needs Assessment (PDNA) methodology, which builds on existing assessment systems in India and an internationally accepted methodology adopted by the United Nations Development Group (UNDG), the European Union (EU) and the World Bank (WB), which signed a joint declaration² in 2008. In order to create capacity on usage of this tool, officials from the national, state and sub-state level agencies are being trained.



Aim and Objectives of training

Aim:

- To capacitate and equip the national, state and sub-state officials on how to conduct a PDNA in accordance with the methodology contained in the PDNA Handbook for India.

Objectives:

In order to achieve the above stated aim, the objectives of training are:

- To provide an overview of existing post-disaster assessment systems in India
- To sensitize on the PDNA framework and procedures
- To train on conducting sector assessment and aggregation of disaster effects and impact
- To equip on identification and prioritization of needs for development of recovery framework



Contents of training

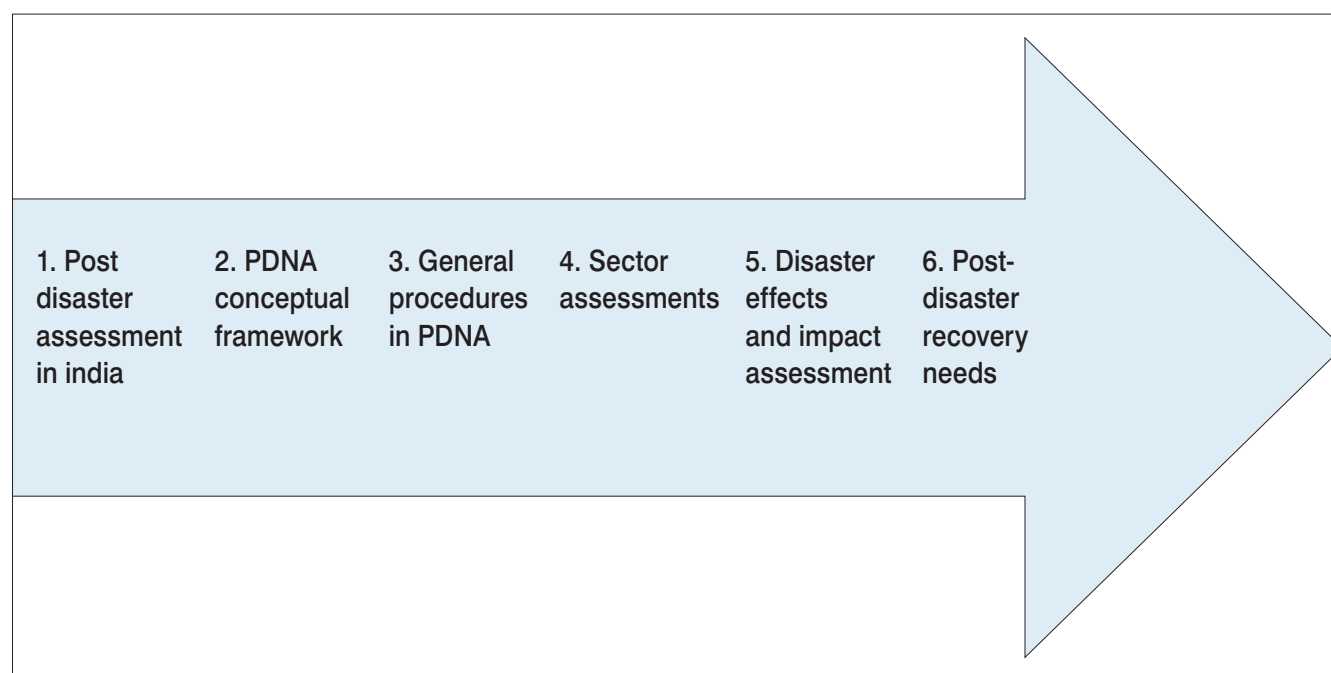
The training has 6 learning units and each unit builds on the preceding unit.

²EU, UNDG and World Bank- Joint Declaration on Post-Crisis Assessment and Recovery Planning, 25th September 2008. The UNDP Administrator signed the Declaration on behalf of the UNDG.

- **Learning Unit 1:** The present post-disaster assessment in India will provide an overview of existing post-disaster assessment in India including strengths and gaps in existing post-disaster assessment.
- **Learning Unit 2:** The PDNA conceptual framework includes concepts related to PDNA, sectors and crosscutting issues for assessment and linkages between sectors.
- **Learning Unit 3:** General procedures in undertaking a PDNA include an overview of all steps from baseline information to estimation of needs.
- **Learning Unit 4:** Sector assessments include the estimation of damages and losses for the sectors namely productive, social, infrastructure and crosscutting issues.
- **Learning Unit 5:** Aggregation of disaster effects and impact assessment include damages and losses and impact at macroeconomic, social, gender and personal and household levels.
- **Learning Unit 6:** Estimation of post-disaster recovery needs to include identification and prioritization of needs and development of recovery framework.

The Learning Units of training (PDNA Professional Module) are summarized in the schematic diagram at Figure 1.1

Figure 1.1 Schematic diagram of PDNA Professional Module



Trainers and participants

- **Trainers:** PDNA Experts and Trainers who have participated in the PDNA Training of Trainers (ToT) course of the NIDM.
- **Participants:** Officials from national, state or district/local bodies levels, which is likely to be engaged in conducting, field assessments after a disaster.



Learning Tools/methodologies

- The training is classroom based and will use adult learning principles. The following tools namely lectures, group work, video, case studies and simulation exercises will be used.
- Participation and sharing of experience by participants will be encouraged for cross-fertilization of ideas, as participants will be from various ministries and departments.
- Learning Unit 4: Sector Assessment, will be conducted simultaneously in different venues. The participants will be segregated into the major PDNA sectors Infrastructure, Social and Productive and the lectures will be conducted in break out groups in separate rooms or venue. This is intended to enable the participants/trainees to focus on their specific sectors of specialization and enhance their absorption of the concepts and methodologies.
- The participants/trainees will be provided with a copy of the pertinent parts of the India PDNA Handbook, namely the concepts and methodologies and the sector of specialization of the trainee.

Feedback and continuous improvement

- At the end of the training, there will be an assessment form by which the participants/trainees can provide feedback on the overall PDNA training and it will help in improving future trainings.
- Course content, especially implementation aspects can be improved periodically as learning's from the usage of the PDNA in post-disaster can inform the training content. Also, case studies on usage of the India PDNA methodology will be prepared overtime, which can be incorporated into the training.
- The true measure of the success of the training will be the evaluation of the post-disaster assessment results using the new methodology vis-à-vis during the time before the PDNA methodology was introduced. NIDM and the National and State Disaster Management Authorities must be able to evaluate the conduct of the PDNAs to determine, whether the concepts and methodologies were observed during the entire PDNA process.
- Lastly, this training module should be periodically reviewed and improved, as application of PDNA methodology is new to India and other countries.

Navigation tools

The training module has used the following icons

Icon³

Message



Title of Learning Unit/Session/ Chapter



Aim/Objectives



Duration



Tools/Methodology



Contents

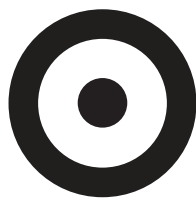


Key learning's



References and additional reading

³Icons from iconarchive.com have been used.



CHAPTER 2

Learning Unit 1: Damage, Loss and Needs Assessment in India



Objectives

- To discuss and understand current post-disaster assessment processes in India
- To understand rationale for Post-Disaster Needs Assessment (PDNA) methodology, based on internationally accepted standards for India
- To provide an overview of evolution of the PDNA



Duration

Total: 120 minutes

- Current post-disaster assessment in India: 45 minutes
- Analysis of the current practices in India: 45 minutes
- Rationale PDNA methodology: 15 minutes
- Overview of PDNA evolution: 15 minutes

Tools/Methodology

- Training methods: Lecture and Group Work
- Material required: Projector, screen, laptop, chart paper and marker.



Contents

- **Current post-disaster assessment process in India**

India enacted Disaster Management Act in 2005, which provides comprehensive framework for disaster management including post-disaster allocation of fund for post-disaster relief and recovery. The National Disaster Response Fund (NDRF) and the State Disaster Response Fund (SDRF) are currently two source of post-disaster funding support, which is based on the assessment of the affected areas. The NDRF and the SDRF is a recent mechanism and is primarily based on the Calamity Relief Fund and National Calamity Contingency Fund (NCCF), which have been in practice for decades.

In 2013, the Ministry of Home Affairs issued revised norms of assistance from the State Disaster Response Fund and the National Disaster Response Fund that would be observed in the period 2010-2015⁴.

These above mentioned funds based on set assessment procedures are designed to estimate the amounts of relief assistance to be given to disaster affected persons. In some cases, broader post-disaster assessments of major events are carried out by the affected State authorities with support from international agencies such as the Asian Development Bank, The World Bank, and The United Nations, which are aimed at estimating beyond relief assistance needs for reconstruction and recovery.

- **Disaster Response Fund Assessments**

The Office of the Relief Commissioner in the Revenue Department of each State and Union Territory (UT) is mandated to collect information on disaster effects after any disaster and to provide the required disaster response thereafter.

On the basis of individual, “Rapid Assessment” reports developed by District, Block and Village Revenue Officers as well as of supplementary “Detailed Assessments” prepared by sectorial State Department Officials (including the Departments of Agriculture, Public Works, etcetera), a “Relief Memorandum” is prepared by the Relief Commissioner to be sent to the Central Government in order to obtain additional financial resources to meet post-disaster demands for assistance. While the contents and details of the relief Memorandum vary from State to State and from one disaster to another, it normally provides full information on the estimated value of required disaster response assistance based on the estimation of the extent and degree of damage and losses sustained by the affected population. Table 2.1 shows the type of information collected by different departments in the State of Gujarat as part of the rapid and detailed assessments, and provides a good example of the scope of assessments undertaken at the present time in the country.

⁴Refer the communication sent on 28 November 2013 by the Deputy Secretary of the Government of India to the Chief Secretaries of all States and to Relief Commissioners/Secretaries, Department of Disaster Management of all States.

Table 2.1. Damage data collected by different Departments in the State of Gujarat

	Sector	Sub-Sector	Damage data collected
1	Administrative buildings, roads and bridges		Damage to public buildings (different administrative offices), damage to key roads, bridges
2	Agriculture	Directorate of Agriculture	Damage to crops, farming equipment
		Directorate of Animal Husbandry	Damage to farm animals, fodder
		Seeds Corporation	Damage to seeds
		Department of Horticulture	Damage to fruits, flowers, cultivation equipment
		Gujarat Agro-Industries Corporation	Damage to food-processing equipment, transporters, raw materials or finished products
3	Education	Primary Education	Damage to Primary Schools at Jilla Panchayat and Municipal Area, Damage to primary Teachers' Training Institution, Kitchen Sheds, Staff/Student casualties
		Secondary and Higher Education	Government, Non-Government schools, Fine Arts Institutions, Sanskrit Pathshalas, Physical Education, Sainik Schools, Staff/Student casualties
		Universities	Government Colleges, Hostels, Vidyapeeth, Research and Cultural Institutes, Basic Training Colleges, Non-Governmental Colleges (Grant-in aid), Staff/Student casualties
		Technical Education Institutions	Government Institutions (Engineering Colleges, polytechnics, etc.) and Grant-in-aid Institutions, Staff/Student casualties
4	Fisheries		Fish, Fish processing industries and equipment of fisher folk, damages to fishing ponds
5	Health		Damage to equipment and goods in sub-centers, primary health care centers, community care health centers, District hospitals, Medical Colleges and Hospitals, Ayurvedic College, Hospitals, Laboratories, Anganwadis and Prosthetic Workshops

6	Industries & Cottage industries		Damage to small and large industries. Secondary damages. Damage to artisan equipment. Loss of skilled workers.
7	Irrigation		Damage to dams, check dams, irrigation canals of major/minor irrigation schemes, percolation pits, Sardar Sarovar Narmada canals. Large reservoirs.
8	Power supply (energy)		Damage to substations, supply lines, wind farms, loss of revenue during shutdown
9	Rural housing		Damage to rural housing, Panchayat property
10	Urban housing and municipalities		Damage to urban housing, damage to Municipal Corporation infrastructure
11	Water supply		Damage to tube wells, wells, pumps, pumping equipment/Tankers, civil structures, water supply pipelines, and water tanks.

The values included in the Relief Memorandum are, incorrectly, called damage and losses, when they actually represent the value of disaster response assistance, which is only a fraction of the value of damage and losses of recovery and reconstruction needs, as will be shown later on in this report.

The Relief Memorandum is intended to quantify the amounts of additional resources required from the central Government (National Disaster Response Fund) to supplement the funds available at the State level (State Disaster Response Fund). In most cases, field verification missions are carried out by Central level Departments to review the reliability and accuracy of the estimations for response fund assistance submitted by the States.

- **Damage and Needs Assessments with International Support**

In recent years notably since the 2001 Gujarat Earthquake – more detailed assessments of disaster impact have been undertaken in the case of selected, major events. International technical and financial support from the Asian Development Bank (ADB), The World Bank (WB) and The United Nations System has been obtained for these undertakings, which subsequently led to obtaining external support for recovery and reconstruction activities. These assessments have had some limitations.

In the case of the Gujarat earthquake, adequate estimations were made of the value of damage or destruction in all affected sectors of social and economic activity; production losses were only partially estimated for some sectors, leaving out many of the social and infrastructure sectors.

The assessments conducted in the cases of the 2008 Bihar floods, the Uttarakhand floods and of Cyclone Phailin in Odisha in 2013 – which were called “Damage and Needs Assessments”, the scope of work was limited to the estimation of the value of destroyed assets and of the corresponding needs for reconstruction. Allegedly due to lack of sufficient information, production losses and social sector changes in flows were not quantified, and not all affected sectors of activity were included in the assessment.

So, even in these cases of assessments conducted with external technical and financial support, their results did not provide sufficient information on disaster impact, especially as regards to production decline and social impact, which in fact preclude the subsequent analysis of overall macro economic and macro-social disaster impact and the quantitative estimation of recovery requirements. There is indication that, because of such limitations, the affected population did not achieve full recovery promptly. Also, there is probability of recreation of risk due to reconstruction of assets without risk reduction features.

It may be stated, then, that current assessment practices do not provide adequate information that may be used by the higher authorities to adopt adequate public policies for recovery and reconstruction, and that as a result the affected population faces longer periods of suffering to achieve recovery.

Putting it differently, due to the limitations of the assessment methodologies presently used, there exist limitations to governance (since the Central and State governments do not obtain the full picture of disaster impact and recovery and reconstruction requirements); the overall potential growth of socio-economic development is not achieved or delayed, and the affected population face significant deterioration on their quality of life and human development.

This situation needs to be addressed, especially since the quantitative information required for a full post-disaster effect-impact-and-needs assessment is available in the country, and only the adoption of a scientific, holistic methodology for assessment is required.

- **SWOT Analysis of Existing Disaster Assessment Scope and Procedures**

A SWOT analysis reveals the internal strengths and weaknesses of the existing system as well as opportunities and threats in the external environment of the system.

- o **Strength:**



The existing system of post-disaster needs assessment in India has certain strengths that include simplicity and efficiency. The issue of simplicity involves: first, the amounts of assistance to be provided to the affected population are pre-defined (not determined on the basis of actual field measurements of damage and losses sustained by the affected population); second, assessments can be carried out by non-specialized technical and professional personnel at State levels and below. The system is efficient because, as recent experience shows, the proceeds of the estimated assistance can be delivered to the affected population within 45 days of the occurrence of the disaster; in addition, the capacity of the system is clearly very high as the recent massive evacuation of population before cyclones in Odisha attests. It may be stated that the existing system for estimating disaster response is a good example of optimum utilization of limited human and financial resources available for assessment and disbursement of relief assistance requirements.

o **Weakness:**



It does not provide means to easily adjust assistance for inflation. Its scope is limited due to the following reasons: first, not all affected population is included to receive assistance; second, not all sectors of economic and social activity are included in the analysis and some sectors are only partially included; and, third, the assessment concentrates on relief assistance and only very partially covers recovery assistance and little or no reconstruction of destroyed assets using risk-reduction features. Finally, as indicated previously, the rates of assistance to be provided have remained at fixed levels for a number of years, with only minor and partial adjustments for inflation.

The present system does not provide for the identification of the total value of destroyed assets and of the total production decline that occurs after a disaster. The result of the assessment is the estimated value of assistance to be provided to the affected population as set forth in the Disaster Response Funds guidelines, which represents a small fraction of the total value of damage and losses sustained by the Indian society and economy. Therefore, the assessment provides the State and Central governments an estimation of the amounts to be given out to the affected persons; but it does not provide an estimation of the total impact of the disaster on social and economic conditions nor of the total needs for recovery and reconstruction.

It is to be noted that official government reports and newspaper accounts erroneously refer to the estimated disaster response costs as the value of damage and losses produced by the disaster, misleading the readers and grossly under-estimating the effects of the disaster on social and economic conditions.

Also, the present system covers only a narrow fraction of the affected population, concentrating, which is correct but insufficient, on the poorer strata of the population: i.e. small farmers, fishermen and artisans. It does not include the analysis of all relevant, affected sectors of economic activity, leaving aside important sectors or sector components and employed populations that are involved in activities such as industry, commerce, tourism and others. In the case of agriculture, losses of food crops are assessed, but commercial crops are not considered; moreover, assistance is provided only to those farmers that lose more than 50 per cent of their crops, and no assistance is given to those that lose less than that value.

For example, the Disaster Response assistance was promptly provided to small farmers, fishermen, and homeowners after the Cyclone Hudhud in Andhra Pradesh and Odisha in 2014. According to newspaper accounts⁵ the list of affected sectors and subsectors included many more, such as agriculture crops, fishery, animal husbandry with special reference to the poultry industry, many types of industries (including IT, pharmaceutical and petro-chemical), steel plants, tourism facilities, roads, railways, airports, telecommunications, water supply and electricity systems, education and health facilities. Disaster Response assistance was provided to the tune of several hundred crore, but the total damage and production losses was roughly estimated to be in the order of one lakh crore⁶.

⁵In this connection, a detailed review was made of daily reports included in <http://www.business-standard.com>.

⁶See Hudhud aftermath: Officials put Hudhud loss at over Rs 1 lakh crore, October 18, 2014, in The Business Standard, http://www.business-standard.com/article/current-affairs/officials-put-hudhud-loss-at-over-rs-1-lakh-crore-114101500798_1.html

Table 2.2 Comparison of estimated value of damage and losses versus disaster response assistance provided in the case of the Cyclone Phailin disaster in Odisha, 2013
(Values in Rs. Million)*

	Damage and Needs Assessment Estimation			Relief Memorandum
	Damage	Losses	Total	
Social sectors	31,371.8	4,050.8	35,422.6	9,171.7
Ex-gratia for loss of life		6.6	6.6	6.6
Relief costs		2,837.7	2,837.7	2,837.7
Housing and household goods	24,749.4	1,206.5	25,955.9	3,313.8
Education	3,108.7	N. A.	3,108.7	2,865.1
Health	337.2	N. A.	337.2	148.5
Other social costs	3,176.5	N. A.	3,176.5	
Productive services	6,651.5	19,361.6	26,013.1	6,235.5
Agriculture, livestock, fishery, forestry	6,537.3	19,340.8	25,878.1	6,213.3
Industry	114.2	N. A.	135.0	22.2
Commerce	N. A.	N. A.	N. A.	
Infrastructure	31,721.7		31,733.9	27,703.6
Road transport	7,973.1	N. A.	7,973.1	9,557.1
Water supply and sanitation	3,196.3	N. A.	3,196.3	380.5
Irrigation works	6,828.3	N. A.	6,828.3	4,308.6
Electricity	10,748.0	N. A.	10,748.0	10,481.4
Govt. administration buildings	515.7		515.7	515.7
Community assets	2,460.3		2,460.3	2,460.3
TOTAL	69,745.0	23,424.6	93,169.6	43,110.8

Note: Shaded areas represent sectors for which only partial or no estimations were made of either damage or losses caused by the disaster.

In addition, a comparison of the value of response assistance provided to the affected persons after the 2013 Cyclone Phailin disaster in Odisha⁷ vis-à-vis the estimated value of damage and losses obtained during the Rapid Damage and Needs Assessment conducted with support from the World Bank and the Asian development Bank⁸ is quite revealing. While the latter report did not cover all affected sectors of social

⁷See Special Relief Commissioner, Memorandum of the very severe Cyclone Phailin and the subsequent flood, 12 to 15 October 2013, Government of Odisha, October 2013.

⁸See India, Cyclone Phailin in Odisha, October 2013; Rapid Damage and Needs Assessment Report, Government of Odisha, Asian Development Bank and World Bank, 2013.

and economic activity and did not include a full estimation of the value of production and personal income losses⁹, the estimated value of disaster effects reached a level of 93,170 million Rupees (or its equivalent of 1,500 million US Dollars), and the value of disaster response assistance was valued as only 43,110 million Rupees (or 685 million US\$), as shown in Table 2. This reveals that provisions in the Disaster Response Fund cover only less than half of the admittedly under-estimated value of total damage and losses.

A third limitation is that when it comes to the replacement of destroyed assets buildings, machinery, equipment the present system includes mainly those under the purview of government-owned activities, leaving aside those falling under private sector ownership (whether owned by individual persons or by enterprises). Industrialized countries have a similar characteristic in that they do not provide coverage for private sector damage and losses because they have insurance coverage; but in developing countries and India is not an exception insurance penetration and coverage is still in very early stages of development and cannot provide such assistance to individuals and enterprises. In the specific case of India, the public sector covers only 20 per cent of economic activities included in the system of national accounts, which means that in any assessment of disaster effects where the private sector impact is not included leaves out nearly four fifths of the impact.

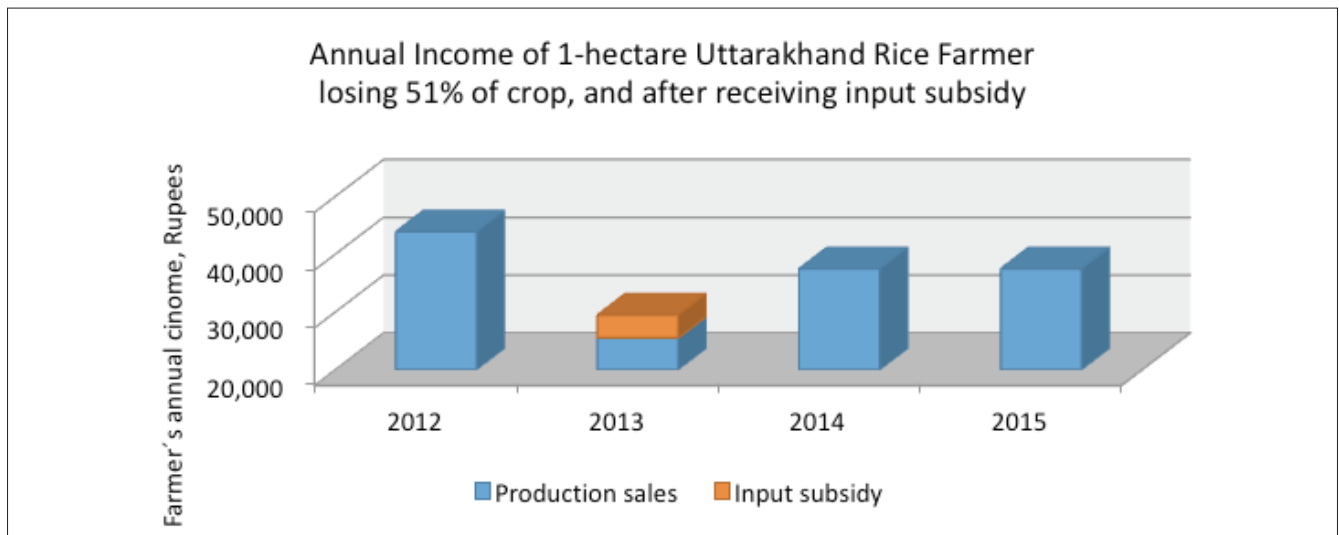
A fourth limitation of the present system refers to the fact that the Disaster Response Fund concentrates its assistance in relief operations and only provides partial assistance to achieve recovery of normalcy levels in personal or household income, basic service access and production recovery, and nearly no assistance for reconstruction of destroyed assets under disaster-resilient standards. An exception to the latter is the reconstruction of government-owned assets that may be funded from the 10% flexible funds available in the plan budget funds, through the Centrally Sponsored Schemes.

In this regard, it is to be noted that those persons that do receive assistance from the Disaster Response Funds actually receive a fraction of the total they require to achieve recovery of personal income, basic services access, and production, and a very small fraction of the amount they require to rebuild their homes and other assets to standards that will be disaster-resilient. Furthermore, not all affected persons receive any assistance, as is illustrated by the fact that farmers that lose less than 50 per cent of their crops do not get any assistance. Furthermore, farmers involved in permanent plantation crops do not get any assistance.

To illustrate this point, using data obtained in Uttarakhand after the 2013 floods disaster, it has been found that a farmer having a 1 hectare farm where he grows grain crops who losses more than half of his crop would receive crop input assistance that does not enable him/her to have sufficient money to plant the same extension of 1 hectare, and therefore his annual income would decline after the disaster and may in fact fall below poverty level (See Figure 2.1). And the farmers that lose less than half of their crops would face similar and probably worse situations.

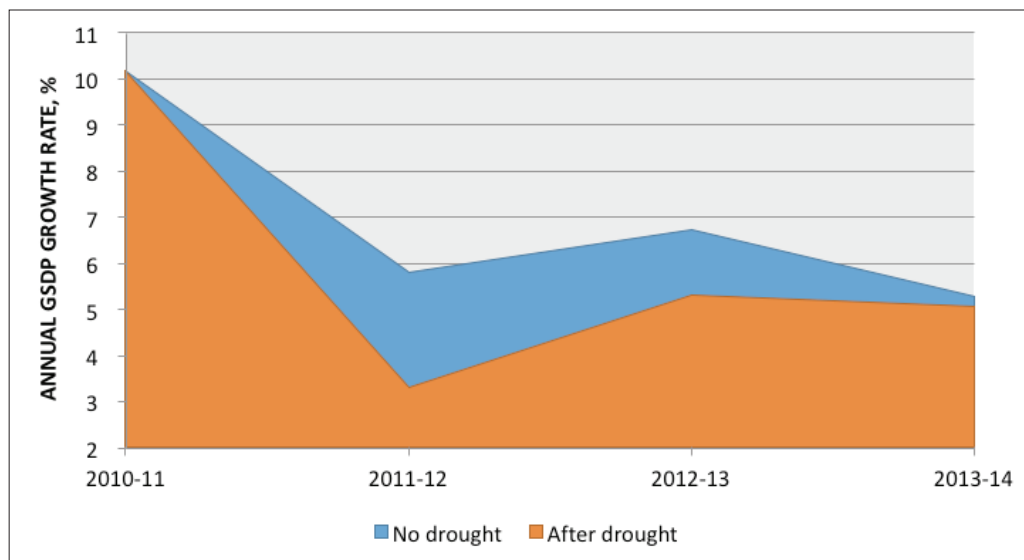
⁹It is to be pointed out that the Rapid Damage and Needs Assessment did not include an analysis of disaster effects in the sectors of industry and commerce, nor did it include estimations of the revenue losses sustained by the services sectors of education, health, transport, water and sanitation, electricity and others, and therefore produced only partial results.

Figure 2.1 Analysis of 1 hectare rice farmer's annual income in Uttarakhand after receiving input subsidy



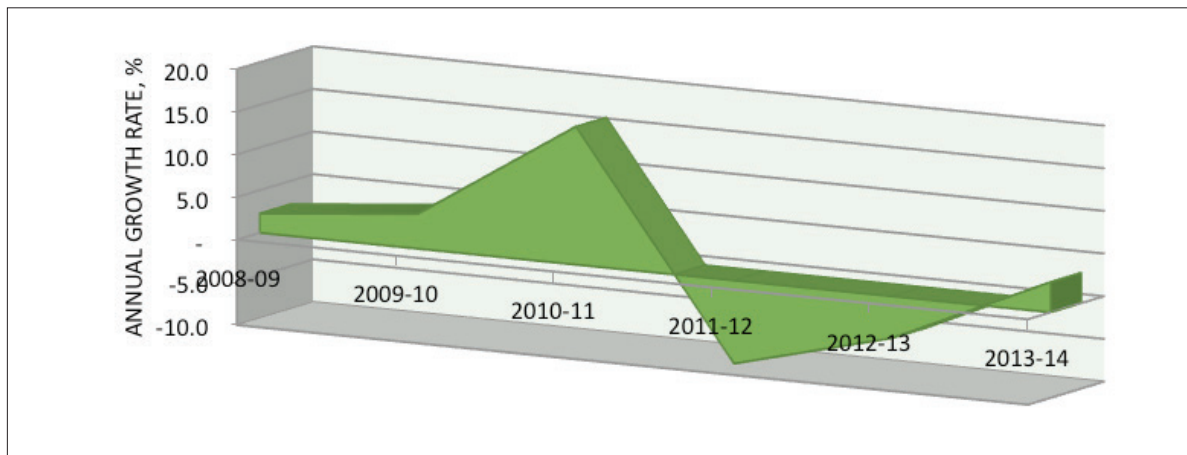
The drought that affected Karnataka in 2011 caused a decline in gross state domestic product of about 2.5 percent in that same year as well as a further decline of 1.4 per cent in 2012. Figure 2.2 shows the trend of GSDP after the drought and that which would have occurred with no drought.

Figure 2.2 Impact of the 2011 drought on the growth of gross state domestic product in Karnataka



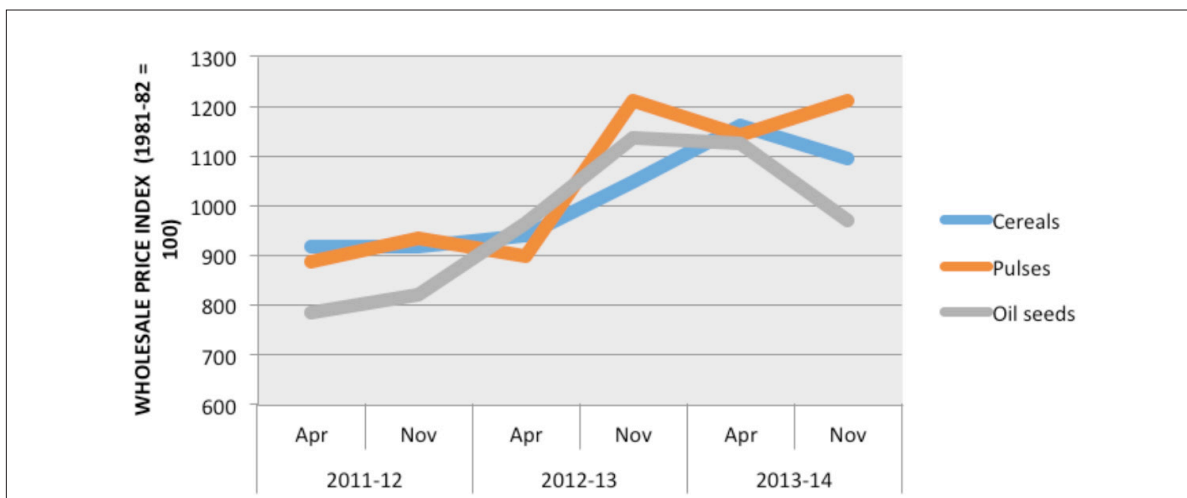
Furthermore, farmer per capita income sustained a significant decline because of the drought in 2011, and did not recover to the level of 2009 until 2013, as shown in Figure 2.3. This was of course due to the insufficiency of the disaster response allocations assigned to them.

Figure 2.3 Annual growth of per capita farmer income in Karnataka, 2008 to 2013



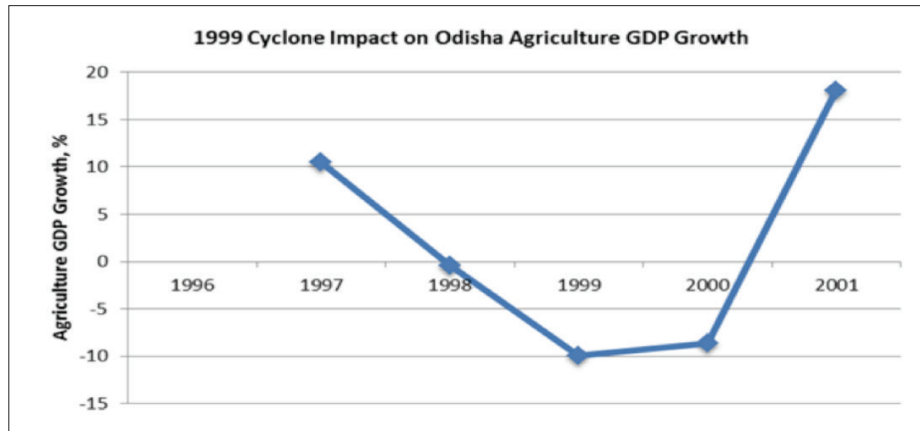
Worse yet, the same farmers that faced such income hardships also endured significant increases in the price of food that they were forced to acquire, as evidenced by the data shown in Figure 2.4, and their net household income sustained much higher impacts, thus reducing their already limited human development. Had the assessment included the estimation and assignation of recovery needs, the hardship of the affected farmers would have been much less.

Figure 2.4 Variation of unit prices of selected agriculture products in Karnataka, 2011 to 2013



In the case of the cyclone that affected Odisha in 1999, the growth of agriculture crop production took more than two years to return to pre-disaster levels, again because the farmers did not receive sufficient assistance for recovery, and their personal or household income declined accordingly (See Figure 2.5).

Figure 2.5 Growth of agriculture production in Odisha before and after 1999 Cyclone



Moreover, the guidelines for Disaster Response do not cover the entire agriculture sector; it concentrates only on farmers that produce food crops, and commercial, non-food farming activities are not included. Therefore, crops losses in sugarcane, tea, and other similar plantations are not estimated and commercial farmers that may sustain losses in production due to a disaster do not receive any recovery assistance.

In addition, the amount provided as assistance under the Disaster Response Fund for a homeowner whose house has been fully destroyed represents only a limited fraction of the cost to rebuild the house.

The above statement is substantiated by the fact that in the case of the Cyclone Phailin in Odisha assessment it is stated that the unit construction cost of destroyed houses ranges between Rs 70,000 for Kutcha houses and Rs 280,000 for the case of Pucca houses¹⁰, while the disaster response assistance to destroyed homeowners was Rs 15,000 and Rs 70,000 for Kutcha and Pucca houses respectively as per the norms of the Disaster Response Fund. These amounts represent, respectively, 21.4 and 25.0 per cent of the total cost of reconstruction of each house type, and the homeowners need to obtain the balance from other sources (i.e. personal or family savings and/or credit loans) in order to rebuild their homes to the same pre-disaster characteristics and standards. If the additional funding required for reconstruction is not obtained from other sources, homeowners are forced to build their homes using lower quality materials and below-quality standards, which results in a higher housing sector risk than the one that prevailed before the disaster, despite claims of adoption of a “building-back-better” strategy.

In addition to the above example, data available for the Uttarakhand Floods of 2013 strengthen the argument. In that State the average construction cost of an urban house is Rs. 560,000 and Rs. 490,000 for a rural housing unit.¹¹ If the same rates defined by the Disaster Fund are used to provide assistance to Pucca homeowners whose houses were destroyed, it is found that the value of relief provided (Rs. 70,000) represents only 12.5 per cent of urban reconstruction costs and 14.2 per cent of rural reconstruction costs.

In summary, it can be stated that in the examples of the farmers and the home owners, the affected persons do not obtain sufficient funding from the Disaster Relief Funds to restore their annual income (recovery) and to rebuild the destroyed home (reconstruction), and must search for additional financing from other sources. When such other sources are not found, or are insufficient to meet the total requirements, the

¹⁰See India, Cyclone Phailin in Odisha, October 2013; Rapid Damage and Needs Assessment Report, Government of Odisha, Op. Cit, page 10.

¹¹See India, Uttarakhand Disaster, June 2013; Joint Damage and Needs Assessment Report, page 28, Government of Uttarakhand, Asian Development Bank and World Bank, 2013.

affected families lose income and wellbeing, sometimes falling under poverty conditions, and may resort to rebuild their homes without adequate standards that do not guarantee disaster resilience, and risk is increased to levels above the one prevailing before the recent disaster.¹² The situation becomes one of significantly lower levels of human and socio-economic development, and when the next disaster occurs further destruction and much higher human suffering is assured. In addition to the above, overall production levels in all affected sectors of social and economic activity do not recover to pre-disaster levels, and the national economy does not reach its potential level of development and growth. Putting it differently, while India's economy has been growing at healthy annual rates in recent years, had disaster recovery been in effect, annual economic growth would have reached higher rates than the present ones.

The above considerations lead to believe that in India the human development and wellbeing of affected population does not recover to pre-disaster levels or that it is only reached after a very long time, with the corresponding long term suffering of the affected population, and that overall socio-economic development is not reaching its potential. In view of the successive occurrence of disasters, especially in the most disaster-prone coastal States, this might lead to increasing poverty numbers and worsened conditions for the affected population, rendering insufficient the current national and State programs to fight or reduce poverty.

One last limitation or shortcoming of the existing system for disaster impact and needs assessment in India is that in some States use is made of other procedures for estimation of damage and losses that do not necessarily coincide with the norms of the Disaster Response Fund. Whenever that happens, the published results of disaster effects cannot be validly compared or added together to arrive at a series of total damage and losses for the country. The published data is therefore skewed and does not provide a reliable value for use in further analysis.

o Opportunity



On the other hand, the very existence and execution of the India PDNA project provides an opportunity to put in place a comprehensive and scientific system of disaster effect and impact assessment for the purpose of ascertaining post-disaster recovery and reconstruction financial needs assessment. The willingness expressed by many State government officials to request and adopt a scientific and comprehensive procedure for disaster impact assessments, which go beyond the estimation and provision of relief assistance, is an opportunity that should be taken advantage of.

o Threat



Should those opportunities not be grabbed opportunely, external threats arise that include: (i) full recovery of production, availability and access to goods and services is not achieved by all affected persons after disasters; (ii) overall well-being and quality of life of the affected population worsens after disasters; (iii) disaster risk is increased after reconstruction of assets using non-improved standards; (iv) slowdown of overall economic growth and worsening of the fiscal position of the State and central governments; (v) significant delays in achieving Millennium Development Goals (MDGs); and (v) widespread dissatisfaction and complaints of the population with the amount and coverage of Government assistance provided after disasters.

¹²It is to be noted that in the case of isolated, selected cases of very major disasters, the assistance provided by the Government to disaster-affected population may exceed the above-described norms and provisions, and may include further assistance for recovery and reconstruction. Examples of those are the Gujarat earthquake in 2001 and the Indian Ocean Tsunami in 2005, among others.

Assessments to define the amounts of post-disaster assistance to be provided to affected population are undertaken by a combination of officials from the State Revenue Department and of sectorial Departments (agriculture, water and sanitation, public works, etcetera). While the norms described above are followed in all States, the procedures for the estimation of assistance are not fully standardized in all of them.

In fact, some States do not have standard formats for the collection of damage and loss information, and rely on the initiative of its officials for such purposes; when these officials move or are replaced, the manner of data collection is not necessarily maintained. Other States do have specific formats for such purpose, but they are not standardized across the country. Therefore, the results in the estimation of assistance requirements are not fully comparable across all States and over time. On the other hand, however, standard formats are used by all States to report the estimated requirements of relief assistance to the Central Level.

The above situation facilitates the claim by Central Government authorities that the States inflate their estimation of National Disaster Response Fund requirements, which in turn results in longer periods of time required for the Central Government to review the funding request of the states.

Lastly, there are no standard lists or forms for collection of the baseline information and information sources required to conduct full-fledged assessments of disaster effects, impacts and need, such as the ones presently in use elsewhere in the world. This fact sometimes leads to the erroneous assumption that the required data is not available in different sources.

- **Rationale for India PDNA methodology**

The analysis undertaken shows a number of significant gaps in the scope of the current system of post-disaster assessments in India vis-à-vis the current international practices. It has been summarized as follows:

- o The existing system of post-disaster assessments in India is designed to estimate disaster relief response from the Central and State government exclusively, and only very partial needs of assistance for recovery;
- o The value of response assistance is erroneously designated as the total value of damage and losses caused by disasters, and thus results in a gross underestimation of disaster effects and impacts;
- o The assessment, in its current form, does not cover the estimation of post-disaster needs for the entire affected population;
- o In addition, it does not cover all affected sectors of socio-economic activity. As examples, the industry, trade or commerce, tourism and mining sectors are not included; and, under agriculture, only food crops are covered, leaving out possible losses in the production and export of tea and other commercial crops. In some cases, no estimation is made of the cost of providing psychosocial assistance to disaster-affected persons.
- o From current assessments, it is not possible to derive the total cost of disasters to the Indian society, economy and environment;
- o The estimation of disaster impact at the macro-economic level is not possible to make, as production losses in all productive sectors are not estimated on a systematic basis
- o Only partial estimations are made of disaster impact at the personal or household levels – which fact prevents an estimation of the decline in personal and family income and increases in costs of living – and no estimates are made of the macro-social impact and of the resulting delays in achieving Millennium Development Goals (MDGs).

- o The current system does not permit estimating the financial requirements to obtain recovery in production, personal income, and supply/access to basic services for the population, and there exists evidence that affected persons do not recover or take a very long time to recover after disasters;
- o The current estimation of assistance for house reconstruction and repairs provides only a fraction of the funds needed by home owners; in the absence of savings or other financial contributions, families are forced to rebuild their homes with sub-standard materials norms and the resulting disaster risks are above those that prevailed before the disaster;
- o Furthermore, there is evidence that at least in some cases reconstruction of roads does not follow a disaster risk reduction standard, thus resulting in higher disaster risk for the future;
- o The fact that the cost of reconstruction of public property and roads is financed from the regular State budget for operation results in a reduced availability of funds for maintenance, which in fact reduce the intended life span of existing infrastructure and would induce higher costs of operation of vehicles.

This situation needs urgent attention and solution if the Government is keen to address the negative impact of disasters. It is recommended that the current methodology for post-disaster assessment used internationally be promptly adapted to the specific characteristics of India, so that the government may consider its eventual adoption. In this connection, it must be emphasized that the baseline information required for such undertakings is available in India, as in any other development country, despite claims to the contrary expressed orally by some government officials and also in some assessment reports.¹³

Furthermore, the sufficient availability of baseline information was evident when, in the period 2003 to 2005, ADPC conducted a technical assistance project to transfer the UN ECLAC methodology to the Gujarat State Disaster Management Authority (GSDMA). Thus, the quantitative information on sectorial disaster effects is collected during field assessments, and combined with the existing baseline information of socio-economic development conditions, the improved UN ECLAC methodology is fully applicable in India, and should enable a full analysis of disaster impact on social, economic and environmental conditions as well as the comprehensive estimation of post-disaster recovery and reconstruction needs.

• **Current International Methodologies for Assessing Disaster Impact**

In 1971, the UN General Assembly established the Office of the United Nations Disaster Relief Coordinator (UNDRO), in view of the magnitude and extent of the disasters that occurred in 1970, which brought about international concern for the provision of assistance to the affected population.

Its main function was that of catalyst and coordinator of donors of aid and services. UNDRO had the capacity to define the specific assistance needs arising from a disaster and to respond rapidly by identifying and mobilizing potential sources of relief. UNDRO's mandate also included assisting governments in preventing disasters or mitigating their effects by contingency planning, in association with similarly concerned voluntary organizations. It promoted the study, prevention, control, and prediction of natural disasters and gathered and disseminated information relevant to disaster relief.

¹³In this regard, note is made of the statement included in the document titled Bihar Koshi Floods 2008, Needs Assessment Report, as prepared by the Government of Bihar, the Asian Development Bank and the World Bank, 2010, where it is indicated that "The second limitation is data availability. As comprehensive data is not available on economic losses, it was not feasible to deploy the UN-ECLAC Damage and Loss Assessment Methodology". The correct meaning of that statement is that no government report on production losses was available at the time of the assessment, and that the assessment team elected not to undertake such estimation on its own due to time constraints.

Furthermore, UNDRO defined the general conceptual framework for assessing disaster effects and impacts. In 1979 it published a volume of its series on current knowledge on disaster prevention and mitigation entitled *Economic Aspects* that outlined the definitions of disaster damage, indirect losses and macroeconomic or secondary impact.¹⁴

After the Christmas earthquake that devastated the capital of Nicaragua in 1972, the United Nations Economic Commission for Latin America (UN-ECLAC) undertook the first-ever full assessment of disaster impact that comprised not only the value of destroyed assets but an estimation of changes in economic flows (indirect production losses) for the affected Central American economy, and assisted the Nicaraguan Government in preparing a plan for economic recovery and reconstruction. Subsequent similar assessment of other major disasters in the Latin America and Caribbean region enabled UN-ECLAC to develop a standard methodology to comprehensively estimate the socio-economic impact of disasters, which was first published in 1991 with support from the Government of Italy.¹⁵ This methodology, which was informally called DaLA methodology, enabled the assessment of direct and indirect disaster effects across all sectors of economic and social activity and provided a basis for estimating macro-economic impact (or secondary effects) of disasters of every kind, and provided inputs for formulating economic recovery and reconstruction plans.

During the 1990s UN-ECLAC, in cooperation with other United Nations agencies with which it had joint units or with which it had established close working relations such as the Food and Agriculture Organization (FAO), UN-HABITAT, the United Nations Environment Program (UNEP), the Pan-American Health Organization (PAHO/WHO), the United Nations Industrial Development Organization (UNIDO) and others further developed and expanded the methodology to include the analysis of disaster impact on the environment, and applied it in a relatively large number of disaster cases that occurred in the Latin America and Caribbean region, assisting many of its member States in defining post-disaster recovery and reconstruction programs. This resulted in an expanded and updated version of the methodology that was published in 2003 with the support of the Government of The Netherlands and the World Bank.¹⁶

In 2001, after the Gujarat earthquake in India, the World Bank and other international agencies assisted in the assessment of disaster impact, in which the UN-ECLAC methodology was partially applied for the purpose of defining recovery and reconstruction requirements and plans.¹⁷ The methodology was also used to estimate the economic impact of the Severe Acute Respiratory Syndrome (SARS) epidemic that occurred in Singapore in 2003¹⁸. The impact of the Indian Ocean earthquake and Tsunami that affected was also estimated using the ECLAC methodology. It was also used in the Cyclone Nargis of Myanmar of 2008, Thailand Floods of 2011 and Cyclone Haiyan of Philippines of 2013.

¹⁴Office of the UN Coordinator of Disaster Relief (UNDRO), *Disaster Prevention and Mitigation, Compendium of Current Knowledge; Volume 7, Economic Aspects*, United Nations, Geneva and New York, 1979.

¹⁵Economic Commission for Latin America and the Caribbean, *Handbook for Estimating the Socio-Economic Effects of Natural Disasters*, United Nations, Santiago, Chile, 1991.

¹⁶Economic Commission for Latin America and the Caribbean, *Handbook for Estimating the Socio-Economic and Environmental Effects of Disasters*, United Nations, Santiago and Mexico, 2003.

¹⁷See India, *Gujarat Earthquake Recovery Program Assessment Report*, World Bank and Asian Development Bank (ADB), 14 March 2001.

¹⁸See Jovel, Roberto, *Estimation of the Economic Impact of the Severe Acute Respiratory Syndrome (SARS) in Singapore*, Asian Disaster Preparedness Center (ADPC), Bangkok, 2005.

Table 2.3 Estimation of Damage and Losses caused by Disasters in Asia (2000 to 2013)
(Inflation adjusted to 2010)

Year	Disaster	Location and Country	Million US Dollars		
			Total	Damage	Losses
Disasters of Geological Origin					
2001	Earthquake	Gujarat, India	3,522.9	2,694.7	828.2
2004	Earthquake & Tsunami	Indonesia	5,115.3	3,357.4	1,758.0
2004	Tsunami	India	1,406.4	660.7	745.7
2004	Tsunami	Sri Lanka	1,670.6	1,314.5	356.2
2004	Tsunami	Maldives Islands	692.8	517.1	175.8
2004	Tsunami	Thailand	2,526.7	584.8	1,941.8
2005	Earthquake	Kashmir, Pakistan	3,194.5	2,549.6	644.9
2006	Earthquake	Yogyakarta, Indonesia	3,375.7	2,636.6	739.1
2009	Earthquake	West Java, Indonesia	212.3	202.8	9.5
2009	Earthquake	West Sumatra, Indonesia	2,293.0	2,060.0	233.0
2010	Volcanic Eruption	Mt. Merapi, Indonesia	469.6	126.5	343.1
Disasters of Hydro-Meteorological Origin					
2007	Cyclone Sidr	Bangladesh	1,751.9	1,211.3	540.6
2007	Floods in Jakarta	Indonesia	601.8	205.2	396.6
2008	Cyclone Nargis	Myanmar	4,101.8	1,773.3	2,328.5
2009	Typhoon Ketsana	Lao PDR	58.1	41.9	16.1
2009	Typhoon Ketsana	Cambodia	133.4	58.7	74.7
2009	Typhoons Ketsana & Parma	Philippines	4,429.3	1,467.1	2,962.2
2010	Floods	Sri Lanka	50.6	23.4	27.2
2010	Floods	Pakistan	10,056.1	6,496.2	3,560.0
2011	Floods	Thailand	44,247.4	19,565.5	24,681.9

Table 2.3 summarizes the estimated total values of damage and losses in the disasters that were assessed using the expanded UN-ECLAC methodology.¹⁹ Data is available in each of those cases of disaster in a disaggregated fashion, for each and all of the standard sectors of economic and social activity as defined in the worldwide system of national accounts, which fact enables comparisons between disasters in different countries.

Table 2.3 provides information on the sectorial dis-aggregation for the estimation of disaster effects (damage and production losses) that is followed in the expanded UN-ECLAC methodology, for one of the cases of disaster analyzed in Asia. The same pattern is followed in all assessments that are included in Table 2.4, which allows for comparisons between disasters at any given location and time of occurrence.

Table 2.4. Detailed estimation of disaster effects after 2009 Typhoons in the Philippines

	Million US Dollars		
	Total	Damage	Losses
Social			
Housing	730.40	541.60	188.80
Health	123.80	105.50	18.30
Education & Culture	64.90	59.50	5.40
Infrastructure			
Electricity	33.90	15.20	18.70
Water & Sanitation	24.30	7.90	16.40
Flood-control works	15.30	15.30	
Transport	159.90	138.70	21.20
Communications	4.10	4.10	
Public Administration	7.20	6.30	0.90
Productive			
Agriculture	849.30	80.10	769.20
Manufacture	403.30	209.20	194.10
Trade	1,900.60	256.20	1,644.40
Tourism	66.30	12.30	54.00
Total	4,383.30	1,451.90	2,931.40

The data included in Table 2.4 can be best understood or visualized when some comparators are used: first, the significance of a disaster may be observed when the value of damage and production losses is compared to the size of the affected country's economy; second, a comparison can also be made of the value of destroyed assets (or damage) with the value of fixed gross capital formation (GFKF) of the affected country, to provide a measure of the domestic capacity to rebuild after the disaster; third, the value of production losses may be compared to the value of the country's gross domestic product (GDP) to provide a first indication of whether overall economic growth may be affected; and fourth, the value of per capita damage and losses yields a first idea of the possible impact at personal level. Table 2.5 shows the values of such comparators for the disasters included in Table 2.3.

¹⁹Needless to say, not all disasters that have occurred in the Asia region have been assessed using the UN-ECLAC methodology. Those shown in the table are the few ones that occurred in the Asian developing countries that have requested such type of assessment to be implemented.

Table 2.5. Selected comparators for disaster effects in Asia 2001 to 2013

Disaster	Effects/ GDP %	Disaster	Losses/ GDP %
2004 Tsunami Maldives Islands	87.1	2004 Tsunami Maldives Islands	22.1
2012 Thailand Floods	13.6	2011 Thailand Floods	7.6
2008 Myanmar Cyclone	13.0	2008 Myanmar Cyclone	7.4
2004 Tsunami Sri Lanka	7.7	2010 Pakistan Floods	2.2
2010 Pakistan Floods	6.2	2009 Philippines Typhoons	1.8
2005 Kashmir Earthquake	2.9	2004 Tsunami Sri Lanka	1.6
2007 Bangladesh Cyclone	2.7	2007 Bangladesh Cyclone	0.8
2009 Philippines Typhoons	2.6	2004 Earthquake/Tsunami Aceh	0.7
2004 Earthquake /Tsunami Aceh	1.9	2009 Cambodia Typhoon	0.7
2004 Tsunami Thailand	1.5	2005 Kashmir Earthquake	0.6
Disaster	Damage/%	Disaster	Effects/ Person, US\$
2004 Tsunami Maldives Islands	239.4	2004 Tsunami Maldives Islands	2,309
2004 Tsunami Sri Lanka	28.0	2011 Thailand Floods	666
2010 Pakistan Floods	25.2	2004 Tsunami Sri Lanka	85
2011 Thailand Floods	24.8	2008 Myanmar Cyclone	83
2005 Kashmir Earthquake	14.0	2010 Pakistan Floods	59
2007 Bangladesh Cyclone	7.1	2009 Philippines Typhoons	48
2009 Philippines Typhoons	5.7	2004 Tsunami Thailand	39
2004 Earthquake/Tsunami Aceh	4.9	2004 Earthquake/Tsunami Aceh	24
2006 Yogyakarta Earthquake	3.4	2005 Pakistan Earthquake	20
2009 Cambodia Typhoon	3.3	2006 Yogyakarta Earthquake	15

From the above information, it is possible to infer that the most significant disaster included in the assessments conducted in the Asia region was that of the 2004 tsunami in the Maldives Islands since the combined value of damage and losses represented 87 per cent of the value of the country's gross domestic product, followed at a distance by the 2012 Thailand floods (13.6 per cent of GDP) and the 2008 Myanmar cyclone (13 per cent of GDP), while the magnitude of the 2004 earthquake and tsunami in Indonesia while causing over 200,000 deaths only represented less than 2 per cent of the country's gross domestic product.²⁰ A very similar statement may be made in relation to disaster impact on production (comparing production losses versus GDP).

In addition to the above, it may be noted that when comparing the value of damage or destroyed assets vis-à-vis the national capacity of constructing fixed capital, the most significant disaster was, again, that of the 2004 tsunami in the Maldives Islands (239.4 per cent), which is a reflection of the degree that the country's capacity for building fixed capital was to be engaged for post-disaster reconstruction. Putting it into different words, this ratio or comparator provides an insight into the kind of efforts and time required for reconstruction. Next in the descending scale of this comparator were the disasters caused by the 2004 tsunami in Sri Lanka (28 per cent), the 2010 Pakistan floods and the 2011 Thailand floods (about 25% each). At the bottom of the scale are the 2006 Yogyakarta earthquake and the 2009 Cambodia typhoon, where damage was equivalent to about 3.5 per cent of the respective countries' annual rate of gross fixed capital formation (GFKF).

In average per capita terms, the most significant disaster was that of the 2004 tsunami in the Maldives Islands (US\$ 2,300 per person) followed by the 2011 Thailand floods (US\$ 666/person). The 2009 Philippines typhoons caused per capita damage and losses in the order of US\$ 50 per person, and in the 2006 Yogyakarta earthquake this figure was of US\$ 15.

The above comparisons are of importance since it can be seen that the disaster that has caused the highest value of damage and losses i.e. the 2011 Thailand floods with 44.5 billion US Dollars in disaster effects compares similarly to the 2004 tsunami in the Maldives Islands whose value of disaster effects is only about 1.5 per cent. Worse yet, the value of per capita disaster effects in the Maldives is nearly four times that of the Thailand floods. Such results are of course due to the differences in relative size of the two affected economies, and provide a measure of the intensity of disaster effects.

In the case of India, many large scale and minor disasters have occurred in the relatively recent past. They include: earthquakes in Latur (1993), Chamoli (1999), Gujarat (2001), Jammu and Kashmir (2005), and Sikkim (2011); flooding caused by the Andhra and Orissa cyclones (1991 and 1997), Odisha cyclone (1999), Assam (2002), Bihar (2004 and 2008), Mumbai (2009), cyclone Aila in West Bengal (2009) and many others; droughts such as the one faced by Karnataka (2011) and in other States. In each case the respective State authorities, in some cases assisted by Central Government authorities, conducted relief needs assessments (whose results were presented in the respective relief Memorandum); in the case of selected very large scale disasters, such as the Gujarat earthquake in 2001, more comprehensive assessments of disaster impact and post-disaster needs were conducted with assistance from international organizations.

²⁰It is to be noted that the above percentage figures are used to indicate the magnitude of the damage and losses caused by disasters in comparison to the size of the disaster-affected economy. These numbers are not to be confused with the possible temporary slowdown of GDP growth that may arise, until recovery programs are put in place.

In more recent years, at least three damage and needs assessments have been conducted with assistance from the World Bank, the Asian Development Bank and the United Nations after the Bihar floods in 2008²¹, the floods in Uttarakhand²² and Cyclone Phailin in Odisha State²³, both in 2013. While these assessments went beyond estimating relief stage requirements, the assessment methodologies that were used did not enable to obtain the value of production losses across the affected sectors, nor were all sectors of social and economic activity covered; furthermore, the data collected did not enable to estimate the macro-economic and personal level impact of such disasters except in the case of the 2008 Koshi floods, or the detailed estimation of recovery of production and personal income levels. Table 2.6 shows the summarized results of these three assessments.

Table 2.6 Results of the damage and needs assessments conducted in India between 2008 and 2013.

	Million Rupees		
	Bihar Floods 2008	Uttarakhand Floods 2013	Cyclone Phailin Odisha 2013
Housing	9,900.0 ²⁴	1,505.0	29,600.0
Education	1,251.0		
Health	730.2		
Public buildings		1,029.0	6,620.0
Urban infrastructure		1,268.0	4,700.0
Livelihoods	1,622.5		26,500.0
Agriculture, Fisheries, Tourism		1,668.0	
Fisheries, SMEs			3,960.0
Tourism		1,166.0	
Irrigation		1,393.0	
Road and bridges	13,936.0	27,103.0	7,000.0
Electricity		2,662.0	10,480.0
Rural water supply		1,305.0	
Water resources	26,828.0		
Forests and biodiversity		542.0	160.0
Total	54,267.7	39,841.0	89,020.0

It is to be noted that most unfortunately the results shown above are not fully comparable between the disasters, due to the fact that the methodologies used for their estimation did not apply the same structure of sectorial composition and because different criteria and procedures were used.

²¹See Bihar, Koshi Flood (2008); Needs Assessment Report, Government of Bihar, World Bank, Global facility for Disaster Reduction and Recovery (GFDRR), June 2010; also, see UNDP-IHD, Koshi Floods 2008: How we coped and what we need? Delhi, January 2009.

²²See India, Uttarakhand Disaster, June 2013, Joint Rapid Damage and Needs Assessment Report, Government of Uttarakhand, Asian Development Bank (ADB) and World Bank, 2013.

²³See India, Cyclone Phailin in Odisha, October 2013, Rapid Damage and Needs Assessment Report, State Government of Odisha, Asian Development Bank (ADB), and World Bank, 2013.

²⁴A discrepancy exists between the estimated values of housing damage: the ADB-WB assessment estimated a damage value of 9.9 billion Rupees, while the UNDP-IHD estimation yielded a value of 8.8 billion only.

The data obtained in those case studies of disaster impact assessment conducted in India, compared to the data developed in the cases of disaster conducted elsewhere in Asia, already reveals the need to improve the methodology for disaster impact assessment currently used in India, not only standardizing the procedure so that comparisons between disasters are made possible, but also including all affected sectors of social and economic activity in order to obtain the full effects and impact of disasters, and to enable the formulation of comprehensive recovery and reconstruction plans.

Due credit must be given to the fact that in the case of the Bihar Floods in 2008, the United Nations and the Institute for Human development (IHD) conducted a supplemental assessment of disaster impact that focused on the effects and impacts at the personal and household level.²⁵ In this assessment, efforts were made to quantify the values of damage and losses for households in the affected areas and to analyze the coping strategies adopted by them. Unfortunately, the data collected did not enable to estimate the impact at the macro-economic and macro-social levels. Had a close cooperation been envisaged with the assessment conducted with assistance from the Asian Development Bank and the World Bank, more holistic and comprehensive results would have been obtained.

- **Scope of Current International Methodology for Disaster Impact Assessment**

The scope of assessments for disaster effects & impact and for estimation of post-disaster recovery and reconstruction financial requirements has been agreed as a result of the signing in 2008 of a tripartite agreement between the heads of the European Commission (EC), the World Bank and the United Nations' Development Group (UNDG),²⁶ within the Hyogo Framework for Action. While this is an agreement between major international organizations, many countries are following such lead and have accepted its contents in recent years.

There is agreement that disaster effects and impacts are to be estimated at different levels of analysis that include all sectors of social and economic activity, the personal or household level, and the macro-economic and macro-social levels. These analyses are intended to provide different views of disaster effects and impact, and as such the different values obtained are not be added together, to avoid double or multiple accounting.

The sectorial assessment of disaster effects should cover the entire panorama of disaster-affected sectors of economic and social activity to ensure comprehensiveness of the analysis and to ensure that the post-disaster needs for recovery and reconstruction are duly registered and eventually financed. Furthermore, the analysis should include all activities of the society and economy, owned by both public and private sectors.

To ensure comparability of assessment results, from one disaster to another and from one country to another, use must be made of the standard list of sectors of economic and social activity as defined in the world wide system of national accounts that all countries use.²⁷ For the case of India, the corresponding list is as follows:²⁸

- o Agriculture, forestry and fishing
- o Mining and quarrying

²⁵See Koshi Floods 2008: How we coped and what we need?, Perception Survey on Impact and Recovery Strategies, United Nations Development Program (UNDP) and Institute for Human Development (IHD), New Delhi, India, 2009.

²⁶See Joint Declaration on Post-Crisis Assessment and Recovery Planning, signed by the European Commission (EC), the United Nations Development Group (UNDG), and the World Bank, 25 September 2008.

²⁷See United Nations, International Standard Industrial Classification of All Economic Activities, Rev.4, New York, 2008. (<http://unstats.org/unsd/cr/registry/>).

²⁸See Central Statistical Office (CSO), National Account Statistics, 2013, page 15, Ministry of Statistics and Programme Implementation, Government of India, New Delhi, 2013.

- o Manufacturing
- o Electricity, gas and water resources
- o Water supply, sewerage and waste management
- o Trade, hotels and restaurants
- o Transportation and communications
- o Financing, insurance, real estate and business services
- o Community, social and personal services

- **Other International Methodologies for Disaster-Related Assessment**

A comprehensive analysis of the available international models and methodologies for disaster assessment, which would include:

- o DaLA (Damage and Loss Assessment) Methodology: This methodology is popularly termed as DaLA or ECLAC methodology and would be the central focus for the assignment for adaptation purpose.
- o The CBA (Cost-Benefit Analysis) Methodology: Cost-benefit analysis CBA is an economic technique used to organize, appraise and present the costs and benefits, and inherent trade-offs of public investment projects and policies taken by governments and public authorities in order to increase public welfare.
- o HAZUS (Hazards in the USA) Methodology: HAZUS I the second major effort to develop a methodology for vulnerability assessment developed for the Federal Emergency Management Agency (FEMA) by the National Institute of Building Sciences (NIBS) to provide a tool for developing earthquake loss estimates.
- o The ACM (Advanced Component Method): The ACM, developed by AIR Worldwide Corporation (AIR), takes a significant step objective and scientific methodology largely replaces the subjective measures and opinions of experts about how building damage relates to earthquake intensity.
- o CatSim (Catastrophe Simulation) Model: CatSim Model is built and designed to illustrate the tradeoffs and choices a country must make in financially managing the economic risks in the anticipation of major disasters. The International Institute for Applied System Analysis (IIASA) developed this tool for natural disaster risk management for delineating the damage and loss probabilities.”²⁹

Nevertheless, it should be noted that in the above list, only the DaLA methodology is used for the actual assessment of post-disaster effects and impacts as well as for estimation of the financial requirements to achieve post-disaster recovery and disaster-resilient reconstruction.

The remaining four models are used for estimating disaster risk and vulnerability, as discussed below, and are not suitable for estimating the actual effects and impacts of a disaster. Rather, they are used for defining needs and planning for disaster mitigation purposes.

HAZUS is in fact a software package built on GIS technology, originally intended for application in the United States of America, which enables the estimation of disaster risk. It estimates the exposure of an area, factors in the intensity of the hazard, and enables an estimation of the potential losses. As it can be seen, the model – whose use has been introduced in other countries as well, including some Asian nations

²⁹See Consultants’ Services: Lump Sum Contract for Post-Disaster Needs Assessment Study for India under the National Cyclone Risk Mitigation Project (NCRMP), New Delhi, pages 44 and 45.

is intended for analyzing disaster risk and estimating potential losses, not for estimating actual values of damage and losses after a disaster. Putting it in different words, Hazus is not a deterministic tool and produces results required for planning prevention and mitigation only.

The **Cost-Benefit Analysis Methodology** is used for purposes of planning disaster risk reduction (DRR) and enables the estimation of disaster risk.³⁰ As in the case of Hazus, the CBA tool has been designed for use in risk prevention and mitigation, and is not a deterministic tool and cannot be used for the actual assessment of disaster effects and impacts.

The **Advanced Component Method** (ACM) was designed by the Boston-based Applied Insurance Research with sponsorship by United Kingdom Department for International Development (DFID), the United States National Oceanic and Atmospheric Administration (NOAA) and the Canadian International Development Research Center (IDRC) with a view to estimate the probability and extent of earthquake damage before a disaster actually occurs. As in the case of the two previous cases, the ACM is intended for estimating disaster risk and not for analyzing the actual effects and impacts of a disaster.

The **Catastrophe Simulation Model (CATSIM)** was developed by the renowned, Vienna-based International Institute for Applied Systems Analysis (IIASA), and is intended to assess the financial vulnerability of the public sector to extreme events and to guide governments in the tradeoffs and choices it must make to manage economic disaster risks.³¹ In fact, the model enables policy makers to make ex-ante evaluations of financial instruments such as insurance catastrophe bonds, contingent credit arrangements and other disaster hedge funds and to compare their benefits vis-à-vis investments in loss reduction. Again, this model while it has been extremely useful for providing financial protection against disasters in several regions and countries of the world, including the Caribbean, Mexico and Colombia cannot be used for estimating the actual effects and impacts of a disaster.

It is therefore concluded that only the UN-ECLAC methodology, duly supplemented to cover macro-social and personal and household loss estimations, is able to produce the assessment of disaster effects and to estimate post-disaster recovery and reconstruction needs. Furthermore, due to the UN-ECLAC's unique feature of relying on baseline information available in the world-wide system of national accounts, it is feasible to adapt it to the specific social, economic and environmental characteristics of India.

The existing practices of disaster impact assessment was conducted in 2007, by the UNDP/BCPR, whose results are described in the document titled Review of Post-Disaster recovery Needs Assessment and Methodologies.³² It analyzed and described the methodologies that were in use at that time, and pointed out gaps and areas of improvement in existing procedures, on the basis of a limited number of case studies from Asia and Latin America. Many of the conclusions contained therein are outdated since the limitations described therein have been solved in the past eight years since the analysis was made. The analysis of current methodological practices described in this module is based on more than 120 cases of disaster impact assessments and it supersedes and expands the conclusions of the 2007 report.

³⁰See Mechler, R., et al, The Cost-Benefit Analysis Methodology, Institute for Social and Environmental Transition and Proventium Consortium, Kathmandu, Nepal, 2008.

³¹See Hochrainer-Stigler S, Mechler R., Assessing financial and economic vulnerability to natural hazards: Bridging the gap between scientific assessment and the implementation of disaster risk management with the CatSim model, International Institute for Applied Systems Analysis (IIASA), Vienna, 2008.

³²See Bollin, Christina, and Khanna, Shivani, Review of Post-Disaster Recovery Needs Assessment and Methodologies, United Nations Development Programme (UNDP), New York, 2007.



Key learning's

- The role of the Office of the Relief Commissioner in the Revenue Department of each State and Union Territory (UT) and the District, Block and Village Revenue Officers in post-disaster assessment.
- The contents of the “Rapid Assessment” reports, the supplementary “Detailed Assessments” and the “Relief Memorandum”.
- The general scope of assistance as defined by the National Disaster Response Fund (NDRF) and by the State Disaster Response Fund (SDRF).
- The strength and weaknesses of the existing post-disaster needs assessment system in India.
- The need to standardize the procedures for the estimation of damages, losses and needs in all States and Union Territories. Also, it is important to ensure that the knowledge and skills in PDNA of national and state level officials are sustained.



References and additional reading

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CHAPTER 3

Learning Unit 2 : The Conceptual Framework for Post-Disaster Needs Assessment



Objectives

- To explain key terms and concepts related to Post-Disaster Needs Assessment (PDNA)
- To introduce the PDNA methodology including sectors, its inter-linkages and cross-cutting issues of PDNA



Duration

Total: 180 minutes

- Key terms and concepts related to PDNA: 90 minutes
- Sectors in PDNA and the National System of Accounts for India: 30 minutes
- Inter-linkages between sectors and impact to economy and people: 20 minutes
- Cross-cutting issues in PDNA: 40 minutes



Tools/Methodology

- Training Methods: Lecture, Case Study, Video and Group Work
- Material required: Projector, screen, laptop, speaker, chart paper and marker.



Contents

Key terms and concepts

The Post-Disaster Damage, Loss and Need Assessment (PDNA) basically include key elements of the Damage and Loss Assessment (DaLA) method and the Human Recovery Needs Assessment (HRNA), which would lead to the development of a Recovery Strategy.

- **Damage:** It is total or partial destruction of physical assets existing in the affected area. Damage occurs during and immediately after the disaster and is measured in physical units. The main items in this category include the total or partial destruction of physical infrastructure, buildings, installations, machinery, equipment, means of transportation and storage, furniture, damage to farmland, irrigation works, reservoirs and the like.

Box 3.1 Damage Overview, Koshi Floods, 2008, Bihar, India

The World Bank conducted a Needs Assessment in the aftermath of the 2008 Koshi Floods in Bihar, India. It covered only four sectors and some sectors that are normally covered in typical Needs Assessments were not been covered due to negligible damage in those sectors, paucity of time, prioritization of sectors by the Government of Bihar (GoB) and constraints of data availability.

Housing: According to GoB figures, 236,632 houses were fully or partially destroyed across the districts of Supaul, Madhepura, Saharsa, Araria, and Purnea. The estimated damage is Rs. 5,935 million (US\$ 134.9 million). Of these, the first three districts were the worst hit with over 95 percent of the reported damage.

Roads and Bridges: About 1800 kilometers of paved and unpaved roads and about 1100 bridges and culverts were destroyed in the floods. Maximum damages were reported in Supaul, Madhepura and Saharsa.

Water Resources (Irrigation and Flood Protection): Extensive structural damage was caused to irrigation and flood protection infrastructure, including the Koshi barrage. More than 6 km of the main Eastern Koshi Canal was fully damaged, 3 km of the branch, and 1 km partially damaged. Over 150 km of the distributaries and sub-distributaries were fully damaged, as well as 730 km of the watercourses, 151 canal bridges, and 138 regulators.

Agriculture and Livestock: Over 350,000 acres of paddy, 18,000 acres of maize and 240,000 of other crops were adversely affected, impacting close to 500,000 farmers. Approximately 10,000 milk animals, 3000 draught animals, and 2500 small ruminants perished in the disaster.

Source: Government of Bihar & et al, 2010

Box 3.2 Post-Nargis Joint Assessment (PNJA), Myanmar

The Post Nargis Joint Assessment (PNJA) conducted in the aftermath of the Cyclone Nargis of 2008 in Myanmar, defined damage and losses to assess the impact on each sector as follows.

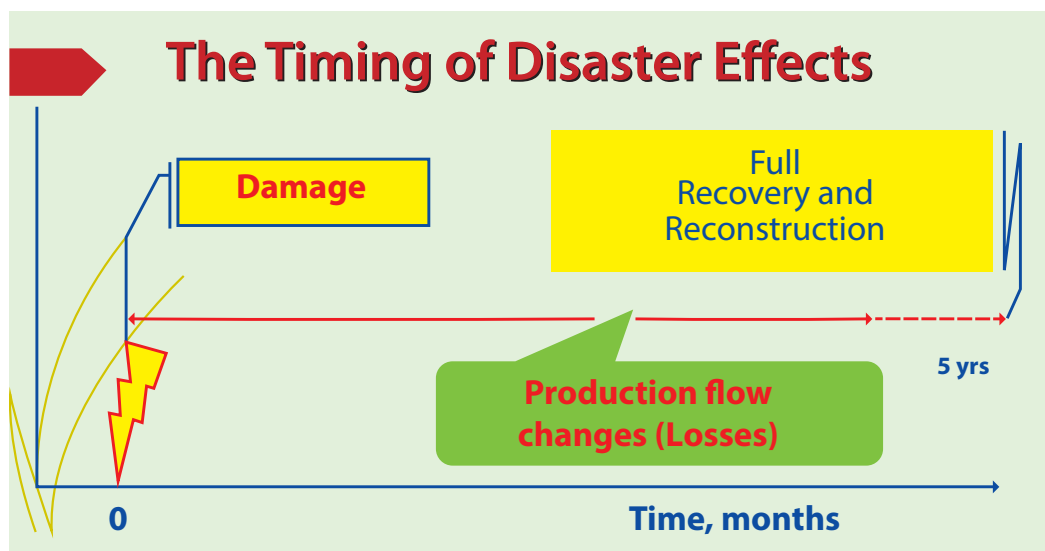
Damage: the estimated replacement value of totally or partially destroyed physical assets. **Losses:** the estimated changes in the flow of the economy that arise from the temporary absence of the damaged assets; they include losses in production and higher costs in goods and services.

Source: TCG, 2008

Losses: It is changes in economic flows arising from the disaster. They occur until full economic recovery and reconstruction is achieved. Examples include the decline in output in productive sectors (agriculture, livestock, fisheries, industry and commerce) and the lower revenues and higher operational costs in the provision of services (education, health, water and sanitation, electricity, transport and communications).

The effect of disaster in terms of timeline is captured in Figure 3.1.

Figure 3.1. Timeline of Disaster Effects



- **Needs:** The assessment of disaster effects and disaster impacts collectively defines recovery needs. The needs so identified form the basis for determining early, medium and long-term recovery and reconstruction interventions through a Strategy. The needs have to be identified from a human, socio-cultural, economic and environmental perspective, which, in turn, helps develop strategy to address recovery and reconstruction needs in a comprehensive and sustainable manner.

It is evidence-based estimations of financial requirements to achieve recovery and reconstruction of the affected areas and population based on the quantitative assessment of disaster effects and impacts.

- **Recovery needs** involve a number of activities that would enable returning economic and living conditions to non-disaster conditions, including
 - o Recovery of personal and household income
 - o Rehabilitation of access and supply of basic services (such as health, education, food availability, water supply and sanitation, electricity, transport and communication, etcetera)
 - o Recovery of production (in agriculture, fishery, livestock, industry, commerce, etcetera).
- **Reconstruction needs** (often called physical recovery needs) involve the amounts of financing required to rebuild or replace all destroyed physical durable assets using disaster-resilient standards with a view to reduce disaster risk of the population and the impact of future disasters.

- **Disaster effect:**

The assessment of the effect of disasters is determined through the assessment of five main elements:

- o Damage to infrastructure and physical assets: the quantification and monetary value of public and private sector infrastructure and assets destroyed in the disaster.
- o Economic losses: the estimation of losses in terms of economic flows; measuring the changes in the output of the economy's productive sectors due to the disaster, and the impact, if any, on the operating and cost structure of delivery of goods and services.
- o Disruption of access to goods and services: assessment of the disaster effects on service delivery, including the availability and quality of services, and on the population's access to goods and services that are required to support lives and livelihoods.
- o Disruption of governance and social processes: assessment of the disaster effects on social and governance processes.
- o Increased risks and vulnerabilities: assessment of what risks increase as a result of the disaster and how, and what additional threats or deteriorating conditions increase the vulnerabilities of people.

- **Disaster impact:**

The assessment of the impact of disasters is determined through the assessment of two main elements:

- o Economic impact at macro and micro levels: the estimation of the disaster's likely effects on economic performance and the temporary macro-economic imbalances that may arise from it, as well as its varied impacts on personal / household income and employment in all sectors.
- o Human development impact: the impacts of the disaster on the quality of human life in the medium and long term.

- **Recovery Strategy:**

The assessment of disaster effects and disaster impacts collectively defines recovery needs. It provides decision makers, especially governments, with a quantification and strategic proposal that would allow sectoral recovery interventions to be incorporated in the subsequent comprehensive Recovery Framework - which, in the end, would become the recovery plan.

The Recovery Strategy answers the following questions:

- o What are the priority recovery needs of the affected population?
- o What measures and capacities are required to revitalize people's abilities to restore their full potential to lead productive, creative lives in accordance with their needs and interests, including protection against risk?
- o What recovery interventions will address these requirements, and what are their broad resource requirements?
- o Given the above, what are the broad intended results and the necessary staging/timing to address them?

Box 3.3 Priorities of Recovery and Reconstruction, Nepal Earthquake 2015

Short-term priorities include:

- Reconstruction of damaged DRR assets and improvements on BBB principle
- Measures to improve preparedness, response, relief and logistics systems
- Measures to strengthen information and communication capacities for relief, response and recovery
- Measures to enhance multi-hazard risk monitoring, vulnerability assessment, risk information dissemination and awareness

Medium to long term priorities include:

- Improvements in legal and institutional arrangements
- Measures to mainstream DRR into the developmental sector, particularly housing, private and public infrastructure, social sectors (health and education), and livelihood
- Measures to improve integration of climate change adaptation and DRR

Source: PDNA, 2015

Sectors in PDNA and the National System of Accounts for India

- **Sectors in PDNA**

The current international practice requires the estimation of post-disaster recovery and reconstruction needs across all sectors of social and economic activity, in both public and private sector domains. The typical sectors that are assessed in a PDNA are at illustrated in Figure 3.2

Figure 3.2 Typical sectors assessed in PDNA

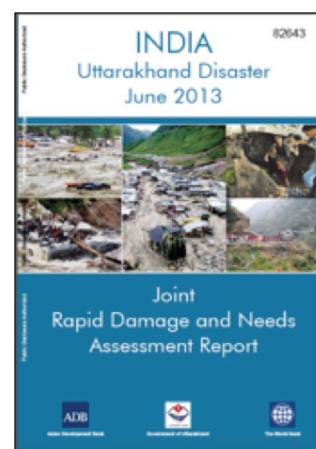


Source: The World Bank & et al, 2013

- **Case: Uttarakhand Disaster, June 2013, India**

The Joint Rapid Damage and Needs Assessment Report prepared by the Government of Uttarakhand, ADB and the World Bank covered the following sectors.

- o Housing
- o Public Buildings
- o Roads and Bridges
- o Urban Infrastructure (Water Supply, Roads, Drains and Sewerage)
- o Rural Water Supply and Sanitation
- o Irrigation
- o Livelihoods (Agriculture, Livestock, Fisheries, Tourism linked Livelihoods and MSME)
- o Tourism Infrastructure
- o Energy
- o Forests and Biodiversity



The main focus of the assessment was to estimate the damages to physical assets and the corresponding needs. The rapid assessment was broadly based on the Damage and Loss Assessment methodology (GoU and et al, 2013).

Box 3.4 Sectors assessed to measure impact of Floods 2011 of Thailand

The assessment to measure the impact of Floods of 2011 on Thailand by the Government of Thailand, the World Bank and other Development partners covered 18 sectors and crosscutting issues. The list of sectors is as follows:

Infrastructure

- Transport
- Flood control, drainage and irrigation
- Telecommunication
- Electricity
- Water supply and sanitation

Social

- Health
- Education
- Housing
- Cultural heritage
- Social Protection
- Social Impacts Assessment

Productive

- Agriculture
- Industry and commerce
- Tourism
- Financial and insurance

Economics

- Macroeconomics
- Livelihoods and Migrant workers

Crosscutting

- Environment
- Gender
- Disaster Risk Management

Source: The World Bank, 2012

• **Sectors in the system of national accounts in India**

The System of National Accounts is a tool that enables to measure the level of economic growth, changes in consumption, savings, investments, debt and wealth for the total economy of a country within all sectors of activity.

The information available in the System permits to, inter alia:

- o Forecast the future growth of the economy
- o Analyze the impacts of alternative policies that may be adopted by the government on the economy and its sectors
- o Estimate the possible impact of a disaster or any other type of shock to the economy and its sectors.

The current list of sectors of economic activity, used in the System of National Accounts of India, is as follows:³³

- o Agriculture, forestry and fishing;
- o Mining and quarrying;
- o Manufacturing;
- o Electricity, gas, and water resources;
- o Water supply, sewerage, waste management;
- o Trade, hotels and restaurants;
- o Transportation and communications;
- o Financing, insurance, real estate and business services; and
- o Community, social and personal services

It is to be noted that the above classification of sectors of social and economic activity does not follow the list of ministries or other institutional arrangements that exist in the country, and that for each of the sectors listed above more than one such ministry or institution may be involved. Refer to the Handbook for detailed explanations.

³³Central Statistical Organization (CSO), National Accounts Statistics, 2013, page 15, Ministry of Statistics and Programme Implementation, Government of India, New Delhi, 2013.

Linkages across sectors

The linkages across sectors should explain the relationships between and among the various sectors in terms of impacts. For instance, manufacturing firms that are dependent on agricultural products as raw inputs to production will experience a reduction in production if the agriculture sector is devastated by floods. The number of tourist arrivals will decline if major airports were damaged by typhoons. Access to social services like health (hospitals) and education (schools) will be cut if roads and bridges that link the people to facilities are destroyed. It is important, therefore, that the trainees must understand the potential impacts of the damages in their respective sectors to other sectors even in areas that were not directly affected by the disaster.

Cross-cutting issues

• Environment

In India as in some countries, efforts are being made at the present time to introduce in the national accounts a “satellite account” on the environment. Until India is able to build and maintain such satellite account on the environment, it will not be considered as an individual sector of economic activity and the accounts of environmental assets and services are distributed throughout the individual, formal sectors of economic activity. For purposes of the assessment, environmental assets may be divided as follows:

- o Physical (climate, air, soil and water);
- o Biotic (human beings, flora and fauna);
- o Perceptual (landscape, scientific and cultural resources); and
- o Interactions between and among the above.

• Culture

In the national accounts of India, culture is included within Arts, Entertainment and Recreation. Under this umbrella are such categories as creative arts and entertainment; libraries, archives and other cultural activities; and sports, entertainment and recreation. UNESCO suggests further categories for examination when undertaking an assessment of the Culture Sector. These are: built heritage and cultural/natural sites; moveable properties and collections; intangible cultural heritage; repositories of heritage (including museums, libraries, and archives); and cultural and creative industry.

Through each of these it is possible to assess the effects and impacts of an event on the culture sector and to make recommendations for recovery and reconstruction. It is important to remember that there will be heritage facilities, artefacts and intangible cultural products and processes that are of particular spiritual or cultural significance and may yet never be able to be fully recovered or restored through reconstruction and so defy economic valuation. The value of such tangible and intangible heritage, may be measured more in terms of its intrinsic value and its impact on the members of the community who hold it dear or in high esteem.

- **Gender, Poverty and Quality of Life**

Among the important issues that are adversely impacted by disasters are gender concerns, poverty incidence and the quality of life of the affected people. Since disasters mostly affect the poorer sector of society, the social impact assessment component of a PDNA covers these issues in detail. The impact analysis, as far as is possible should be presented at two levels, the micro level and the macro level.

At the micro level the social impact, where data is available, should be presented at the level of the household and that of individual persons. When examining the situation at the level of the household, issues such as the impact of the event on household heads male and female with regard to changing roles and responsibilities, increased or decreased dependency (or burden of care) as a result of the disaster, on changing patterns of income and consumption, changing risks to health and on changing housing conditions and geographic location, are to be analyzed fully. With regard to the individual, the most significant indicator is change in personal income.

At the macro level the social impact assessment team should consider the utilization of a selected number of indicators available at the national or State level that would be sensitive to disasters for use in measuring the impact of the disaster on the quality of life of the members of the community.

Case study: Post-disaster Needs Assessment Cyclone Eva 2012, Samoa

Context:

Samoa comprises two large volcanic islands and several smaller islands with a total land area of approximately 2,935 sq. kms. It lies in the southwest Pacific within an exclusive economic zone of 120,000 sq. kms. It is exposed to a number of natural hazards, including tropical cyclones, floods, earthquakes, tsunamis, volcanic eruption and drought.

It was hit by the Cyclone Evan (Category 3), which made landfall on December 13, 2012 and caused widespread damage across country. It caused heavy rainfall and flash floods with maximum sustained winds up to 90 knots (166.7 km/h). The cyclone killed at least five people and displaced 4,763 people.

Methodology:

The PDNA methodology combines Damage and loss assessment (DALA) methodology, the human recovery needs assessment (HRNA) methodology and the social impact assessment (SIA) methodology to assessing disaster effects, impacts, and needs.

The scope of the three complementary methodologies used in the Samoa assessment is described below:

- Under the DALA methodology conceptual framework, Damage, Losses, Possible macroeconomic performance modifications, Decline in personal or household living conditions, livelihoods, and income and Financial needs for economic recovery and disaster resilient reconstruction were measured.

- The HRNA enabled Estimation of the decline in human development, expressed by the quantification of the Human Development Index (HDI), arising from the disaster effects and impact, Estimation of possible setbacks in the achievement of the Millennium Development Goals (MDGs) for the affected country that may arise due to the disaster and Estimation of needs to achieve early human recovery at the personal and community levels assessment.
- The SIA methodology aimed to measure disaster impacts related to social cohesion, social relations, and governance. It aimed to assess the human and social impacts of the disaster on communities and households and to develop recommendations for recovery and reconstruction.

Outputs:

- **Damage and losses**

The value of durable physical assets across all economic and social sectors destroyed by Evan (referred to as damage) was estimated at US\$103.3 million. In addition, production losses and higher production costs arising from the disaster across all sectors (referred to as losses) was estimated at US\$100.6 million. Thus the total effects of the disaster amount to US\$203.9 million.

- **Economic impact**

If no recovery activities are undertaken, Samoa's, GDP growth will slow by 0.2 percent in 2012, may be nil or negative in 2013, and will slow by nearly one percentage point in 2014, in comparison to the forecasted rates of growth that the government had made prior to the disaster. It will also result in the Balance of Payment current account rising by 1 percent of GDP in 2013 and 2014.

- **Disaster's Human and Social Impacts**

Low-income individuals and those depending on subsistence livelihoods are suffering in the post-disaster period due to reduced incomes and food sources, and they will require support in the short term to meet minimum needs and to avoid negative coping strategies (for example, pulling children out of school or selling productive livelihoods assets) that could harm livelihoods and human and social well-being in the long term.

The cyclone affected vulnerable groups and also created new vulnerabilities. The elderly, children, and people with disabilities were recognized as vulnerable, and so were well taken care of by family and communities. Social cohesion and social relations were found to be strong throughout and after the disaster, with people supporting their extended families and communities well, some incidents of antisocial behavior were reported

(Extracted from PDNA Evan 2012, Samoa; Gov't of Samoa, 2013)



Key learning's

- Definitions of key terms used in PDNA including damage, losses and needs.
- Concept of the changes in economic flows due to disaster
- Sectors as classified in the PDNA and the National System of Accounts for India.
- Inter-relationships of the damages and losses across the sectors and their potential impacts to the economy and the people.
- Potential impacts of damages and losses to cross-cutting concerns like the environment, livelihood, gender, governance, migration, etc.



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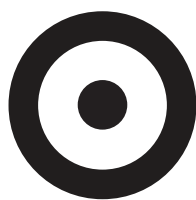
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CHAPTER 4

Learning Unit 3: General Procedures in Undertaking a Post-Disaster Needs Assessment



Objectives

- To introduce general step in conducting a PDNA
- To understand required baseline information for each sector and its importance
- To understand the requirements (organization, logistics, etc.) of field assessment
- To understand assessment of disaster effects and impacts on each sector
- To determine disaster recovery needs.



Duration

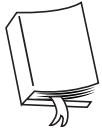
Total: 105 minutes

- Introduction to general steps of a PDNA: 15 minutes
- Understand and develop baseline for assessment: 30 minutes
- Undertaking field assessment: 20 minutes
- Aggregation of Data and Impact Assessment: 20 minutes
- Estimation of Needs: 20 minutes



Tools/Methodology

- **Training methods:** Lecture, Case Study and Group Work
- **Material required:** Projector, screen, laptop, chart paper and marker.



Contents

General steps of a PDNA

The PDNA includes:

- The collection of pre-disaster baseline data to compare with post-disaster conditions in order to evaluate the magnitude and scale of the disaster
- The evaluation of the disaster effects and disaster impacts in each sector to determine the overall recovery needs
- The assessment of disaster impacts
- The prioritization of these recovery needs by way of a Recovery Strategy;

Baseline for assessment

- It is the first step to examine the general pre-disaster conditions social, economic, cultural and political which serves as a baseline to compare with post-disaster conditions in the affected area.
- It includes national, socio economic, demographic and geographical data relevant to the affected areas, including development indicators such as literacy rates, malnutrition and food insecurity, poverty levels, access to potable water and sanitation facilities, education facilities and school enrolment, and the incidence of communicable diseases, among others.
- Where possible, all relevant data should be disaggregated by sex, age, disability, characteristics if relevant to the identification of specific vulnerabilities and opportunities that women, girls, boys and men, and other vulnerable groups may encounter, and which require to be acted upon post-disaster.
- It is critical to determining the overall impact of the disaster across all sectors, including its impact on human development. It also contributes to the vulnerability analysis and towards an understanding of the underlying causes of the disaster. That in turn contributes to planning an effective and resilient recovery.
- Generally, the information collected includes the following:
 - o Pre-disaster demographic, socio-economic, geographic and cultural information
 - o Pre-disaster data for each sector;
 - o Nature and extent of pre-disaster hazards, vulnerabilities and risks;
 - o National, state and local (divisional, municipal, district, etc.) development plans, socio-economic goals in the annual, 5-year plans, other development plans, poverty reduction strategies.

- In case on the non-availability of the baseline data, the following options may be explored:
 - o Estimate a baseline data on the basis of discussion with key informants.
 - o Arrive at a baseline data on the basis of visual impressions of unaffected areas and its comparison with the affected areas, provided there are geo-referenced data corresponding to the images.
 - o In certain situations, where satellite imagery of pre-disaster situations is available, these images could be interpreted to develop sector-wise baseline data.

Estimation of Disaster Effects

The assessment of disaster effects includes the following:

- Damage to infrastructure and physical assets in all sectors, productive and social
- Losses across sectors with regard to production flows, supply of all sectors as well as demand constraints
- Disruption of service delivery and access to goods and services.
- Disruption of governance and social processes
- Increased risks and vulnerabilities, and environmental impact

Damage to infrastructure and physical assets in all sectors, productive and social: It calculates the total or partial destruction of physical assets and infrastructure in the affected areas, in measures of physical units for all sectors.

This comprises:

- Social infrastructure such as the number of homes, education and health facilities, government buildings, community infrastructure, cultural and religious centers
- Basic infrastructure such as transport and communications (roads, bridges, ports, airports, and train lines, among others), water and sanitation systems, irrigation systems, energy generation, distribution and supply lines
- Productive sectors such as agricultural infrastructure, industrial and commercial installations, and businesses including tourism and service-based industries
- In addition, it quantifies the physical assets damaged or destroyed in those buildings and infrastructures, such as furnishings and equipment, farm machinery and tools, among others
- These damages are valued first in physical terms (number, extension in terms of area or surface, as applicable) and then in terms of their monetary value, expressed as the replacement costs according to the market price prevailing just before and after the disaster. This is to be seen as the baseline cost, for the calculation of reconstruction costs would take into account post-disaster price alterations and improvements associated with risk reduction and the concept of build back better in the preparation of the Recovery Framework.

Losses: It refers to changes in economic flows arising from the disaster which continue until the achievement of full economic recovery and reconstruction - in some cases lasting for several years.

Typical losses include:

- Decline in output in productive sectors (Agriculture, livestock, fisheries; Industry, Commerce, and services including Tourism) associated with damage to infrastructure and asset damages
- Lower revenues associated with demand reduction due to the disaster, higher production and operational costs, including higher costs in the provision of services (education, health, water and sanitation, electricity, transport and communications), combined with an increased demand for social services by the affected population in the recovery period;
- Increased fiscal expenditures as opposed to reduced tax revenues in a scenario where the demand for government expenditures related to the disaster increases even as revenues drop on account of damages sustained by the productive sectors;
- Losses are expressed in current monetary values. In some sectors or areas, the actual variation of flows may not be negative; in the construction sector, for instance, the immediate repairs, removal of debris and full-scale repair and reconstruction would increase this sector's activities. On the other hand, these extraordinary expenses would be a loss or cost not budgeted for by the affected sector in terms of unexpected expenditures to meet emergency needs.

Box 4.2: Damage and Losses due to Indian Ocean Tsunami 2004 in India

The Indian Ocean Tsunami of 26th December 2004 affected a number of countries in Asia and Africa including India. In India, 4 States and Union Territories were affected. The Asian Development Bank, the United Nations and the World Bank jointly conducted an assessment of the socioeconomic and environmental impact of the Tsunami in 4 states and union territory (UT). The findings are summarized in the table below. It was not the final assessment. The assessment defined Damage (direct impact) as the impact on assets, stock, and property valued at agreed replacement (as opposed to reconstruction cost) unit prices. Losses (indirect impact) referred to flows that will be effected, such as reduced income, increased expenditure over the time period until asset are recovered.

State/UT	Damage	Losses	Total
Andhra Pradesh	29.7	15.0	44.7
Kerala	61.7	39.1	100.8
Tamil Nadu	437.8	377.2	815.0
Pondicherry	45.3	6.5	51.8
Total	574.5	437.8	1012.3

(in USD million)

Source: ADB et al, 2005

Disruption of Social Service Delivery and Access to Goods and Services: The effect of the disaster on service delivery across all relevant social sectors and population groups, in particular the availability of basic services and the quality of service delivery is also evaluated. This includes services such as education, social security, housing, health care, culture, availability of safe drinking water and sanitation facilities, and public administration services, whether provided by the public or the private sector. New demands for services or goods arising from the disaster also have to be considered.

Some important considerations while assessing changes from pre-disaster conditions, especially regarding the availability and quality of the delivery of basic services are:

- Sector-wise assessment of equipment, supplies, information systems and technology destroyed
- The availability or lack of basic supplies and commodities in markets. In this case care should be taken not to duplicate the effect that may have been quantified in terms of agricultural, industrial or commercial damages and losses
- Focus on population groups that are particularly affected by the lack of available services
- Assessment of the temporary infrastructure required such as shelter, education centers, water and energy supply, health facilities, religious and cultural centers, and additional services required as a result of the disaster such as emergency energy supply, temporary shelters, disease control, income generation and sanitation, among others
- Thinking of how service delivery programs such as education or health care programs, to name a few, need to be re-adapted
- The availability of human resources to ensure adequate service delivery, including wage compensation to service delivery staff such as teachers and nurses, and additional technical expertise.

Disruption of Governance and Social Processes: It includes the key governance processes and social processes of each sector that may be affected by a disaster such as

- The disruption of basic community functions, social services provided by community-based organizations, and disruption of cultural and community life
- The effect of disasters on the management and organization of sector services that support life and livelihoods
- The effect of the disaster on government functions and on civil servants which disrupt sector-based administrative processes
- The assessment of sector, national, state and local capacities to lead and manage the recovery process itself.

Below are key considerations for assessing governance and social processes:

- Description of the disaster's effect on processes of ministries/departments
- The effects on the capacity of the sector in question to manage service delivery and continue functions of policy and planning effects in terms of processes for deliberation, decision-making, consultation, management, and technical and operational capacity;

- Effect on community life, social coherence and power relations including gender power relations, latent conflicts, social support networks, and division of labour;
- Additional burdens placed on governments and other organizations as a result of the disaster, and ways in which they cope
- Capacity of ministries/departments to lead and manage the recovery process.

Box 4.3 Effect of Indian Ocean Tsunami of 2004 on social processes in affected areas, India

The majority of those affected on the coast were fisher folk, who suffered the most damage in terms of housing and livelihoods with loss of dwelling units, household assets, and productive assets like boats and nets. The disaster has most adversely affected the livelihoods of those that were already poor. The vulnerability of these communities is accentuated by their indebtedness to big merchants and informal moneylenders with whom many had current borrowings, lack of access to markets and credit, absence of social security nets, and socio-political marginalization. The immediate need is the provision of livable temporary shelters for displaced people, and creating income-generating opportunities.

Relocation of affected people is an important question that must be addressed immediately. A key concern is that the impact of relocation on livelihoods should not increase vulnerability and thus defeat the very purpose of the relocation. Thus the states' recovery strategy will need to strike a balance between short and long term social security, livelihood and hazard risk reduction needs.

Source: ADB et al, 2005

Increased Risks and Vulnerabilities: The PDNA examines the risks and vulnerabilities underlying the impact of the disaster – pre-existing risks that become apparent during the disaster, and new risks and vulnerabilities enhanced by the disaster. Both are to be taken into account to determine the key elements needed to ensure a resilient recovery.

The assessment relating to risks has two key objectives:

- Assess immediate disaster risks to avoid emerging threats and/or deteriorating conditions;
- Assess pre-existing vulnerabilities and factors that contributed to damage and loss of the sector in the current disaster.

Some elements of risk and vulnerability indicators to assess are:

- Identifying additional hazards and risks that may threaten the recovery process and in can include landslides, upcoming rainy season, hurricane season, further tremors, among others
- Environmental risks
- Socio-political risks, including conflict risk
- New vulnerabilities created by the disaster that may present additional threats
- Population groups served by the sector (economic, social, cultural, geographic) that are especially vulnerable or at risk;
- Priority mitigation measures needed to avoid another disaster or the further deterioration of current conditions.

Box. 4.4 The effect of Gujarat Earthquake 2001 on Environmental

The major direct environmental effect include:

- Debris and rubble removal and disposal, which has been estimated at 10 to 20 million metric tons (MT) in urban areas and 15 to 30 million MT in rural areas
- Impacts and residual risks from damage to industrial facilities
- Impact to water and water management resources
- Impacts to municipal and industrial environmental infrastructures such as sewage and wastewater treatment.

A number of indirect environmental effects are also anticipated and, where appropriate, should be monitored and mitigated. The more significant indirect impacts include:

- Poorer sanitation and waste management practices
- Increase in industrial pollution due to reconstruction activities requiring millions of tons of construction materials
- Changes in land use due to need for rubble disposal sites and potential relocation of villages.

As all environmental effects and impact cannot yet be assessed, the development of a comprehensive environmental monitoring program becomes an important priority. Key sectors with yet unknown environmental impacts include: Potential impact of the earthquake on aquifers and groundwater movement, and Potential impact on ecosystems.

Source: GoG et al, 2001

Assessment of Disaster Impacts

The impacts of disaster are consequence of the effects, which can be on social and on economic development.

Social condition:

The impact on social conditions can lead to:

- Decline in well-being, quality of life and human development
- Decline in personal or household income, and rise in costs of living
- Increase in poverty levels and numbers

A disaster's impact on human development is known to persist long after physical reconstruction is complete. It is therefore essential that the impact on human development be accurately assessed so that recovery strategies can be put in place to mitigate development reversals. It is also crucial in forging the link between initial humanitarian efforts, recovery measures and longer-term development.

The objective is to overcome the adverse impact on human development and that recovery strategies ensure that development, at the very minimum, returns to pre-disaster levels. Therefore, recovery efforts would continue for as long as necessary until human development is restored and/or enhanced. The impact on human development due to the disaster can be captured as the difference between pre-disaster and post-disaster levels of human development, including the cumulative deficits accruing until human development has recovered and returns to the pre-disaster human development trajectory. The impact on human development is the disaster's impact on the quality of human life in the medium and long term.

Box 4.5 2010 Pakistan Floods and impact on the MDGs

The 2010 Pakistan floods had following impacts on the Millennium Development Goals (MDGs)

- 5 million people have become undernourished in the affected, and the significant damage to crops has affected the livelihoods of 5.2 million workers. High food prices and reduced access to food will push more people into poverty (Goal 1)
- Almost half a million children are prevented from attending primary schools due to damage to the buildings as well as the use of schools as temporary shelters (Goal 2)
- 2.8 million under 5s developed acute respiratory diseases and diarrhoea (Goal 4)
- Stagnant water is becoming a favourable habitat for malaria, and is thought to have affected 1 million people nationally (Goal 5 and 6)

Source: ADPC, 2012

Various measures can be applicable to determining the impact of development factors, including the Human Development Index (HDI), the Hybrid HDI, the Inequality-adjusted HDI, the Multi-Dimensional Poverty Index and the Gender Inequality Index. In addition, the indicators and targets of the Millennium Development Goals (MDG) or the post 2015 Sustainable Development Goals can also be used as proxies to human development, too, and as a macro framework for human development assessment.

Disaster effect vis-à-vis impact: Thailand Floods 2011

Background: In 2010, Thailand was badly affected by floods and 66 of the country's 77 provinces were flooded. It led to loss of 680 lives and accumulated affected population was estimated at 13.57 million.

Disaster effect: Some of the key effects include as follows:

- o The most affected crops were rice, sugar cane, cassava, sweet corn, maize, vegetables, and fruit trees (e.g., milk banana, guava, mango) planted in approximately 11,460,000 rai (1 hectare= 6.25 rai) of land.
- o Total number of livestock lost is about 29.34 million heads
- o The damage and loss to industry was 248 billion baht (Thai currency)
- o The damage and loss to transport sector (road, air and water) was 30.5 billion baht.
- o The electricity sector (power plants, sub-station and distribution networks) damage and loss was 8.9 billion baht.

Disaster impact: Some of the key impact due to the effect of floods of 2011 (above-mentioned) is as follows:

- o The estimated tax revenue loss is around THB 66.5 billion, or 3.7 percent of the estimated pre-flood revenues.
- o It will result in a reduction in real GDP growth in 2011 by around 1.1 percent, increase real GDP growth in 2012 by 1.7 percent, and reduce 2013 real GDP by 0.5 percent.
- o The current account balance in 2011 is estimated to fall to USD 11.9 billion compared to USD 20.6 billion had the flood not happened (The World Bank, 2012)

Economic Impact:

The impact on economic development can lead to:

- Decline in overall production and growth
- Possible increase in inflation
- Deterioration of governance functions

To measure the impact on macro-economic variables, analyses are usually made of the post-disaster performance on gross domestic product (GDP), the balance of payments (BOP) and the fiscal sector.

- The impact on GDP refers to the temporary negative repercussions of disaster losses on the performance of the economy, and to the positive effects on construction and other sectors due to the initiation of the reconstruction program.
- The impact of damage on gross investments is measured in the following years as asset restoration or replacement gets underway (depending on the construction sector capacity and available financial resources).
- The impact on the BOP involves estimating the possible increase in imports and the decline of exports arising from the disaster, as well as possible reinsurance payments from abroad and relief donations from the international community.
- The analysis of disaster impact on the public sector budget is estimated in terms of increased operational costs and lower revenues; wherever the public sector directly owns sectorial enterprises, its budget would sustain losses.
- The analysis of impact on personal or household well-being normally includes an estimation of employment and income decline due to the losses sustained in the productive and services sectors, as well as higher than normal family or personal expenditures.

The attempt to include an estimation of the impact on personal and household well-being in contexts where productive activity is undertaken through the informal sector, subsistence farming and unpaid family work continues to pose a challenge. These sectors often constitute a large share of the affected economy and have important gender dimensions and implications.

Box 4.6 Macroeconomic impact of 2004 Indian Ocean Tsunami on India

Expenditures Impact. The impact on the public finances of the states is limited to the expenditure side only. There is no impact on state revenues because the economic activity along the coastline is largely in the informal and unorganized sector. The contribution of the affected coastal regions to consumption taxes like sales tax, excise, etc., is relatively insignificant.

The impact of additional expenditures, in turn, varies across states depending on the requirement of rehabilitation and reconstruction activities. Much also depends on the fiscal space and the absorptive capacity of the states to incur such expenditures. This impact could be mitigated by alternative sources of financing (such as assistance from the center, external agencies or by accessing funds from the market) to meet additional expenditures. However, the overall finances will be affected by the terms and conditions on which the states are likely to borrow funds to meet the additional expenditures.

Fiscal costs in terms of additional expenditures can be divided into two categories -

- Immediate and temporary relief, falling in 2004-05
- Reconstruction cost - short-term (2005-06) and medium term (2006-07 and 2007-08), spread over a couple of years.

On the basis of preliminary estimates of reconstruction costs submitted by the states, tsunami related expenditures are likely to strain the finances of Tamil Nadu and Kerala. In the case of Andhra Pradesh, the rehabilitation expenditure is manageable (a mere 0.1 percent of state GDP) and well within its overall budget. It is difficult to assess the fiscal gap in Pondicherry since the Centre fills this.

Fiscal Deficit. For Tamil Nadu, it is estimated that the ratio of fiscal deficit to GSDP expands during the reconstruction period (2005-06 – 2007-08) by more than the tsunami induced expenditures due to an additional interest burden attributable to the additional debt stock caused by tsunami-related expenditures. The spiral effect of debt deficit dynamics through a higher interest burden will spill over beyond 2007-08 till it stabilizes as a percentage of GSDP.

In case of Kerala, in 2005-06, the ratio of fiscal deficit to GSDP in the new scenario increases by 0.3 percentage points compared to the status quo. In the medium term, the fiscal deficit to GSDP in the new scenario is higher by 0.1 percentage points in 2006-07 and 0.2 percentage points in 2007-08 compared to status quo scenario. In 2007-08, fiscal deficit to GSDP in the new scenario is higher than the tsunami induced expenditure (as percentage of GSDP) because of the underlying debt-deficit dynamics through additional interest burden on the accumulated debt stock due to tsunami related expenditures.

Source: ADB et al, 2005

Environmental Impacts

The impact of the disaster on the environment are the long-term consequences of the effects of the disaster on the environment in the affected area. They may be expressed in terms of the percentage reduction in total environmental assets that existed prior to the disaster and of the fraction of carbon sequestration, regulation of the water cycle, and other environmental services that has resulted after the disaster. The environment assessment team should be aware that the estimated values of environmental asset destruction and of losses in environmental services are not to be used to estimate the macro-economic impact of the disaster, since these values are not used to estimate gross domestic product (GDP) at national or State levels. However, if any potential environmental impacts that will reduce production or if the recovery and reconstruction requirements for the environment will need to import assets or construction materials as well as additional expenditures or any change in collection of taxes of any kind (increases in import duties or decline in export duties, as an example), the environment assessment team should estimate them and inform the macro-economic assessment team accordingly.

Disaster Recovery Needs

In order to design the Recovery strategy, the quantitative data obtained from the PDNA assessment of disaster effects and disaster impact need to be consolidated and presented in a manner that provides the comprehensive picture of all sectors and areas affected.

Recovery needs are determined for four components:

- The reconstruction of damaged infrastructure and physical assets
- The resumption of economic and social activities, service delivery and access to goods and services
- The restoration of governance and social processes
- Build back better and risk reduction.

It is important to prioritize the needs, as often recovery needs are higher than the available resources in limited time. Some key considerations to help facilitate prioritization are:

- The most urgent needs expressed by the affected population
- People in vulnerable situations
- Sequencing of needs, from the short-term to the medium and long term
- Restoring to pre-disaster levels, followed by improvements
- Actions that can yield early results effectively
- Greater impact
- Institutional and technical capacity
- Geographic areas with urgent needs
- Addressing key obstacles associated with sectors

Table 4.1 Illustrative examples of priority needs, interventions, outputs, costs and outcomes

Priority Needs	Interventions / Inputs Required	Expected Outputs	Recovery Costs	Intended Outcomes
• Repair and rebuild damaged community schools. • Teaching, learning and classroom materials for all transitional schools. • Access to education for boys and girls.	• Construction materials, labour • Procurement and distribution of teaching and learning supplies • Removing obstacles and providing incentives for school attendance of boys and girls (e.g. school feeding schemes, provision of sanitation facilities separated by sex, safe transportation, etc.)	• 421 community schools repaired and rebuilt. • Restored access to quality primary and pre-primary education.	• Costs for repair of schools \$8,000,000 • Costs for upgraded sanitation facilities in schools \$2,000,000 • Costs of school supplies \$ 2,000,000 • Costs for school feeding programmes \$2,000,000 • Total costs for recovery in Education sector \$14,000,000	• Increased attendance rate of boys and girls in schools.

Case: Disaster Risk Management Needs in 2004 Indian Tsunami affected areas in India

The Disaster risk management (DRM) needs, a crosscutting issue in recovery, identified in the tsunami-affected areas in India are summarized in table 4.2.

Table 4.2 Hazard Risk Management Needs (\$ million)

Components/ Projects	Tamil Nadu	Pondicherry	Kerala	Costs
Short term				
Multi-hazard risk assessment in the affected areas in the coastal areas with priority on affected talukas	1.65	0.20	0.30	2.15
Preparation of sector risk reduction guidelines (technical guidelines, suggested techno-legal arrangements, process guidance)				0.80
Community based reconstruction planning	1.86	0.16	0.20	2.22
Information, communication and public awareness	1.30	0.20	0.40	1.90
Mechanisms for dissemination of Early Warning Systems in the coastal districts	0.52	0.08	0.40	1.00
Sub Total	5.33	0.64	1.30	8.07
Medium term				
Multi-hazard risk assessment in unaffected but vulnerable Areas	0.85	0.10	0.65	1.60
Capacity Building at the village, block and district levels for Early Warning Systems in the coastal districts	0.68		0.12	0.80
Community based disaster risk management programs	1.50	0.10	0.65	2.25
Disaster risk information systems	1.50	0.10	0.65	2.25
Studies/ pilots on state specific studies on risk transfer mechanisms	1.50	0.10	0.65	2.25
Sub Total	6.03	0.40	2.72	9.15
TOTAL	11.36	1.04	4.02	17.22

Source: ADB et al, 2005



Key learning's

- Key elements in conducting PDNA are: Baseline data, disaster effects, disaster impact and recovery needs.
- Disaster effect include: Damage and losses in all sectors, disruption of service delivery and access to goods and services, governance and social processes, Increased risks and vulnerabilities, and environmental impact
- Disaster impact is consequence of effect and estimated on economic development and social condition.
- Based on assessment, recovery strategy and needs are determined it should include priority needs, interventions, outputs, costs and outcomes
- A Recovery Strategy that defines clear objectives, appropriate interventions to meet priority recovery needs, the expected outputs and overall intended outcome, and finally, outlines the implementation arrangements.



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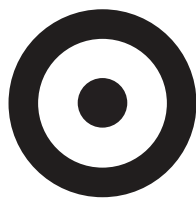
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CHAPTER 5

Learning Unit 4: Sector Guidelines for Estimating Damages and Losses in Undertaking PDNA



Objectives

Overall objective is to understand how to conduct a post-disaster needs assessment of sectors, which entails

- Assessment of individual sectors including specific issues as one sector varies from other
- Assessment of the effects of disaster on the sector i.e. damages and changes in economic flows (losses) in the sector



Duration

Total: 240 minutes

- Introduction to the sector assessment: 30 minutes
- Sector assessment for damages and losses (Parallel sessions for sectors): 90 minutes
- Group work on the estimation of damages and losses: 120 minutes
- Plenary to discuss group work findings: 120 minutes



Tools/Methodology

- **Training methods:** Lecture, Case Study, Video and Group Work
- **Material required:** Projector, screen, laptop, speaker, India PDNA Handbook/ Assessment Formats, chart paper and marker.

- **Note on the parallel sessions.**

- o The presentations for the sectors on the estimation of damages and losses and other effects are similar in nature. The purposes of the parallel sessions are:
 - a. To focus more on the uniqueness and peculiarities of the individual sectors in terms of the assets and potential sources of losses;
 - b. To provide more time for participants to discuss the issues on their sectors; and
 - c. To save time in the conduct of the whole training.
- o In conducting the parallel sessions, the 3 major sector groups infrastructure, social and productive sectors can be segregated in separate rooms where 3 different facilitators can lead the training.
- o Only the sessions on the estimation of damages and losses may be held in parallel sessions. Once the session is done, the participants will attend the same sessions again. Only during the exercise where they will be working in groups again.
- o However, in cases where there are not enough qualified facilitators, the session on estimating damages and losses can be held simultaneously with emphasis on the important sectors within the major sector groups which are generally important for countries like India. These sector are:
 - a. Transportation for the infrastructure sector;
 - b. Agriculture for the productive sector; and
 - c. Housing, health and education for the social sector.
- o The facilitator must, however, ensure that the participants have a copy of their Handbook and must encourage them to ask questions on their respective sector of concern.



Contents

Introduction to Sector Assessment

The assessment of disaster effects needs to be conducted in a bottom up approach that involves the estimation of the value of destruction of physical, durable assets and of the value of the disaster induced disruption of production flows in all affected sectors of economic and social activity, and their subsequent aggregation to ascertain total disaster effects and impacts.

Key considerations in sector assessment are:

- For a truly representative and valid estimation of total disaster effects and impacts, all affected sectors of economic and social activity should be fully assessed, despite their respective ownership: i.e. public and private entities. Leaving specific sectors out of the assessment constitutes a guarantee that certain parts of the affected society and economy would be left on their own and may not achieve recovery and disaster-resilient reconstruction or face longer periods of unnecessary suffering, in view of the existing inter-relations between sectors of the society.

- The procedures to be adopted should be systematically applied across the board of all sectors to ensure their subsequent valid aggregation for the desired objectives. All sectors should follow the same coherent procedures to ensure that the subsequent impact analysis and needs estimation are valid throughout.
- The estimations at sector, macro and micro levels – should be based on available and reliable quantitative information, supplemented where appropriate, by parallel qualitative considerations that are no substitute for the former; only this can ensure reliability of the assessment results in the minds of those responsible for the assignation of financial resources for recovery and reconstruction, whether they are government officials or representatives of international assistance and financial institutions.
- In order to ensure comparability of assessment results with those of other disaster events that may have occurred in the past or in other countries, it is essential that the sectorial structure adopted for the exercise be made in accordance to international standards of classification. For that purpose, it is essential that the sectors of economic and social activity included in the assessment follow the classification of the worldwide System of National Accounts. Furthermore, it is to be recalled that the System of National Accounts is a tool that has been generated and agreed upon by all countries of the world as a tool that enables the estimation of, inter alia, the effects of external crises on an economy and society (such as that caused by a disaster) as well as the results of adopting and enacting alternative public policies for development (including those adopted under post-disaster recovery and reconstruction).

Sectors of Activity under National Accounts versus Government Organization

It is widely known that the list of social and economic activities or sectors used in the System of National Accounts in India does not coincide with the organizational structure of the central and State governments. In fact, in some sectors defined in the national accounts, several ministries and departments may be involved in the discharge of government duties. Since the use of the national accounting system is a pre-requisite for the valid application of the procedures for estimating disaster effects and impacts, the table 5.1 shows the mapping of government ministries and departments that are included within the boundaries of the sectors of activity as per the national accounts.

Table 5.1 Government ministries/departments vis-à-vis sectors in the national accounts of India

Sr. No.	Sectors as defined in the System of National Accounts	List of activities carried out by different government ministries and departments ³⁴
1	Agriculture, forestry and fisheries	• Rural development • Agriculture and allied activities • Irrigation • Animal husbandry • Environment and forestry
2	Mining and quarrying	• Oil and gas • Mining of minerals
3	Manufacturing	• (Commerce) and industries • Small scale industries

³⁴The list under this column was provided by NIDM as list of sectorial activities to be included in assessments.

4	Electricity and gas	• Power sector • Water resources
5	Water supply, sewerage and waste management	• Public health engineering
6	Trade, hotels and restaurants	• Tourism • Commerce
7	Transportation and communications	• Roads and bridges • Road Transport • Railway transport • Air transport • Water transport • Communications • Public works
8	Financing, insurance, real estate and business services	• Housing (rural, urban as well as public and private)
9	Community, social and personal services	• Education • Health • Labour • Women and child • Social welfare • Urban development • Govt installations at State level • Municipal corporation

The participants/readers should be aware that in the sections that follow to describe sectorial procedures for disaster effects and impact assessment, the nine sectors included in the second column of the above table are to be described and the environment, though is not a sector of activity under the National Accounts. In each of these sections, all activities included in the third column and which are part of the boundaries defined by the national accounts for each institutional sector of activity. In that sense, the sectorial assessment team may include experts that normally work under one or more central ministries or State Departments. Also, whenever the assets of a particular ministry are destroyed, the values of damage to such premises or equipment are to be included within the formal sector where they belong, and not separately as belonging to a specific ministry or department.³⁵

Note to the facilitator:

Before proceeding to the individual sectors, the concept and definitions of damages and losses must be reviewed with the participants.

³⁵As an example, any destruction of the buildings or equipment of the ministry or department of agriculture is to be included as damage to the sector of agriculture, although breakdowns of damage for central and State governments are to be included as well to facilitate their location in the estimation of disaster effects.



Agriculture, Livestock and Fisheries Sector



Objectives

- To provide an overview of the status and performance as well as vulnerabilities of the agricultural sector
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on agricultural sector
- To identify needs for agricultural sector recovery



Contents

• Introduction

The agricultural sector accounts for about 14% of GDP, 10% of exports and 50% of the work force (employment). About 30% of the population is below the poverty level and almost 75% of all the poor in India are in the agricultural sector. Agriculture growth is 2-3 times more effective in reducing poverty than growth in the non-agriculture sectors. The annual average growth target for the 12th Five Year Plan (2012-17) is 8% for GDP and 4% for agriculture.

However, as per the development experience around the world, the relative contribution of the agricultural sector in India's GDP has declined over time from almost 52% in 1950/51 to 14.5% in 2010/11. The share of agriculture is composed of four sub-sectors: crops, livestock, fisheries and forestry. The relative share of all the sub-sectors has also declined over time. However, crops and livestock agriculture sub-sectors account for almost 85% of the total share of agriculture in GDP. The composition of agricultural output over time is given in Table 5.2

Table 5.2 Composition of Agricultural Output (%)

Sub-sector	Crops	Triennium ending 1990/91(%)	Triennium ending 2009/10 (%)
Crops		65	61
	Cereals	23	18
	Pulses	4	3
	Oil seeds	7	6
	Sugar	4	4
	Fiber	2	3
	Other crops	9	7
	Horticulture	16	20
Livestock		20	25
Fisheries		3	5
Forestry		12	9
Total		100	100

There is large year to year variability in growth rate in agriculture GDP. The primary reason for this variability has been fluctuations in weather indicators, climatic conditions and monsoon rains that have been responsible for natural disasters, floods and droughts. Almost 55% of Indian agriculture is rain-fed and its production depends on timely and adequate monsoon rainfalls.

Increasing Vulnerability and Declining Farm Size: The average size of operational holdings in India (based on various agricultural censuses) is very small and it has been declining (in 2010-11, it was 1.16 hectares) even further over time. Indian agriculture is dominated by small farmers who are very vulnerable to natural disasters as well as disasters caused by the outbreaks of pests and diseases (e.g. avian flu and swine flu). The farm size is so small that it is very difficult to achieve the economies of scale. This explains why majority of those who are involved in agriculture in India are poor and vulnerable.

Agriculture is a very risky business and the small farmers have limited capacity to bear the potential risks in agriculture. Since the current post-disaster assessment and assistance to agriculture is relief-centric, it does not promote recovery and resilience. This partly explains the desperate economic situation of marginal and small farmers after disasters.

- **Information Requirements**

The information requirements for making an assessment of disaster effects can be grouped as:

- o Baseline information (possibly up to 5 years, including the most recent year prior to the disaster) on all the physical assets and production activities for all the agricultural sub-sectors
- o Any existing damage and production loss information (however partial or preliminary) for each of the agricultural sub-sectors and related activities following the disaster
- o Information related to the forecasts for agricultural production and the physical assets for the future, including the year of the disaster.

All this information must be at the national level as well as disaggregated to the lowest administrative unit possibly District and State.

This information should deal with, but not be limited to, the following activities:

- o **Crops:** Area, yield and production of various crops (annual and perennial), use of agricultural inputs, availability of physical assets and agricultural infrastructure, including irrigation system;
- o **Livestock:** Number, yield and production of livestock, use of livestock inputs, availability of physical assets and livestock infrastructure;
- o **Fisheries:** Area, yield and production of various types of fisheries, use of fisheries inputs, availability of physical assets and fisheries infrastructure;
- o **Forestry:** Area, yield and production of exploited forestry, production of forest non-timber goods and services, availability of physical assets and infrastructure area;
- o **Macroeconomics:** Agricultural GDP, overall GDP, value added coefficients, balance of payments in agriculture, revenue and expenditure in agriculture and inflation;
- o **Socio-economics:** Population, labor supply, wage rates, employment, livelihood opportunities, level of rural household income and role of women in agriculture;

- o **Food Security:** Production, imports, exports, stocks, social safety net, food for work programs, nutrition, hunger, role of dairy, poultry, fisheries;
- o **Rural Poverty:** National and regional poverty levels over time and by rural and urban sectors as well as the criteria for poverty;
- o **Environment:** Status of environmental assets over time and location, levels of land degradation, desertification and deforestation;
- o **Agricultural inputs:** Production, consumption, distribution, imports and exports by type of inputs and location, levels of productivity of various inputs;
- o **Agricultural prices:** Farm gate, procurement, guaranteed, wholesale, retail, export and import prices for all agricultural inputs and outputs as well as marketing; and
- o **Agricultural trade:** Exports and imports of agricultural inputs, outputs and related products by country and mode of transport.

Every effort must be made to make sure that there is no double accounting, no gaps in critical information and that information is cross checked to ensure its quality. Information on macro-economic and socio-economic variables related to agriculture is generally collected by the agriculture team and given to the respective macro-economic and socio-economic teams.

• Initial Analysis of the Agricultural Sub-sectors

In order to provide a broad socio-economic perspective and accurately estimate the value of destroyed assets and production losses caused by a disaster, it is very important to first undertake an initial analysis of the agricultural sub-sectors (crops, livestock, fisheries and forestry). The importance of these sub-sectors may vary from one State to another.

The initial analysis of the sub-sectors should deal with, but not be limited to, the following aspects:

- o Socio-economic importance of sub-sector and sector
 - Contribution to GDP;
 - Contribution to employment;
 - Contribution to food security; and
 - Contribution to exports.
- o Type of production
 - Subsistence or commercial;
 - Irrigated or rain-fed;
 - Labor intensive or mechanized;
 - Specialized or diversified;
 - Cropping pattern;
 - Role of animals as draft power; and
 - Type of fisheries (aquaculture, artisanal, commercial).

- o Calendar of crop production
 - Annual crops (planting to harvesting); and
 - Perennial crops (flowering to harvesting).

However, one must keep in mind that the importance of agricultural sub-sectors may vary by States or districts, and hence the nature of disaster effects. By superimposing disaster time on the crop calendar, it would be possible to visualize whether the crop has been fully lost or only partially lost due to decline in crop yield. In addition, there is also a need to analyze

- o Farm size and agricultural land distribution and the relative share of the landless and the small and marginal farmers in order to get a sense of equity
- o The quantity and quality of physical assets and their distribution by farm size groups and regions or States.

- **Baseline information**

- o **Pre-disaster Situation in the Sub-sectors**

In order to properly estimate the value of physical asset destruction and production flow changes in the sub-sectors, it is very important to first develop the baseline information as well as expected (forecast) information related to production of each of the sub-sectors. This statistical information is not only essential for estimating production losses caused by the disaster, but it is also important to validate information received from various sources. In addition, there is a need to have a complete inventory of all the physical assets used in the sub-sectors by States. In the absence of appropriate baseline information on physical assets, it may not be possible to accurately estimate the damage to physical assets.

- o **Sources of Information**

The sources of information may vary by agricultural sub-sector, sector and state. However, the critical list of the likely sources of information is provided below.

- National, State and other economic and statistical agencies;
- Census data (e.g. agriculture, population, credit);
- Household or household income and expenditure surveys;
- Specialized post-disaster field surveys;
- Satellite photographs (before and after the disaster);
- Field visits to the affected areas;
- Government reports on the disaster;
- Reports by CBOs and NGOs;
- Interviews with affected stakeholders; and
- Newspaper articles (mainly for qualitative information).

- **Post-Disaster Situation and Sector Performance**

- **Post-disaster Analysis for the Agricultural Sub-sectors**

Crops: Following the disaster, it is important to determine the post-disaster situation in the crop sub-sector i.e. for both the annual and perennial crops. This would require the determination of the extent and severity of disaster effects in terms of area and yield in the regions or States affected by the disaster. In addition, there is a need to take an inventory of all the physical assets used in the crop sub-sector that have been affected by the disaster, including soil (land); agricultural infrastructure such as buildings, farm access roads, irrigation system; farm machinery and equipment, including irrigation equipment; perennial crops; and agricultural stocks (such as seeds, other inputs and produce) stored at the farm.

Livestock: Following a disaster, it is important to take an inventory of the livestock sub-sector and the likely disaster effects in the affected areas. This of course depends on the type, extent and severity of the disaster. Cyclone surges in the coastal areas and flash floods are likely to kill animals through drowning and long droughts are likely to kill animals through starvation or to cause animals to lose weight and yield less milk or meat because of stress. In addition to the likely production loss, there is a need to take an inventory of the damage to physical assets, including livestock infrastructure, equipment and machinery and stored input, feed and fodder stocks.

Fisheries: In order to estimate the value of damage and loss of production, it is important that the post-disaster information on the physical assets and production in the fisheries sub-sector, particularly in the disaster-affected area, is accurate and complete. Unlike the other sub-sectors, the fisheries sub-sector faces a unique situation with respect to fish fries and fingerlings. For example, during heavy floods, individual fish farmers and hatchery owners may lose fish fry and fingerlings and thereby experience financial loss. However, most of the fish fries and fingerlings may merely swim to other parts of the State or India (and some may go to the sea). As a result, the country may suffer only a minimum financial loss in the form of fries and fingerlings.

Forestry: Forestry sub-sector is further divided into two parts: exploited forestry and natural forestry. As part of agriculture, the forestry sub-sector deals only with the part that is exploited for timber production and non-timber forest goods and services. The natural forestry is considered part of the environment sector. In order to estimate the value of damage and loss of production, it is important to collect all the pre-disaster information on the physical assets and production under the exploited forestry. The nature and type of non-timber forest goods and services depends on the type of forest (tropical or non-tropical) and the type of trees used for timber.

Supplementary Sources of Post-Disaster Information: Information related to post-disaster situation for each of the agricultural sub-sectors needs to be supplemented by other available sources of disaster related information. This includes field visits to the disaster areas, satellite pictures before and after the disaster, focus group discussions at the local levels with representatives of the communities that have been affected by the disaster, as well as rapid agricultural surveys of the affected areas, if need be.

- **Estimation of Disaster Effects**

- **Estimating the Value of Destroyed Physical Durable Assets for Crops**

Taking an inventory of the destroyed assets and determining the extent of their damage can estimate the value of destroyed physical durable assets in the crop sub-sector. These physical assets can be classified into six broad categories:

- Soil (agricultural land);
- Irrigation system;
- Agricultural infrastructure;
- Agricultural machinery and equipment;
- Agricultural stocks; and
- Perennial crops.

With the exception of perennial crops, the destruction of physical assets can be estimated by multiplying the number of units of fully destroyed by the replacement value (for soil, irrigation system and infrastructure) or the prevailing market price (for agricultural machinery, equipment and stocks). On the other hand, damage to partially destroyed but repairable physical assets can be estimated by multiplying the number of units of partially destroyed by the prevailing average cost of repair. The estimated value of damage to individual physical assets (across regions or States) can then be aggregated to obtain the estimated value of total damage to physical assets.

- **Estimating Production Flow Changes in Annual Crops**

Criteria for Determining the Magnitude of Production Flow Changes: If disaster occurs at the end of the season and the annual crop is affected by the disaster, the production loss is equal to

- Full production loss if the crop is fully destroyed; or
- Partial production loss if only crop yield declines.

On the other hand, if the disaster occurs at the beginning of the season and total production is not obtained, depending on whether the crop can be replanted without affecting the next crop, the production loss is equal to

- Full loss if the crop cannot be replanted and harvested in the same calendar year
- Partial loss equal to the value of investments that were made before the crop was destroyed (i.e. cost of production).

There is a need to apply these criteria to each of the annual crop that is affected by the disaster.

- **Procedure A for Estimating Full Crop Production Loss:** This procedure involves the following steps for the individual annual crops that have been fully destroyed:

- Determine baseline (historical) data for
 - Crop area;
 - Average crop yield;
 - Crop production; and
 - Farm gate price for crop produce.

- Obtain pre-disaster forecast for
 - Crop area;
 - Crop yield; and
 - Crop production.
- Develop post-disaster forecast for
 - Crop area;
 - Crop yield;
 - Crop production; and
 - Current farm gate price of crop produce.

Crop production loss is the difference between the value of post-disaster crop production and the corresponding value of pre-disaster forecasted crop production. However, if neither the historical data for crop area, yield and production nor the corresponding forecasts are available at the level of States or Districts that are affected by the disaster, this procedure is not applicable.

- **Procedure B for Estimating Full Crop Production Loss:** This procedure involves the following steps for the affected individual annual crops:
 - Determine post-disaster values for
 - Affected crop area;
 - Expected or forecasted average crop yield in the absence of a disaster; and
 - Current farm gate price of crop produce.

Production loss is equal to the value (using current farm gate price) of lost production as determined by the affected crop area and the expected average crop yield for the crop.

- **Procedure for Estimating Production Loss due to Decline in Crop Yields:** For a particular individual crop that has experienced only partial production loss due to a decline in crop yield caused by the disaster, the production loss can be estimated as follows:
 - Determine disaster affected crop area (say, A);
 - Expected/forecasted average crop yield in the absence of a disaster (say, Y);
 - Estimate crop production in the absence of a disaster ($A*Y$);
 - Determine % decline in average crop yield (say, p);
 - Determine likely crop production loss ($p*A*Y$);
 - Determine current farm gate price (P);
 - Determine value of likely crop production loss ($P*p*A*Y$).

- **Estimating Production Loss in Perennial Crops (Plantations or Trees)**

As far as perennial crops (plantations or trees) are concerned, following a disaster, there are likely to be three scenarios i.e. full destruction of the perennial crops; full loss of production; and partial loss of production due to a decline in yield.

- o **Full Destruction of Perennial Crops:** Under this scenario,
 - The value of damage may be estimated as equal to the cost of replanting the destroyed perennial crop. The replacement trees must be equal quality as the destroyed ones; and
 - The value of production losses is equal to the sum of the value of the full standing crop production at the time of disaster plus the value of production losses over time that is required for the new trees to fully mature and start production or bearing fruit.
 - **Full Production Loss:** Under this scenario, there is no destruction of trees due to a disaster and the production loss is equal to the value of production of the full standing crop.
- o **Partial Production Loss due to a Decline in Yield:** Under this scenario, the production loss is determined by following the same procedure as has been outlined above for a decline in yield in the case of annual crops. However, there is one difference. Depending on the nature and intensity of the disaster, the yield for perennial crops may remain below normal for several years. For example, if the perennial crop in the coastal areas is affected by the intrusion of brackish water (due to water surge caused by a cyclone, as in the case of Odisha), yield may remain below normal for several years. When that occurs, estimations are made of the average annual yields that may be obtained after the disaster, using data obtained from past experience and similar cases.
- o **Estimating Damage to Physical Durable Assets for Livestock:** The physical assets in the livestock sub-sector can be classified into 5 broad categories:
 - Animal deaths;
 - Livestock sheds;
 - Storage buildings;
 - Stored feed and fodder; and
 - Livestock equipment and machinery.

The damage to these physical assets can be estimated by multiplying the number of fully destroyed units with their replacement cost (e.g. sheds and buildings) or current market price (e.g. dead animals, poultry and honey bees, feed and fodder). On the other hand, damage to partially destroyed physical assets can be estimated by multiplying the number of affected units by their average cost of repair. The estimated value of damage to individual physical assets must be aggregated to obtain the value of total damage for each District, State and for the country.

- o **Estimating Production Loss for Livestock:** For estimating production loss in the livestock sub-sector, there are likely to be three scenarios i.e. full production loss due to death of animals, birds or bees; partial production losses due to a decline in yield and/or an increase in production costs.
- o **Full Production Loss due to Death of Animals, Birds or Bees:** Death of male animals used for meat and broilers will be included only in the damage part of the livestock sub-sector. However, production loss will be estimated for the male animals used for draft purposes, cows and buffaloes used for milk, poultry layers for eggs and honey bees for honey. Production loss is equal to the value of lost draft services, milk, eggs or honey over a period of time till the young replacements are mature

and start producing. The lost value for milk production, for example, can be estimated by multiplying the number of dead cows with annual average milk yield and current market price for milk. The same can be done for estimating the value of production loss for eggs, honey or draft power. However, in order to accurately estimate the value of production loss, it is important that only that number of cows should be used in calculation, that were in actual production. The same is true for poultry layers and draft animals.

- **Partial Production Loss due to a Decline in Yield:** Under this scenario, the production loss is determined by following the same procedure as has been outlined for estimating production loss from decline in yield for perennial crops. After disasters, the livestock may come under stress, lose weight due to lack of water, feed or fodder or may become sick. Hence, depending on the nature of the problem or the manner to restore the animal stock to pre-disaster levels and numbers, the decline in yield can be only for one year or it can last for several years. Generally, over time, yield will improve as the conditions for livestock become normal.
- **Higher Production Costs:** In addition to losses in production, the production costs may also increase due to disasters. The higher production costs could be attributed to higher costs involved in feeding animals, providing veterinary treatments and costs associated with possible transporting animals to other areas where they may find food and water.
- **Estimating Destruction of Physical Assets for Fisheries:** It is important to estimate the number of different type of physical assets (such as ponds, hatcheries, fries, fingerlings, stores, stocked fish or feed, and fishing equipment) that have been fully or partially destroyed by the disaster. The damage to these physical assets can be estimated by multiplying the number of fully destroyed units by their replacement value (e.g. infrastructure) and current market price (fishing equipment). On the other hand, damage to partially destroyed physical assets can be estimated by multiplying the number of partially destroyed units by the average cost of repair. The value of the total damage due to disaster can then be estimated by aggregating the damage to individual physical assets.
- **Estimating Changes in Production Flows for Fisheries:** For estimating production loss in the fisheries sub-sector, there are likely to be four scenarios i.e. partial to full production loss in aquaculture ponds; full production loss in inland capture fisheries; full production loss in marine capture fisheries; and higher production costs.
- **Partial to full production loss in aquaculture ponds:** Depending upon the damage to the pond, contamination of pond water and loss of fries and fingerlings, fish yield per pond may decline between zero and 100%. The yield decline may vary from one pond to another. Hence it is important to estimate average yield decline. The value of the production loss can be estimated by multiplying decline in yield with area under aquaculture and prevailing market prices for fish.
- **Full production loss in inland capture fisheries:** Depending on the loss in the number of fishing days caused by either disaster or damage to the fishing equipment, there will be full production loss for certain number of days or partial loss in terms of annual loss. Similarly, the value of the lost production can be determined by multiplying production with the prevailing market prices for the particular type of fish that has been lost.
- **Full production loss in marine capture fisheries:** The methodology is same as above except that it is applied to production loss in marine capture fisheries production.

- **Higher Production Costs:** Higher production costs can be due to many factors such as higher cost of aquaculture or capture fisheries due to increased cost of inputs, increased cost of equipment rental, higher cost of fuel to reach fish that may have migrated far away, cost of temporary rental of boats while they are being repaired.
- **Estimating Destruction of Physical Assets for Forestry:** It is important to estimate the number and the extent of damage to physical assets such as standing timber, forestry equipment and machinery, fire management equipment, firebreaks, houses, watch towers and access roads that have been fully or partially destroyed by the disaster. The value of damage can be estimated by multiplying the fully destroyed assets by the replacement cost (infrastructure) or the prevailing market price (equipment). On the other hand, the value of partially destroyed assets can be estimated by multiplying the number of partially destroyed assets with the average repair cost. The total value of damage to physical assets can be estimated by aggregating the value of fully and partially destroyed physical assets in forestry.
- **Estimating Changes in Production Flow of Forestry:** For estimating production loss in forestry sub-sector, there are likely to be four scenarios i.e. partial production loss due to decline in timber yield; partial production loss due to decline in yield of non-timber goods; partial production loss due to loss of carbon sequestration; and higher input cost due to cost of removing the dead trees and cost of replanting.
- **Public and Private Sector Breakdown of Disaster Effects:** As has been indicated earlier, most of the agricultural sector is in the domain of the private sector. However, substantial amount of agricultural infrastructure (such as irrigation, drainage, research, extension, veterinary hospitals, fish landing facilities, forestry infrastructure) are in the public sector. The main logic for dividing the disaster effects into the public and private sectors is to determine their relative shares on the public and private sectors and to assign the primary responsibility for recovery and reconstruction following the disaster. Even when most of the disaster effects are in the private sector, the governments should generally play a very active role in facilitating appropriate arrangements for financing recovery and reconstruction.
- **Geographical Breakdown of Disaster Effects:** The extent of geographical coverage by a disaster depends on the type and intensity of the disaster. More importantly, however, it also depends on the size of the country. For example, cyclones may cover only a part of India. In order to develop an appropriate recovery and reconstruction strategy, however, it is very important to determine the location-specific impact of the disaster in terms of damage, production loss and secondary impact. It may also be important to divide the recovery and reconstruction responsibilities by the State and Central governments. Furthermore, it is important to allocate recovery and reconstruction resources based on quantitative estimation of the disaster effects rather than on political considerations. Estimating damage and production losses by geographical areas provides an objective criterion for developing a financing strategy and allocating resources following a disaster, irrespective who is providing the financial resources.
- **Reference for assessment**
 - For Standard Procedures for Agriculture, Forestry, Livestock and Fishery Assessment, please refer to India PDNA Handbook (Page number 21-26)
 - To collect baseline information on Agriculture, Forestry, Livestock and Fishery sector assets and production flows, please refer to India PDNA Handbook (Page number 27-34)



Mining and quarrying



Objectives

- To provide an overview of the status and performance as well as vulnerabilities of the mining and quarrying
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on mining and quarrying
- To identify needs for recovery of mining and quarrying



Contents

- **Introduction**

In India, the sector of mining and quarrying includes several subsectors or activities, including the following (Gol, 2013):

- o **Major minerals, with the following subdivisions**

- Fuel minerals, including coal, lignite, petroleum and natural gas
- Metallic minerals: iron ore, manganese ore, bauxite, copper ore, gold and others
- Non-metallic minerals, including limestone, mica stone and others

- o **Minor minerals**

Undoubtedly, the subsectors of petroleum and gas (38 per cent of the sector total) and of coal (35%) are the most relevant in terms of production value.

- o **Key ministries involved:**

- The Ministry of Mines is responsible for the survey and exploration of all minerals (except natural gas and petroleum), mining and metallurgy of non-ferrous metals, and for the administration of mines and minerals. The Geological Survey of India and the Indian Bureau of Mines are subordinate offices of the Ministry of Mines. There are several public-sector enterprises that operate in the sector, and produce about 85 per cent of the country's mineral production.
- The Ministry of Petroleum and Natural Gas is responsible for exploration, production, refining, distribution, marketing, import/export, and conservation of petroleum, natural gas, petroleum products and liquefied natural gas. Note should be taken that, according to the national accounting system, oil refining activities are to be included under the manufacturing sector and not under mining and quarrying.

- o **Vulnerability of sector:**

Any destruction, however partial, to mines and equipment used for extraction and processing of minerals and oil related products would result in the temporary decline of production activities and/or in higher costs of production, until recovery is achieved. In turn such reduction in production would affect other production processes that utilize minerals and fuels as input, thereby multiplying the effects of the disaster within the economy and society.

Due to limited work on this issue in India as well as other countries, the guidelines for assessment of this sector will be of limited nature and will have to be further developed later on after actual assessments are conducted in India.

- **Baseline information**

Data on the existing production infrastructure and output in the sector is to be collected as the first stage of the assessment to estimate the value of disaster effects, including the following³⁶:

- o Location, capacities and ownership of each productive unit (both affected or unaffected, under operation and on stand-by mode) in the sector and its subsectors, such as inter alia:
 - Mines
 - Oil fields and wells
 - Refineries³⁷
 - Storage facilities, and
 - Waste disposal facilities
- o Information on the destination of mineral and fuel products, domestic and for export
- o Information on quantities and prices of imported and exported crude and refined products
- o Information on skilled and non-skilled labor force in the sector, and their wages and salaries.

This kind of information is available in the Ministries of Mines and of Petroleum and Natural Gas, as well as in the Central and State Statistical Offices, and should be collected by the sector assessment team before starting any assessment.

- **Post-disaster sector situation and performance**

The mining and quarrying sector assessment team needs to conduct field visits to the disaster-affected areas in order obtain first-hand information on the destruction sustained by the sector assets and to acquire a clear idea of the manner in which sectorial production would temporarily function until full recovery and reconstruction is attained.

In addition, the sector assessment team should collect all available information on unit costs to rebuild or replace damaged or destroyed assets, for which interviews are to be held with private contractors working in the field and with officials from the government agencies in the sector that may have recently constructed some of the destroyed assets. Furthermore, the team should visit local insurance companies that may have information on the availability of insurance on sector assets, and obtain from them the likely amounts of insurance proceeds on infrastructure and equipment that may be obtained.

³⁶Missing

³⁷It is to be noted that the activity of oil refining is actually part of the manufacturing sector; not of mining and quarrying. Any disaster effects and impact on refining activities are to be referred to the manufacturing sector assessment team.

During the field visits, the sector assessment team should ascertain whether there are undamaged idle capacities (such as standby oil wells) that may be used to partially offset production decline, or whether there are unaffected assets whose production levels may be increased to meet normal demands, the higher costs that may be involved in such operations, and the time periods that may be required to restore production in the affected mines, and oil and gas facilities.

With such information at hand, the sector assessment team should develop a calendar of activities required to ensure the reconstruction of destroyed assets and equipment and the recovery of production of minerals, oil and gas.

- **Estimation of Disaster Effects**

The value of damage in the mining and quarrying sector is to be estimated as the cost, which is required to rebuild all destroyed assets and to replace damaged equipment in the sector and its components, with the same characteristics they had prior to the disaster and the unit costs that prevailed at the time the disaster occurred.

In the mining sub-sector, this would normally involve the cost of draining by pumping of flooded underground mines and the removal of waste materials, which may have occurred in adjacent lands. In the oil and gas sub-sector it may involve the cost of drilling new wells and that of replacing equipment and machinery to replace the destroyed ones, together with the cost of rebuilding or repairing any storage facilities and pipelines. The replacement cost of destroyed vehicles and other specialized equipment should be included as well.

Very often after disasters any destruction of sector facilities and assets may bring about unwanted effects to the surrounding environment and adjacent areas. A clear example of this is the possible rupture of earth dams containing metallic mine tailings and their spilling over agriculture lands or contaminating water supplies³⁸ as well as the possible rupture of oil wells and pipelines and the spilled oil contaminating adjacent lands and other productive activities³⁹. While the damage sustained by the environment would be covered in the sectors of economic and social activity that have sustained these effects, the cost of environmental cleanup would have to be borne and included in the assessment of the mining and quarrying sector as part of the cost of reconstruction.

The value of the disruption of production flows may include the value of production that will not be obtained because of the interruption or slowdown of sector activities, and the higher costs of production which may be required until full recovery and reconstruction is achieved. As hinted at previously, it is possible that utilization of unaffected stand-by facilities and/or a more intensive operation of undamaged facilities may enable to partially offset production decline or interruption in the destroyed facilities and assets; but operational costs may have to increase with respect to the normal level of operation.

³⁸As occurred in the recent floods in Serbia.

³⁹As was the case in the 1987 earthquake in Ecuador and in the 2012 floods in Nigeria.

The total value of changes in production flows may be estimated by aggregating the following:

- o Value of production interruption which is not recovered by more intensive operation of unaffected sectorial facilities and assets within the same calendar year;
- o Value of production losses arising from partial operation of sectorial facilities and assets that are only partially damaged, until they are repaired, rebuilt or replaced; and
- o Higher operational costs involved in the more intensive utilization of standby or unaffected facilities over the recovery and reconstruction period.

The estimated values of damage and of production flow changes in the sector must be apportioned according to public and private ownership of the enterprises that operate in the sector, as such structure will have a bearing on the financing of post-disaster recovery and reconstruction activities.

- **Reference for assessment**

- o For Standard Procedures for Mining and Quarrying Assessment, please refer to India PDNA Handbook (Page number 43)
- o To collect baseline information on Mining and Quarrying sector assets and production flows, please refer to India PDNA Handbook (Page number 44-47)



Manufacturing Sector



Objectives

- To provide an overview of the status and performance as well as vulnerabilities of the manufacturing sector
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on manufacturing sector
- To identify needs for recovery of manufacturing sector



Content

• Introduction

The manufacturing sector in India comprises the following industries, as per the System of National Accounts⁴⁰:

- | | |
|--|--------------------------------------|
| o Food (meat, fish, fruits, vegetables and oils) | o Dairy products |
| o Grain mills products | o Other food products |
| o Beverages | o Tobacco products |
| o Spinning, weaving and finishing of textiles | o Wearing apparel |
| o Leather and fur products | o Wood and wood products |
| o Furniture | o Paper and printing |
| o Rubber, petroleum products | o Chemicals and chemical products |
| o Non-metallic products | o Basic metals |
| o Metal products and machinery | o Electrical machinery |
| o Other manufacturing | o Transport equipment manufacturing. |

It must be noted that in India the manufacturing sector is not normally included in post-disaster impact and needs assessments. A review of existing reports on the subject indicates that: (i) for the purpose of estimating disaster relief assistance, the manufacturing sector is not included; and (ii) that even in more thorough assessments conducted in cases of major disasters with assistance from international organizations, the manufacturing sector was not assessed. A partial exception to the latter statement may be found in the case of the Gujarat earthquake in 2001, where numerous industrial enterprises sustained widespread destruction and significant disruption of production. However, it was under-estimated, perhaps because of the fact that these industries were privately owned and because the anticipated higher demand for industrial products for reconstruction was expected to offset such losses.

⁴⁰See National Account Statistics, 2013, Central Statistical Office, Ministry of Statistics and Programme Implementation, Government of India, New Delhi, 2013.

The fact that manufacturing industries belong to the private sector does not warrant the assumption that they have insurance and thus they would need no post-disaster assistance for recovery and reconstruction is not valid. In fact, insurance penetration in India as in other developing countries is relatively low; and it is often found that those firms that are insured, coverage is normally restricted to physical assets (premises, machinery and equipment), but do not necessarily include production losses arising from disasters. That is more evident for the case of micro and small to medium enterprises whose savings capacity and credit worthiness is limited. Such a limitation in post-disaster assistance makes such enterprises very vulnerable to the impact of disasters, and these industries generate a relatively large number of jobs for the population which, when disaster strikes, are left without adequate household income.

When pointing out such a limitation in post-disaster assessments and recovery programs, the intention is not to have the Central and State governments to provide direct assistance to the enterprises and to the affected household members that lose jobs and income; the intention is exclusively to highlight that these enterprises have recovery and reconstruction needs that need to be channeled through the private sector banking and the development banks. In the case of micro-industries, they may require financial assistance through different modalities, since they are not necessarily credit worthy and cannot expect to meet their post-disaster requirements through the private banks.

In any case, any post-disaster assessment should cover the estimation of damage and production flow changes of the manufacturing sector, in its different types of industries, to ascertain disaster impact and to estimate their recovery and reconstruction financial requirements. Leaving the sector out of the assessment is a sure way to put aside a sizable number of the labor force that may lose employment and income.

- **Baseline information**

The following baseline information on the characteristics and capacity of the manufacturing sector and its different branches of activity must be obtained.

- o Number and size of industrial establishments, by branch, type and size of industry, existing in the affected area
- o Typical physical facilities in each of the above, including a description of the number and capacities of industrial buildings, equipment and machinery
- o Information on annual or monthly gross production for each industrial establishment
- o Quantitative information on the usual destination of manufactured goods, whether they are produced for domestic consumption or for export to other countries.

- **Likely sources for information:**

- o Recent industrial survey or census that the country or states may have undertaken, which may have been conducted either by the ministry of industry or by the Statistical Office in the affected State.
- o National accounts handled by the Central and State Statistical Offices. Since this information may already be out of date at the time of the assessment, projections to the current year must be made by the industry assessment team on the basis of recent growth rates for the sector in the affected State.
- o Direct contacts with private sector associations of industry, which may have or may be able to obtain full particulars about the installed capacities and production of their associated enterprises. In fact, such private sector bodies may become partners in conducting the assessment, since they are likely very keen in defining post-disaster needs for recovery and reconstruction.

On the basis of the previously listed information, a typology of industries, by branch of industrial activity, size, and private and public ownership is to be defined for purposes of the assessment. The branches of industrial activities to be analyzed should be defined on the basis of the national accounting system of the country in question, as described above.

- **Post-disaster situation and performance**

The assessment team should conduct field visits to determine the effects of the disaster in the affected industries, and/or rely on existing reports from qualified stakeholders that may have already conducted assessments, however preliminary they may be. In the latter case, the industry sector assessment team should validate, homogenize and supplement the existing estimations on the basis of their primary observations in the field.

In addition to the above, a sample survey of typical industrial establishments is to be conducted on a parallel fashion, in order to be able to assess the value of damage and to estimate possible changes in production flows for the sector. The sample survey should cover a sufficient number of all types of affected industries in the disaster area to obtain representative values of damage and production losses, as well as representative needs for recovery and reconstruction for the sector. The survey should include the appropriate list of industry types that may have been affected by the disaster in question.

Any existing reports, however partial in coverage, must be used by the team in conjunction with the field visits and the sample survey mentioned above, to estimate the number of industrial establishments of each pre-defined type that may have sustained total or partial destruction and whose production may have been affected directly or indirectly by the disaster.

The field visits by the assessment team, coupled with the sample survey questionnaire responses, should enable to define the average type and value of damage for each industry establishment type, the time of production stoppage or decline due to different reasons⁴¹, and the likely requirements for recovery and reconstruction. During the same field visits, unit reconstruction and replacement costs for repair and rebuilding of physical assets as well as replacement of equipment and machinery are to be obtained, through interviews with industry executives and representatives. Any difficulties and limitations foreseen by the owners of such industries – for instance, in terms of financial and credit requirements, availability of raw materials and inputs, availability of labor, time required for replacement of specialized equipment and machinery, etcetera are also to be identified.

On the basis of the information thus collected and in combination with the baseline data on existing physical capacities and normal or non disaster production, the industry sector assessment team must develop a scenario of how the sector is likely to function after the disaster until full recovery and reconstruction is achieved. This would include developing separate calendars for the repair and reconstruction of buildings and other facilities, replacement of equipment and machinery and for the resumption of normal or non-disaster production levels over time.

- **Estimation of Disaster Effects**

After a disaster, the manufacturing sector may sustain the destruction of its assets (damage) that may include buildings, equipment and machinery, stocks of raw materials and of manufactured goods.

⁴¹Production stoppage or decline may be due to several possible reasons, such as: destruction of premises, equipment and machinery; temporary unavailability of raw materials for processing and of essential inputs such as electricity and water; and temporary unavailability of sufficient labor.

In addition, the sector may face disruptions in its production flows, including production decline arising from the fact that the sector assets are destroyed or to other causes associated to the disaster (such as lack of raw materials, strategic inputs of water and electricity, temporary absence of labor, lack of working capital, etcetera). Industries may also face higher costs of production that arise from having to purchase raw materials and inputs from alternative, more costly sources.

In addition to the above, some branches of industry such as the food-producing industries that rely in the production obtained from other sectors of the economy for raw material purposes may sustain production decline even if no damage has happened to the industrial facilities.⁴²

As in the case of other sectors, the value of damage in the manufacturing industry is measured initially in physical terms and is subsequently converted into monetary terms by using the reconstruction or replacement cost of the destroyed physical assets, to the same quality and quantity standards and using unit replacement costs that prevailed prior to the disaster.⁴³

Changes in production flows in the manufacturing sector refer to the value of the decline in industrial output and to possible increases in production costs that may arise after, and as a consequence of, the disaster. Increases in production costs represent in fact increases in intermediate consumption for the sector, and are to be treated accordingly when estimating the macroeconomic impact of the disaster. Post-disaster reconstruction activities, on the other hand, may actually induce an increase in the demand and production of certain manufactured goods, which case is analyzed later on in the assessment when estimating the possible positive impact of reconstruction.

The assessment of disaster effects in the manufacturing sector is more complex than in other sectors of economic activity in view of the usually large number of existing industrial establishments, of different types and size, which are usually spread over large areas of a country. Moreover, despite the fact that there is a ministry of industries, most industrial establishments are privately owned which fact makes more difficult to obtain information on disaster effects. Therefore, a special sample survey of affected industrial establishments is to be carried out in parallel to the field visits to be made by the industry sector assessment team, and its results are to be combined with the existing baseline information in order to cover the entire universe of the sector.

To facilitate the assessment, the cooperation of industrial associations of the private sector, which usually have direct access to information from its associated individual members and which share interest in obtaining post-disaster assistance, is to be enlisted.

- o **Destruction of premises, equipment and machinery**

The value of destroyed assets (damage) in this sector is to be estimated on the basis of the cost to rebuild or repair the buildings and other associated facilities that were totally or partially destroyed, as well as the replacement value of the furniture, equipment, machinery and supplies that were also similarly affected. It is to be assumed that these assets are to be replaced with the same capacity and quality they had prior to the disaster, and using the unit reconstruction and replacement costs that prevailed at the time of the disaster.⁴⁴

⁴²This is a typical example of grain milling and other food processing industries that after a disaster may face shortages of raw materials for processing, due to the primary production losses in agriculture, livestock and fishery, even if the industrial capacity has not been negatively affected by destruction.

⁴³The possibility of reconstruction or replacement using improved, disaster-resilient standards, as part of a possible strategy of “building back better”, is to be introduced later when estimating financial requirements for recovery and reconstruction.

⁴⁴Any higher costs involved in building to improved, disaster-resilient standards and in retrofitting existing structures will be included as part of the subsequent estimation of needs in the assessment. If for some reason, the equipment and machinery that was destroyed can only be substituted by more modern and capable machinery, the additional costs involved should be taken into consideration during the estimation of needs.

In view of the usually very large number, size and type of industrial establishments existing in the disaster-affected area, the damage assessment must rely on information obtained from the already mentioned, parallel sample survey to define average values of damage for each type or branch of industry, and on counts of the number of each industry type that were either totally or partially destroyed. Then, an extrapolation of the value of damage to cover the entire universe of industrial establishments in the affected area or State must be made based on an assumed ratio of destructed versus total number of industry shops⁴⁵. The accuracy of this extrapolation of course is of paramount importance, and the industry sector assessment team should devote sufficient time in order to discuss and agree on such ratio, so that results are reliable.

In addition to the estimated value of damage, the industry sector assessment team should obtain data on the average age of the destroyed infrastructure, machinery and equipment, and deliver such information to the macroeconomic assessment team for estimation of disaster impact on the capital account. It is to be noted, however, that the value of destroyed assets is that of their replacement costs, and not that of their depreciated or “book value”.

In spite of the already-acknowledged low penetration rate of insurance in India, the industrial sector assessment team should obtain information on the possible existence of insurance on destroyed premises, machinery and equipment as well as on industrial production. The questionnaire for the industrial sample survey includes questions that are pertinent to the issue of insurance, and the industry sector assessment team should inquire about the matter during the field visits. The industry assessment team should also visit local insurance enterprises in order to obtain information on insurance coverage for the sector, the typical percentage of covered assets and production and the likely delay that may occur before delivery of insurance proceeds to the affected industrial establishments.⁴⁶

o **Disruption of industrial production**

The estimation of the value of possible and temporary industrial production flow changes must be made by the industry assessment team on the basis of several considerations, of which the time frame for their occurrence is of paramount importance. Production flow changes will normally occur over the time period required to achieve full reconstruction of premises, replacement of destroyed machinery, and to obtain full availability and flow of raw materials and inputs.

Production flow changes are likely to occur due to:

- Damage to the industrial capacity, in terms of destruction of buildings, equipment and machinery
- Temporary stoppage of production due to lack of electricity or water
- Temporary disruption of raw material availability and inflow

⁴⁵In some other countries, when an actual ratio has not been possible to obtain for the particular assessment under reference, use has been made of the ratio of destroyed to existing housing units (obtained from the housing sector assessment) to be representative of the ratio for the case of micro-sized and small-to-medium sized enterprises.

⁴⁶The industry sector assessment team should realize that the value of damage is not to be reduced by the amount of possible insurance coverage; the possible availability of insurance is to be used later on when estimating the value of recovery and reconstruction requirements. Putting it in different words, the existence of insurance – total or partial – does not affect the value of destroyed assets and lower production, but will diminish the amount of recovery and reconstruction requirements.

- Temporary unavailability or shortages of labor
- Future unavailability of raw materials in agro-industrial plants due to expected future losses in agriculture, livestock and fishery production that may occur after the disaster itself;⁴⁷
- Insufficiency or non-existence of working capital at the enterprise; and
- Possible changes (decline or increase) in demand of the manufactured goods, which may arise from possible generalized income decline of the population and from the expected high demand for construction materials for the reconstruction, respectively.

The industrial sector assessment team should derive a preliminary calendar of how and when the above mentioned limiting factors would be overcome, giving due consideration to the availability of and difficulties to obtain adequate financing and to the time required to import replacement equipment and machinery that is not manufactured in India and that may need to be imported from abroad.

The changes in production flows to be estimated in the industry sector should include both possible production decline and possible operational cost increases. Production decline losses are to be estimated on the basis of the expected time frames required to achieve normal or non-disaster levels of production, after overcoming the possible limitations described above.

Increased operational costs may arise from the following possible reasons:

- Payment of overtime to staff to attend and solve most urgent problems in the factories immediately after the disaster occurs;
- Rental of alternative premises while the destroyed or damaged ones are being rebuilt or repaired;
- Temporary acquisition of electricity and water for the production process from alternative sources, such as renting or acquiring portable power generators or resorting to purchase water from alternative sources other than the pipeline network; and
- Temporary acquisition of raw materials from alternative sources that may be more costly and/or located in far-away locations including other countries.

The latter higher costs of production constitute in fact increased intermediate consumption for the industrial process, which would have a negative bearing on the added value of industrial production but which may increase commerce sales.

The estimated values of damage and changes in production flows should be broken down according to ownership by public and private sector. In this regard, it should be recalled that some industrial enterprises might be public-sector owned, private sector owned, as well as some cases that may be jointly owned.

- **Reference for assessment**

- o For Standard Procedures for manufacturing sector Assessment, please refer to India PDNA Handbook (Page number 59)
- o To collect baseline information on manufacturing sector assets and production flows, please refer to India PDNA Handbook (Page number 60-63)

⁴⁷This is a typical case for the food-processing industry, but also applicable to other agro-industry enterprises that may face shortages of raw materials after the disaster, caused by future losses in primary agriculture, livestock and fishery production.



Electricity and Gas



Objectives

- To provide an overview of the status and performance as well as vulnerabilities of the electricity and gas sector
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on electricity and gas
- To identify needs for recovery of electricity and gas sector



Content

- **Introduction**

The electrical sector comprises the following activities or components

- o Generation of electricity in different types of power plants
- o Transmission of electricity from the generation plants to the distribution grids
- o Distribution and sales of electricity to the end-users.

Each of these components may be owned and operated either by public or public sector companies. Despite their ownership, if it is affected by a disaster, then it should be included in the assessment of disaster effects, impacts and recovery needs.

Various types of user, which include residential, industrial, commerce, agriculture, public lighting and others usually consume the electricity generated. Each consumer sector has different demands for electricity, which changes over time and is charged for its consumption at different rates for the amount of electricity they utilize as well as fixed charges for the power capacity they require.

Electricity tariffs charged to consumers vary from State to State, as a function of the actual cost of generation, transmission and distribution, and are defined from time to time by the State Electricity Regulatory Commission. After a disaster, the electrical sector may sustain destruction of its physical, durable assets (damage) as well as subsequent changes or disruptions in its production flows, which may include a temporary decline in production and sales of electricity and possible increases in production costs in each of the system components (generation, transmission and distribution), until recovery is attained. Changes in production and sales flows may arise from (i) the interruption, however temporary, of the production and supply of electricity due to damage to the electrical system components, and also from (ii) the temporary decline in consumer demand caused by the disaster. In regard to the latter, it must be noted that any destruction caused by the disaster to the electricity-consuming sectors would result in the interruption of their normal electricity demand over the time required to achieve recovery and reconstruction at the consumers' end. During the assessment, the cost of repairing or rebuilding the electrical system components that have been affected, and the value of the changes in supply of electricity must be estimated in order to estimate disaster effects, as well as the value of recovery and reconstruction requirements.

Putting it differently, the assessment of disaster effects does not involve estimating only the cost of restoring the supply of electricity after the destruction caused by the disaster; rather, the cost of disruption of the production and sales of electricity to all consumers (i.e. the changes in the flows of electricity production and sales) until full recovery is achieved must be factored in to ascertain total disaster effects. This is very important, since it has been found that in many cases of disaster the value of production flow losses may be higher than the value of damage to the electrical system, and it may be so high as to compromise the governance or financial position of the sector enterprises, and may result in the need to introduce or increase government subsidies and/or to increase pre-disaster tariffs for electricity to the consumers.

In this sector, again, damage is initially measured in physical quantities or units, which are later on converted into monetary value using the replacement cost of the affected assets with the same characteristics they had at the time of the disaster. Production flow changes include the possible decline in electrical enterprise revenues that arise from the temporary interruption of electricity supply, the possible temporary increase in operational costs until normal operations are achieved, and the possible temporary decline in electricity demand due to the destruction sustained separately by the sectors of housing, industry, commerce, agriculture and other sectorial consumers. Such changes in production flows are to be expressed in current or nominal monetary values.

In order to integrate the assessment team for the electrical sector it will be essential to have civil and electrical engineers to estimate the value of damage, and economists that may analyze and estimate the value of production flow changes.

- **Baseline information**

The first stage of a post-disaster assessment requires the assessment team for the electrical sector to collect quantitative baseline information to define the manner in which the sector functions under normal or non-disaster conditions. Such baseline data provides the point of reference to compare post-disaster sector performance and enable the estimation of damage, losses, impact and needs for recovery and reconstruction for the sector.

The following information, which is normally available in the planning and commercial departments of the electrical enterprises that operate in the sector, is to be collected before field visits are undertaken⁴⁸:

- o The characteristics in terms of geographical or spatial location, installed capacities and operational costs of all components of the electrical system located in the area affected by the disaster;
- o Existing stand-by capacities in both the affected and nearby systems or areas that may be interconnected to the affected system or that may have the capacity for rapid interconnection as an alternative, temporary solution after the disaster;
- o Statistical information on annual electricity generation and sales to the main electricity-consuming sectors, and their seasonal variations over the year, for at least the past three years;
- o Projections of above for the current year and for subsequent calendar years;
- o Financial information on the enterprises that comprise the sector, including monthly operational data on revenues, production costs per type of power plant, revenues and rates charged to different electricity-consuming sectors;⁴⁹

⁴⁸ Missing

⁴⁹Such information is normally available in the annual reports issued by each electrical enterprise, whether publicly- or privately-owned.

- o Statistical data on population coverage by the electrical sector in both urban and rural areas; and
- o Millennium Development Goals for the sector, and specific coverage and access targets for the current and subsequent years.

The last two types of information may be obtained from the government organization in charge of socio-economic development planning in the affected State.

Post-disaster situation and sector performance: This second stage of the assessment involves conducting field surveys by the assessment team to ascertain the effects of the disaster on the generation, transmission and distribution capacities of the affected electrical systems. If the personnel from the disaster-affected electrical enterprises have conducted similar field assessments, then the sector assessment team members must collect all existing reports, analyze their contents for consistency and conduct whatever supplemental field visits may be required to verify the previous estimations. In the case of a disaster that may have caused major destruction of housing, industries, commerce, and other sectors that utilize electricity, the field survey must be used also to ascertain the characteristics and extent of the post-disaster decline in electricity demand from such users.

Upon completion of the field visits and after holding extensive discussions with substantive personnel of the enterprises composing the sector in the affected area, the electrical sector assessment team must estimate the remaining post-disaster capacity – in terms of generation, transmission and distribution and its expected temporary performance, until the system can be repaired and brought back to its full or non-disaster capacity. In order to obtain the entire picture, especially in regard to the post-disaster demand of electricity, the electrical sector assessment team must closely interact with the sectorial assessment teams that cover the sectors that consume electricity: i.e. housing, industry, agriculture, trade, et cetera, to ascertain the possible recovery of electricity demand after reconstruction.

- **Estimation of disaster effects**

The electrical sector assessment team must estimate the value of destroyed physical assets (damage) for each of the electrical system components, including its breakdown on each sub-system (power generation plants, transmission subsystems, and electricity distribution grids). In some complex cases, it may be required to separately include some of the main components of each of the subsystems, such as hydropower dams and plants, thermal generation plants, geothermal sources and generation plants and their disposal units; transmission lines and sub-stations; poles and other distribution facilities.

The value of damage must be expressed in terms of the prevailing replacement costs of each system component with the same characteristics they had at the time when the disaster occurred.⁵⁰ These unit values may be obtained from the electrical enterprises; as a supplement or for verification purposes, the electrical sector assessment team may wish to contact private building contractors that may have appropriate replacement costs information. It is to be noted that the replacement or repair unit costs to be adopted must not be affected by scarcity or inflation that may arise after the disaster, as appropriate adjustments for such factors will be made later on in the final stage of overall reconstruction planning.

⁵⁰Should the decision be adopted that system components are to be rebuilt using disaster-resilient features, the additional cost involved (over and above the usual unit costs) may be added at the time when recovery and reconstruction needs are estimated. But the value of damage should conform to the asset characteristics prevailing at the time of the disaster.

Asset depreciation should not be used in the estimation of the value of damage; however, information on the age of destroyed assets should also be obtained by the electrical sector assessment team, and be delivered to the separate assessment team in charge of analyzing overall or macro-economic disaster impact to ascertain possible disaster impact on the capital account of the State or the nation.

In order to estimate the value of production flow changes, the electrical sector assessment team must develop an objective calendar or schedule of repair and reconstruction of sector assets, duly taking into consideration the availability and schedule of sufficient financing, as well as of replacement machinery, equipment and skilled labor that will enable the return to non-disaster conditions of electrical service supply.

On the basis of the above, the electrical sector assessment team must prepare a preliminary calendar or schedule of electricity supply recovery, together with a similar estimation of post-disaster electrical demand performance, based on the expected calendar of reconstruction of the electricity-consuming sectors. These should be combined in order to define the overall post-disaster performance for the sector, until full recovery of electricity supply and demand is achieved.

In this regard, as in the case of the water supply and sanitation sector, special care must be exercised by the electrical sector assessment team to ensure that the recovery of demand from all electricity-consuming sectors with special reference to the residential, agricultural, commercial and industrial sectors is given full consideration in their analysis. It must be borne in mind that if widespread destruction has been caused by the disaster, the demand for electricity will not recover to non-disaster levels until full reconstruction in the electricity-consuming sectors is achieved, even if electricity supply is restored promptly. It is therefore essential that the electrical sector assessment team coordinate its actions and projections with those of other economic and social sectors that consume electricity in their daily functioning.

Once the anticipated timetable for recovery and reconstruction in the electricity consumer sectors has been pre-defined, the electrical sector assessment team must develop a calendar of the expected recovery of those sectors and of the equivalent recovery of revenues of the electrical enterprises. To calibrate such recovery estimation, the electrical sector assessment team should consult with the commercial department of the electrical companies to obtain information on the decline in sales of electricity to consumer-sectors at least during the first month after the disaster.

Production flow changes are then estimated by comparing the non-disaster with the post-disaster performance for the electrical sector, ensuring that the following issues are analyzed in depth:

- o Lower operational revenues arising from temporary lower sales to electricity-consuming sectors, until such time as may be required to achieve non-disaster levels of demand, due to: the initial, temporary, total interruption of service; the partial supply of electricity while assets are being repaired or replaced; and the temporary decline in electrical demand from electricity-consuming sectors.⁵¹
- o Higher operational costs incurred by the electrical enterprises due to utilization of stand-by power plants that may have a higher unit cost of operation, and/or higher costs of acquisition of electricity from nearby, unaffected electrical systems.⁵²

⁵¹In this regard, it must be remembered that the provision of electricity may be stopped during an initial short period of time immediately after the disaster (from a few hours to a few days): that electricity supply may be resumed on a partial basis during the period of electrical system repairs, until full system reconstruction is achieved. Furthermore, that electrical demand from various electricity-consuming sectors may decline due to extensive damage and destruction of housing, agriculture, mining, industries and commercial establishments and the subsequent overall decline in economic activity in the affected area.

⁵²This is typical of the case when damaged hydropower plant electricity generation is temporarily substituted by stand-by thermal power units that have a higher unit cost of operation, or when having to purchase electricity from nearby unaffected systems at unit prices higher than the affected enterprise's own production price levels.

Production flow changes are to be estimated on a calendar-year basis, for the year in which the disaster occurred and the subsequent years required to achieve full recovery and reconstruction. In addition to this, the electrical sector assessment team must analyze whether as a result of the changes in production flows (revenues and higher costs of operation) the financial position of the electrical enterprises or utility companies has been compromised, as to require a temporary modification to the non-disaster tariff or rates charged to electricity consumers or a temporary government subsidy (or a subsidy increase) to avoid affecting the consumers.

Ownership of the damage and losses is to be defined and broken down by public and private sectors, as their impact must be dealt with differently in the overall analysis of disaster impact.

The electrical sector assessment team must also undertake interviews with local insurance companies to ascertain whether the electrical enterprises operating in the disaster-affected area have any insurance on destruction of assets and on revenue decline due to disasters. Data on possible insurance proceeds amounts will be collected by the electrical sector assessment team, and delivered to the macro-economic assessment team to ascertain recovery and reconstruction needs in subsequent stages of the assessment. In any case, the value of damage and losses should not be decreased by the amount of existing insurance.

The electrical sector assessment team must bear in mind that any production flow losses sustained by the electricity-consuming sectors in view of the absence or insufficiency of electricity such as housing or residential, agriculture, industry, commerce, etcetera are to be estimated and accounted for in each of those other sectors, either as production losses and/or as higher production costs when alternative, higher-cost sources of electricity are chosen as interim solutions. Such losses are not to be included in the assessment of the electrical sector.⁵³

- **Reference for assessment**

- o For Standard Procedures for electricity and gas sector Assessment, please refer to India PDNA Handbook (Page number 80)
- o To collect baseline information on electricity and gas sector assets and production flows, please refer to India PDNA Handbook (Page number 81-84)

⁵³The possible temporary post-disaster higher expenditures in electricity that may be sustained by individual households due to unavailability of electricity service from the grid and/or because increases in electricity rates arising from the disaster will be used in the analysis of disaster impact on overall human well-being or quality of life, where possible household income decline and costs of living increases are to be considered, but they are not part of the assessment of the electrical sector.



Water supply, sewage and waste management



Objectives

- To provide an overview of the status and performance as well as vulnerabilities of the Water supply, sewage and waste management sector
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on Water supply, sewage and waste management
- To identify needs for recovery of Water supply, sewage and waste management sector



Content

• Introduction

Currently, only the value of destroyed physical, durable assets is usually estimated during assessments of disaster effects and impacts for the water supply and sanitation sector in India. There is no consideration given to the changes in production flows of the sector. As an example, consider the case of the Gujarat earthquake in 2001 where an assessment of disaster impact was conducted with assistance from the World Bank and the ADB. The value of destroyed premises, equipment and other assets of rural water supply systems as well as that of urban municipal water and sanitation systems was estimated at about 3,730 million Rupees.⁵⁴ No changes in production flows were estimated, despite the widespread destruction, which limited the provision of water and sanitation services. In fact, several surface water systems, about 400 deep wells and pumping stations, transmission works and distribution pipeline systems were destroyed or damaged severely. Only about 30 per cent of the usual supply was provided to the population after the disaster through the use of water tanks and other means, until reconstruction was completed.

This means that the utility companies spent relatively large amounts of money to meet such increased costs of operation, and also its revenues remains well below the normal level. When such situation occurs, the financial capacity of the sector is compromised a disaster impact on governance for the sector and remedial measures such as the introduction or increase in State government subsidies, and/or an increase (however temporary) needs to be made in the tariffs or rates charged to consumers. Needless to say, the individual or household consumers receive a negative impact on their quality of life and human development conditions due to the unavailability of a full supply and access to water and sanitation and to the need to spend more to obtain such services.

The methodology for disaster effects, impact and needs assessment must include the full analysis of disaster effects, covering the destruction of assets, the resulting changes in production flows, the impact of the disaster on governance (i.e. the estimation of financial constraints on the utility companies arising from the disaster), and the impact at the personal and household level.

⁵⁴See India: Gujarat Earthquake Recovery Program; Assessment Report, page 12, The World Bank and Asian Development Bank, March 2001.

According to the system of National Accounts the water and sanitation sector covers four separate activities:⁵⁵

- o **Water collection, treatment and supply:** The following activities are included: collection of water from rivers, lakes, wells, etcetera; collection of rainwater; purification of water for water supply purposes; treatment of water for industrial and other purposes; desalting of sea or groundwater to produce water as the principal product of interest; distribution of water through mains, trucks or other means; and, operation of irrigation canals. However, the provision of irrigation services through sprinkler systems and similar agricultural services are not included.
- o **Sewerage: The following activities are included:** operation of sewer systems or sewer treatment facilities; collecting and transporting of human or industrial wastewater from one or several users; as well as rainwater by means of sewerage networks, collectors, tanks and other means of transport; emptying and cleaning of cesspools and septic tanks, sinks and pits from sewage, and the servicing of chemical toilets; treatment of wastewater (including human and industrial wastewater, water from swimming pools, etcetera); and maintenance and cleaning of sewers and drains.
- o **Waste collection, treatment and disposal activities; materials recovery:** It covers both non-hazardous and hazardous waste. Under the first subdivision are included: collection of non-hazardous solid waste within a local area, such as from households and businesses; collection of recyclable materials; collection of used cooking oils and fats; and collection of refuse in litter bins in public places. It also includes the collection of construction and demolitions waste; collection and removal of debris such as brush and rubble; collection of waste output from textile mills; and operation of waste transfer stations for non-hazardous waste. The second subdivision covers the collection of hazardous waste such as used oil from shipment or garages, bio-hazardous waste, used batteries and the operation of waste transfer stations for hazardous waste.

The following activities are included under waste treatment and disposal of non-hazardous waste: operation of landfills; disposal of non-hazardous waste by combustion or incineration with or without generation of electricity, steam, fuels, biogas or other by-products; treatment of organic waste for disposal; and production of compost from organic waste. In the case of hazardous waste, the following activities are included: operation of facilities for treatment of hazardous waste; treatment and disposal of toxic live or dead animals and other contaminated waste; incineration of hazardous waste; disposal of used goods such as refrigerators to eliminate harmful waste; treatment, disposal and storage of radio-active nuclear waste, including hospital waste; and encapsulation, preparation and other treatment of nuclear waste for storage.

Materials recovery activities include: processing of metal and non-metal waste and scrap and other articles into secondary raw materials, usually involving mechanical or chemical transformation processes; recovery of garbage materials from waste streams, and recovery, separation and sorting of commingled recoverable materials such as paper, plastics, used beverage cans and metals.

- o **Remediation activities and other waste management services:** It include decontamination of soils and groundwater at the place of pollution; decontamination of industrial plants or sites; decontamination and cleaning of surface water following accidental pollution; cleaning up of oil spills and other pollutions on land, surface waters, ocean waters; cleaning up of asbestos, lead paint and other toxic materials; clearing of landmines, and other specialized pollution-control activities.

⁵⁵See United Nations, International Standard Industrial Classification of All Economic Activities, Rev.4, New York, 2008. (<http://unstats.org/unsd/cr/registry/>).

- **Baseline Information**

To enable the undertaking of a post-disaster needs assessment, the following baseline information needs to be collected by the assessment team to provide the basis for estimating disaster effects, impacts and needs⁵⁶:

- o The characteristics (geographical or spatial location, and production, treatment, pumping, conveyance, storage, distribution and disposal) installed capacities of the main components of the water and sanitation systems located in the affected area itself.
- o Existing similar capacities in nearby unaffected locations that may be used as alternative, temporary solutions after disasters.
- o Statistical data on water supply, wastewater and solid waste disposal by main users, and their seasonal variation over the calendar year.
- o Projections of above for the current and subsequent calendar years.
- o Financial information on the public and private enterprises that provide services in the sector, including annual or monthly operational data on revenues and production costs, as well as data on the differential rates charged to each type of user.⁵⁷
- o Statistical data on population coverage by water and sanitation facilities in both urban and rural areas.
- o Millennium Development Goals for the sector and specific coverage and access targets (such as percentage of homes with direct connection and access to water and sanitation services in urban and rural areas) set for the current and subsequent years.

- **Post-Disaster Situation and Performance**

The second stage of the assessment requires the undertaking by the water and sanitation assessment team of a field visit (or visits, depending on the extent of the affected areas and the complexity of the issues) to ascertain the effects of the disaster on the sector. It is also possible that the assessment team may need to review and field-verify disaster effects information and reports prepared earlier by other stakeholders.

After conducting the field surveys and holding in-depth discussions with substantive personnel from the enterprises (if they are not part of the assessment team) and with selected representatives of the consumers, the water and sanitation assessment team must be able to determine the remaining production capacity of each subsystem and its temporary performance, until the time when the systems can be repaired or rebuilt and brought back to their non-disaster level of operation.

- **Estimation of Disaster Effects⁵⁸**

When a disaster occurs as in all sectors of economic and social activity the water and sanitation sector may sustain destruction of its physical assets (damage) and changes in its production flows, which may include both decline in production and sales of water and sanitation services and possible higher costs of systems operation.

⁵⁶Missing

⁵⁷In the case of privately owned enterprises, this information is normally available in annual reports that by law are to be submitted by the enterprise to its stockholders.

⁵⁸Missing

The water and sanitation sector has distinct organizational features depending on whether it covers urban and rural areas. In urban areas, water and sanitation services are provided to the users through collective systems. In many rural areas, households usually own their own facilities that may include shallow wells and sanitary latrines or septic tanks; in some cases, community-owned system may be present. Each of these different types of systems will have to be analyzed by the water supply and sanitation assessment team for possible post-disaster effects and impact.⁵⁹

In order to set up the water and sanitation sector assessment team, it is necessary to consider that civil or sanitary engineers are normally required for the assessment of damage; and the estimation of production flow changes usually requires the participation of economists or accountants with relevant experience in the water and sanitation field. Such diverse expertise is essential for the conformation of the assessment team.

- o **Damage:**

For each of the drinking water supply, wastewater and solid waste subsystems in urban and rural areas, the value of destroyed physical assets must be estimated. A further breakdown may be required for the main individual components of these subsystems, including inter alia dams, wells, water-treatment plants, pumping stations, pipelines, storage tanks, distribution grids, sewerage facilities, latrines and septic tanks in the rural areas, and solid waste collection, treatment and disposal facilities.

The replacement value of destroyed assets must be ascertained using pre-disaster construction or replacement costs, that may be obtained either from private contractors presently involved in similar work in the affected country or area, or from the planning department of the affected utility enterprises that may have new, similar projects in the planning or construction stages. The replacement values to be adopted for the estimation of the value of damage are those that prevailed at the time just prior to the disaster, and not those affected by scarcity or speculation after the disaster; adjustments for the latter factors will be dealt with when overall reconstruction needs are considered.

Replacement values are used for the estimation of damage, but the assessment team must also ascertain the year when each damaged component of the individual systems were originally built. This information is required, not because depreciated or “book” value is to be used in the assessment, but because the macro-economic assessment team requires it for their subsequent estimations on disaster impact on the capital account of the country or State.

In addition, the water and sanitation team should meet with local insurance company representatives to ascertain whether the sector enterprises had any insurance coverage on the assets destroyed by the disaster. In addition, these meetings would enable to find out the possible amounts of insurance proceeds that may be expected after the disaster. However, the value of expected insurance proceeds is to be used for the estimation of reconstruction needs and not for the estimation of the value of damage.

- o **Estimation of production flow changes:**

An objective calendar of repair and replacement of the affected assets should be developed by the assessment team, giving due consideration to the availability and delivery schedule of adequate financing, as well as of replacement materials, equipment and machinery, and that will enable returning the system to normal (or non-disaster) conditions of service.

⁵⁹To ensure a systematic, coherent and consistent treatment of different systems, whether collective or isolated, individual or community-owned, the water supply and sanitation assessment team should deal with the assessment for the entire sector covering both urban and rural systems.

Based on the above, a preliminary calendar or schedule of capacity and access to water and sanitation service recovery must be developed by the water and sanitation assessment team. Furthermore, when the demand for services has been considerably affected – i. e. when destruction of housing and industries is widespread in an urban area, for instance – projections of recovery for the demand of water supply and sanitation services must be made on the basis of the reconstruction calendar of the respective sectors of housing and industry, and superimposed on the calendar of recovery of the water and sanitation services.

Production flow changes are then estimated by comparing the “non-disaster” to the “post-disaster” performance of each subsystem, ensuring that the following issues are duly examined:

- o Temporary decline in operational revenues of the sector enterprises, until services are brought back to normal levels, due to the brief total suspension of operations and partial supply of services while assets are under repair, and due to possible temporary decrease of demand from consumers.⁶⁰
- o Temporary increase in operational costs (due to use of alternative sources or means of water, wastewater and solid waste supply and disposal, the temporary operation of damaged system components, or the temporary, more-intensive operation of undamaged system components).⁶¹

A word of caution is required here for the assessment team members. In practice, it is quite possible that the water and sanitation systems may be repaired and reconstructed before the overall consumer demand for its services recovers to non-disaster levels in the affected area. In the case of major disasters, where destruction of entire cities has occurred, the demand of water and sanitation services would not recover to non-disaster levels until full reconstruction of housing and industries is achieved; in such cases, revenues for the service enterprises would not recover until full reconstruction of the housing and other sectors is achieved. Therefore, the water and sanitation sector assessment team must interact closely with the housing and industry sector assessment teams to ascertain their likely period of reconstruction.

Production flow changes should be estimated on a calendar-year basis, including those of the year in which the disaster occurred and the subsequent years of recovery and reconstruction. In addition, the water and sanitation sector assessment team should analyze whether the estimated production flow changes (temporary lower revenues and higher costs of operation) have compromised the financial position of the utility companies in the sector, so much that a temporary modification of the tariffs charged to consumers is required as a result of the disaster, or whether a special subsidy is required from the State government in lieu of an increase in tariffs.

The ownership of damage and production flow changes is to be defined and broken down into public and private sector.

⁶⁰The operation of the services may be fully stopped during an initial short period of time immediately after the disaster (a few hours to a few days), to be partially resumed during the period of repairs until full system reconstruction is achieved. In addition, service demand may drop due to extensive destruction in cities caused by the disaster and the subsequent overall lower economic activity. These temporary interruptions or partial operations for each subsystem would result in corresponding revenue decline for the enterprises.

⁶¹Among the possible items to be considered under this heading are: temporary higher costs of chemicals required to ensure quality of drinking water; higher water-distribution costs when temporarily using tanker trucks to reach users and/or the temporary free distribution of bottled water; the more-intensive operation of water systems to compensate for higher water flow losses in damaged system components (such as distribution or conveyance water mains); cleaning of sewerage systems and treatment plants after flooding; higher transport costs to collect and dispose of solid waste, etcetera. In some cases, salt-water desalination plants are installed and operated in coastal areas or in small island development countries affected by disasters, which imply a very high cost of operation. Such higher costs of post-disaster operation translate into higher intermediate consumption for the macro-economic impact analysis.

During the estimation of production flow changes, the assessment team should inquire with local insurance companies whether the disaster-affected enterprises had any insurance on revenue losses. While any possible insurance proceeds due to revenue losses would not reduce the estimated value of production flow changes or decline, the value of such insurance proceeds is to be used later on in the assessment for the estimation of recovery needs.

The assessment team members must keep in mind that any production flow losses arising in water-consuming sectors such as agriculture, industry, trade and tourism, for instance as a result of the non-provision or inadequacy of water supply, are to be estimated and accounted for in each of those sectors, either as production losses and/or as higher production costs when alternative, higher-cost sources of water are chosen by them as interim solutions.

In addition to the estimation of disaster effects on assets and production flows for the sector which was described previously, the water and sanitation assessment team must also obtain information on possible higher costs incurred by individual households in obtaining access to these services, as an input for the analysis of disaster impact on human development and quality of life for the population. These possible higher costs are different in urban areas than in the case of rural areas. Indeed, in urban areas, households may be forced to purchase bottled water whenever their access to drinking water from the damaged public systems is not sufficient, and this fact would increase their normal costs of living. In rural areas, several possible cases of higher costs can be foreseen: wives and children may have to devote more time to fetching water from public sources (and thus have less time available to other productive and reproductive activities, including some cases in which children may have to forego attending school to take care of these chores); unforeseen household expenditures to deepen, cleanup and disinfect shallow water wells and septic tanks and latrines that may have been flooded, and others.

The assessment team, through direct field interviews with affected families and/or special sample surveys, should collect information on these types of temporary higher household costs of living and their amount. A word of caution: these household costs are not to be added to the water and sanitation sector production flow changes estimated before, since such expenditures are not included in the production accounts. Instead, these additional costs of living are to be used independently by the human development impact assessment team to compare with the data on household or personal income decline to ascertain the impact of the disaster on quality of life, and would also be required by the macro-economic assessment team for use when estimating the higher production levels that will occur after the disaster in the sectors of economic activity where such inputs – i.e. bottled water in industry, tools and cement for deepening and chemicals for disinfecting sanitation facilities – are to be produced at higher amounts.

- **Reference for assessment**

- o For Standard Procedures for water supply, sewage and waste management sector Assessment, please refer to India PDNA Handbook (Page number 97)
- o To collect baseline information on water supply, sewage and waste management sector assets and production flows, please refer to India PDNA Handbook (Page number 98-102)



Trade, Hotels and Restaurants



Objectives

- To provide an overview of the status and performance as well as vulnerabilities of the Trade, Hotels and Restaurants sector
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on Trade, Hotels and Restaurants sector
- To identify needs for recovery of Trade, Hotels and Restaurants sector



Content

- **Introduction**

As defined in the world-wide System of National Accounts,⁶² the commerce sector includes wholesale trade, retail trade, sales and maintenance of vehicles, as well as hotel and restaurant services or tourism. Because of its relevance to development in India and its special characteristics, however, the case of tourism will be dealt with in a separate chapter.

Again, it needs to be indicated that in India the commerce or trade sector is not normally included in the assessment of disaster effects and impact, despite the fact that a sizable number of the population is engaged in formal and informal trade activities. Any destruction of the physical assets of the sector and the disruption of its sale activities would have a negative bearing on the employment and income of the many persons and households that depend on the sector for its livelihood.

The reason behind this exclusion probably lies in the fact that most of the trade or commerce activities are in the hands of the private sector as well as in the erroneous assumption that they have insurance that would take care of their post-disaster needs for recovery and reconstruction. As was indicated in the case of the manufacturing sector, the number of commercial establishments that have insurance is very limited in India, as in other developing countries. In fact, it has been found that only a limited number of such enterprises have insurance on their assets, and that an even lower number of trade companies have insurance on loss of sales. Again, the above facts are more evident in the case of the micro- and small-to-medium-sized commercial establishments, whose savings capacity and credit worthiness is very limited. They thus have a high vulnerability to disasters and do not receive any assistance after disasters, thus leaving a sizable fraction of the population unattended for recovery and reconstruction. The result is evident: many traders may go broke and fall below the level of poverty after disasters.

⁶²See United Nations, International Standard Industrial Classification of All Economic Activities, Rev.4, New York, 2008. (<http://unstats.org/unsd/cr/registry/>).

The above statements are not made with a view to have the Central and State governments include the affected traders in the current post-disaster assistance programs. Instead, the intention is to highlight the fact that these trade individuals and companies also have recovery and reconstruction needs, which should be addressed by the development and private banking systems to ensure their adequate and prompt recovery after disasters. For the case of micro-traders, it may be necessary to define special modalities of financing for recovery because they are not credit-worthy, have no savings, and cannot be expected to meet their post-disaster requirements through private credit.

Any post-disaster needs assessment should include the estimation of damage and sales decline in the trade sector, and its subsectors, to ascertain disaster impact on the traders and estimate their recovery and reconstruction requirements. Leaving them out of the assessment is a way to leave unattended a sizable fraction of the affected population, which would lose employment and income.

The commerce or trade sector may be affected by disasters of every kind, sustaining destruction of its physical assets (damage) and changes in the flows of sales. The latter may include both a decline in sales as well as higher costs of operation of the commercial establishments.

As is customary, damage in commerce establishments – including premises, furniture, equipment and stocks of goods is measured initially in physical terms and subsequently converted into monetary terms by using the construction cost or replacement value of the destroyed physical assets, to the same quality and quantity standards they had prior to the disaster.⁶³

Changes in the flows of sales in the commerce or trade sector refer to temporary decline in sales of goods and to increases in operational costs that may arise after and as a consequence of – the disaster. The decline in sales is usually caused by the destruction of the premises and furniture and of the stock of goods to be sold in each commercial establishment, as well as by the possible lack of key inputs such as electricity and water required for the operation of the shops, or by the temporary absence of labor who may be occupied attending to other, more urgent chores. Another possible limitation to sales may be the absence or inadequacy of credit or financing for the acquisition of goods to sell. Higher costs of operation may be faced by traders, when they have to temporarily rent alternative premises while repairs/reconstruction are being made to the damaged premises, when acquiring goods to sell from alternative, higher-cost sources, or when having to pay more for electricity and water supplies.

In cases of very major disasters that may have caused widespread destruction, the affected population may not have the means to acquire goods in markets, and a decline in their demand may occur with corresponding lower sales of goods for the traders. Such cases of lower demand of goods would only be overcome when general recovery measures are put in place. On the other hand, during the post-disaster reconstruction stage, the demand for sales of construction materials and equipment may increase and compensate and sometimes exceed the losses in sales caused by the disaster. However, these are to be estimated and considered afterwards, and the initial estimation of disaster effects should not consider such positive indirect impact of post-disaster reconstruction.

⁶³The possibility of reconstruction or replacement using improved, disaster-resilient standards, as part of a possible strategy of “building back better”, would be considered at the time of estimating needs for recovery and reconstruction.

The assessment of disaster effects for this sector is more complex than in other sectors in view of the usually large number of existing commercial shops, of different types and size, which may exist in the disaster-affected areas. Therefore, a special sample survey of representative, affected commercial establishments is to be carried out⁶⁴ in parallel to the assessment, and its results should be combined with the existing baseline information and data collected during field visits by the commerce sector assessment team in order to cover the entire universe of the sector.

For the estimation of damage in this sector, civil engineers or architects are required to be part of the commerce assessment team, while economists are required for the estimation of sales flows changes.

- **Baseline information**

The following baseline information is required for the assessment⁶⁵:

- o Number and size of commercial establishments, by type of commerce, existing in the affected area
- o Typical physical facilities in each of the above, including a description of the usual furniture, equipment and storage of goods to sell, as well as required for the provision of services
- o Information on the value of annual or monthly gross sales for each type of commercial establishment
- o Quantitative information on the usual destination of sales, whether it is for domestic consumption and/or for export to other countries
- o Source of information:
 - Recent commerce sector survey or census that the country or states may have undertaken, which may have been conducted either by the Ministry of Trade or Commerce and/or by the Central or State Statistical Office in the affected State.
 - National accounts handled by the Central Statistical Office. Since this information may already be out of date at the time of the assessment, projections to the current year must be made based on recent growth rates for the sector.
 - Direct contacts and close cooperation with private sector Chambers of Commerce representatives, which would normally have detailed information on the capacities and sales of their associates. In fact, such private sector bodies should become partners in conducting the assessment, since they are normally very keen in defining post-disaster needs for recovery and reconstruction.
 - Municipal Corporations and Municipalities where the commerce or trade shops are located, since they usually submit reports of their stocks and facilities for tax payment purposes. Similar data may be available to insurance companies for the cases of the limited number of commerce or trade shops that carry infrastructure and/or sales insurance.

⁶⁴In fact, a joint sample survey is usually conducted for the industry and commerce sectors, since most of the information required is quite similar for both sectors.

⁶⁵Missing

The assessment team should be aware that large commercial establishments make the highest percentage of sales in any given State or area, which fact should facilitate planning for conducting field visits and sample surveys. However, micro-sized to medium sized commercial establishments are always more numerous and usually generate more employment of personnel, and their analysis would require special attention. The latter consideration is very relevant for the case of informal traders, which are usually the most affected by disasters and whose sales are not necessarily included in the national accounts; for this case, use may be made of special sample surveys that may be conducted in temporary shelter camps during the assessment.

On the basis of the previously listed information, a typology of commercial shops, under private or public ownership, is to be defined for purposes of the assessment.

o **Post-disaster situation and performance**

The assessment team should undertake field visits to determine the effects of the disaster in the affected commercial enterprises and shops; alternatively, it may rely on existing reports from qualified stakeholders that may have already visited the affected areas and establishments, no matter how preliminary those estimates are. In the latter case, however, the commerce sector assessment team should validate, homogenize and supplement the existing estimations, on the basis of their direct field observations.

In addition to the above in a similar fashion as for the case of the manufacturing sector – a sample survey of affected typical commercial establishments should be conducted simultaneously to ascertain the average value of damage and estimate the possible changes in sales flows for the sector.⁶⁶ This sample survey should cover an adequate number of all types and sizes of commerce shops in the affected area to obtain representative values of damage, losses in sales and requirements for post-disaster recovery and reconstruction for the sector. A special questionnaire for use in the sample survey is already available, after its successful application in different countries of the world; it requires very little if any adaptation to Indian conditions (Refer India PDNA Handbook, page 114).

Another important point to highlight that, due to the presence of informal traders in the sector, which have special characteristics, a separate sample survey of the effects and impact of the disaster and of relevant recovery and reconstruction needs for informal traders is usually conducted. For this, advantage is taken of the informal traders that may be temporarily sheltered in emergency camps, where the questionnaire is applied to obtain the relevant information.⁶⁷

The assessment team must use the available baseline information data, together with the results of the two separate sample surveys and of any existing preliminary disaster effects reports, to estimate the number of commercial establishments and shops of each pre-defined type, that may have sustained total or partial destruction and whose sales may have been disrupted directly or indirectly by the disaster, the time of sales stoppage or decline due to different reasons⁶⁸, and the likely requirements for recovery and reconstruction.

⁶⁶It requires only minor adaptations in order to capture information on the different types of industrial branches existing in the affected State.

⁶⁷Missing

⁶⁸Temporary sales stoppage or decline may be due to several possible reasons, such as: destruction of premises, equipment and machinery, and goods to sell; temporary unavailability of inputs such as electricity and water; temporary unavailability of sufficient labor and of goods to sell, and lack of working capital.

During the same field visit, the assessment team must collect unit reconstruction and replacement costs for rebuilding physical assets as well as replacement of equipment and stock of goods, through direct interviews with traders. Any difficulties and limitations foreseen by the owners of such establishments for instance, in terms of financial and credit requirements, availability of goods to sell, availability of labor, etcetera are to be identified.

On the basis of the information thus collected and in combination with the baseline data on existing physical capacities and normal or non-disaster volume of sales, it will be possible for the commerce team to develop a scenario of how the sector will likely function after the disaster until full recovery and reconstruction is achieved. This would include developing separate calendars for the repair and reconstruction of buildings and other facilities, replacement of equipment and goods to sell and for the resumption of normal or non-disaster sales levels over time.

- **Estimation of Disaster Effects⁶⁹**

- **Destruction of premises, furniture, equipment and stock of goods to sell**

The value of the destroyed assets (damage) in the commerce or trade sector is to be estimated on the basis of the cost to rebuild or repair the buildings and other associated premises that were totally or partially destroyed, as well as the replacement cost of the furniture, equipment and stocks of goods to sell that were destroyed, assuming that they are being replaced with the same capacity and quality they had prior to the disaster.⁷⁰

Since it is likely that in the affected area there will exist a very large number, size and type of commerce establishments, the damage assessment must rely on information obtained from the already-mentioned, parallel sample survey to define average values of damage for each type of commerce, and on counts of the number of each commerce type that were either totally or partially destroyed. Then, an extrapolation of the value of damage to cover the entire universe of trade establishments in the affected area or country must be made based on an assumed ratio of destroyed versus total number of shops.⁷¹ The accuracy of this extrapolation of course is of paramount importance, and the assessment team should devote sufficient time in order to discuss and agree on such ratio, so that results are reliable.

In addition to the estimation of the value of damage, the commerce sector assessment team must obtain the average age of the destroyed infrastructure, and deliver such data to the macroeconomic assessment team. Note, however, that the estimated value of destroyed assets is that of their replacement cost, and not that of their depreciated or “book value”.

⁶⁹Missing

⁷⁰The higher costs involved in building back to improved, disaster-resilient standards and in retrofitting existing structures are to be included as part of the subsequent estimation of needs in the assessment. If for some reason, the equipment and machinery that was destroyed can only be substituted by more modern and capable machinery, the additional costs involved should be taken into consideration during the estimation of needs.

⁷¹In more than one case, use has been made of the ratio of destroyed to existing housing units, for the estimation of the ratio of micro- and small-to-medium size trade shops, whenever an actual ratio has not been possible to obtain.

The commerce sector team in the estimation of damage must take special care to informal traders. Due to their special characteristics, it is likely that they faced destruction of premises (they usually operate from their own homes rather than from separate commerce buildings) and that what has happened to them is the destruction of the stock of goods they normally sell, which in many cases would not represent more than a week's worth of sales.

In addition to the above, despite the low penetration of insurance in India, the assessment team must obtain information on the possible existence of insurance on both the destroyed premises and on sales. For this purpose, the questionnaire on the sample survey of commerce shops includes space to ascertain this issue, and the commerce sector assessment team should also visit local insurance companies to ascertain the overall coverage of insurance on the sector, the percentage of covered assets and sales and the likely delay that may occur in the delivery of insurance proceeds to the insured trade or commerce shops.⁷²

o **Disruption of sales**

The estimation of trade sales flow changes must be made on the basis of several considerations, of which the time frame for their occurrence is paramount. Sales flow changes will normally occur over the time period required to achieve full reconstruction of premises, replacement of destroyed furniture and equipment, and resumption of normal availability and flow of goods to sell.

Therefore, sales flow changes are likely to occur due to:

- Destruction of sector assets, in terms of destruction of buildings, equipment, furniture and stock of goods to sell;
- Temporary stoppage of sales due to lack of electricity or water;
- Temporary disruption of goods availability and inflow;
- Temporary unavailability or shortages of labor;
- Future unavailability of goods to sell that may be due to future losses expected in agriculture, livestock and fishery production;⁷³
- Insufficiency or non-existence of working capital at the commercial enterprise; and
- Possible changes (decline or increase) in demand of the goods, that may arise from possible generalized income decline of the population and from anticipated or foreseen high demand for construction materials for the reconstruction, respectively.

Therefore, it is essential for the commerce sector assessment team to develop a comprehensive calendar of how and when the above mentioned limiting factors would be overcome, giving due consideration to the availability of, and difficulties to, obtaining adequate financing for working capital.

⁷²The commerce sector assessment team should be aware that the value of damage is not to be reduced by the amount of possible insurance, and that the availability of insurance is to be used only to estimate recovery and reconstruction requirements.

⁷³This refers to the case of food products obtained from the food processing industry, but also applicable for goods from other agro-industry enterprises that may face future shortages of raw materials due to future losses in primary agriculture, livestock and fishery production.

The changes in sales flows to be estimated should include both possible sales decline and operational cost increases. The value of possible sales decline is to be estimated on the basis of the expected time frames necessary to achieve normal or non-disaster levels of sales, after overcoming the possible problems described above. Increased operational costs may arise from the following possible reasons:

- Payment of overtime to staff to attend and solve most urgent problems immediately after the disaster occurs;
- Rental of alternative premises, furniture and equipment while the destroyed or damaged ones are being rebuilt or repaired;
- Temporary acquisition of electricity and water from alternative sources, such as renting or acquiring portable power generators; and
- Temporary acquisition of goods to sell from alternative sources that may be more costly and /or located in far-away locations of India and other countries.

The estimated figures of damage and changes in sales flows should be broken down according to ownership by private and public sector. In this regard, it should be recalled that some trade enterprises might be public sector owned, private sector owned, as well as some cases that may be owned jointly.

- **Reference for assessment**

- o For Standard Procedures for trade, hotel and restaurants sector Assessment, please refer to India PDNA Handbook (Page number 113)
- o To collect baseline information on trade, hotel and restaurants sector assets and production flows, please refer to India PDNA Handbook (Page number 114-122)



- To provide an overview of the status and performance as well as vulnerabilities of the Tourism sector
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on Tourism sector
- To identify needs for recovery of Tourism sector



- **Introduction**

The system of national accounts includes tourism as a component or part of that sector⁷⁴; and India is no exception to the rule.⁷⁵ However, due to its growing relevance to overall socio-economic development, as well as the differences to other components of commerce or trade, tourism is being addressed separately in this methodological handbook.

The fact that the tourism sector activities are not normally included in disaster assessments in India must be pointed out from the outset; in fact, in the most recent assessments conducted in the country, only a cursory mention is made to tourism, but no estimation of production losses is made⁷⁶. However, any destruction of the physical assets of the sector and any disruption of its operation would produce a negative impact on the employment and income of the labor force and households whose livelihoods depend on tourism.

The reason behind such exclusion probably resides in the fact that most of tourism activities lie in the hands of private sector entities and persons and in the erroneous assumption that they have insurance that would provide the financing required for their recovery and reconstruction.

Nevertheless, and as indicated in the case of the manufacturing and commerce sectors, the number of tourism establishments that have adequate insurance coverage on assets is very limited in India (and in other developing countries as well) and that an even lower number of them have insurance on interrupted revenues. Thus, it may be stated that tourism owners and operators have a high vulnerability to disasters, and that they receive no assistance for recovery and reconstruction after disasters.

⁷⁴See United Nations, International Standard Industrial Classification of All Economic Activities, Rev. 4, New York, 2008. (<http://unstats.org/unsd/cr/registry>).

⁷⁵See National Account Statistics, 2013, Central Statistical Office, Ministry of Statistics and Programme Implementation, Government of India, New Delhi, 2013.

⁷⁶India Uttarakhand Disaster, June 2013, Joint Rapid Damage and Needs Assessment Report, Asian Development Bank (ADB), Government of Uttarakhand, and The World Bank, 2013.

Again, the above statement is not meant for the central or State government to include tourism owners and operators as recipients in the current Disaster Response Fund; rather, the intention is to highlight the fact that they also have post-disaster recovery and reconstruction needs which should be addressed by the development and private banking systems under appropriate terms and conditions, for which government intervention and representations are required.

The tourism sector may be affected by disasters of any kind: its physical durable assets may be destroyed and the flow of production may be disrupted. The latter may include a temporary decline in revenues from sales as well as temporary higher costs of operation of the facilities. The value of damage in the case of this sector is estimated initially in physical terms and is subsequently converted into monetary value by using the unit repair, reconstruction or replacement costs of the affected sector assets, to the same quality and quantity standards they had prior to the disaster.⁷⁷

Changes in production flows in this sector refer to, on one hand, a decline in revenues that arise due to the temporary non-availability of destroyed assets and/or to the decline in arrival of foreign tourists; on the other hand, to possible higher costs of operation of the tourism facilities such as the post-disaster temporary provision of water and electricity from alternative sources as well as the unexpected costs of promotion to convince the tourists to come back after a disaster. The estimation of some of these losses may have a double impact in that they may not only decrease gross domestic production (GDP) but negatively affect the balance of payments of the country, since a significant foreign exchange flow may be temporarily interrupted due to the disaster.

In this sector again, a detailed assessment of all tourism facilities must be made, on a one-by-one basis, since the assets are usually very distinct from each other, and the approach of developing typical types of assets as used in the housing sector cannot be adopted. This will then involve visits by the tourism sector assessment team to all affected areas and tourism resorts and facilities, for which assistance may be obtained from the existing hotel associations in the country. Of course, the tourism assessment team may take advantage of the availability of aerial or satellite imagery for its estimations on damage.

- **Baseline information**

Minimum quantitative baseline information required for the assessment is:⁷⁸

- o The number, size and location of all tourism assets that exist in the disaster-affected areas;
- o Description and quantities of the typical furniture, equipment and other goods that are normally present in the affected assets;
- o Statistical data on the arrival and seasonal variation of tourist arrivals, both domestic and foreign since they are likely to behave differently;
- o Information on the average length of stay of tourists in the affected State, and on their average expenditures, for both domestic and foreign tourists; and
- o Data on any fees or special taxes charged to foreign nationals, including visa fees, special tourism taxes, et cetera.

⁷⁷As for any other sector, the possible repair, reconstruction or replacement of tourism assets using improved, disaster-resilient standards, as part of a "building back better" reconstruction strategy, are to be considered later on, at the time of the estimation of needs for recovery and reconstruction.

⁷⁸Missing

- o **Sources of information:**

Most of the baseline information required for the assessment is available in the central and State Statistical offices, since they normally keep data on the number and origin of domestic and foreign tourist arrivals, including their seasonal variation; these offices also have data on the average length of stay by foreign tourists and their estimated average expenditures in the country. Furthermore, any existing private sector association of tourist operators or entrepreneurs in the affected State is likely to have detailed information for the baseline and also be willing to cooperate in the assessment.

- o **Post-disaster situation and performance**

The tourism sector assessment team should undertake detailed field visits to obtain first-hand knowledge about the effects of the disaster on the sector's infrastructure and facilities and to obtain information to estimate sectorial production flow changes. During these field visits, the assessment team should hold special interviews with hotel and restaurant owners and tourism operators to obtain their views and determine their special needs for recovery and reconstruction, and to ascertain whether insurance is available and whether it covers both infrastructure and/or revenue losses.⁷⁹

Any available reports from the emergency phase – no matter how partial in coverage – must be gathered and used to guide or orient the field visits by the tourism sector assessment team to ensure that all affected assets of the sector are visited and assessed. Very often hotel owners may commission assessments by private assessors and/or insurance companies that cover the assets may have done their own estimations. The tourism sector assessment team should make every effort to obtain access to such prior estimations.

The assessment team should also visit private construction contractors operating in the affected area to obtain information on typical unit construction and repair costs prevailing at the time of the disaster that may be used in the estimation of damage, as well as learned opinions on the likely duration of the repair/reconstruction period.

During the field visits, the assessment team should also obtain directly from hotel owners and tourism operators data on actual post-disaster occupancy of bed capacity that may be used to compare to the “normal” or “non-disaster” trends and conditions.

Using this field information and in combination with the baseline data collected before, the tourism sector assessment team must prepare a calendar of how the sector's bed capacity will be restored over the time of reconstruction. Projections about tourist arrival recovery should also be made, dealing separately with domestic and foreign tourists, bearing in mind that reconstruction of bed capacity and demand for tourism services do not necessarily match. In view of the uncertainty of how foreign tourist arrivals may recover, use can be made of data on recovery from recent, past disasters, and on the effectiveness of previous campaigns to adequately inform potential clients abroad.

The above-described estimations and projections should enable the preparation of a calendar of sector economic recovery over time, which can then be used for the subsequent estimation of production flow changes.

⁷⁹The same questionnaire used for collecting disaster-related data for the manufacturing and commerce sectors might be used to collect tourism sector information.

- **Estimation of Disaster Effects⁸⁰**

- **Destruction of physical assets**

Damage: The value of damage should be estimated as the cost to rebuild or repair each and all the buildings and associated sector facilities that were (totally or partially) destroyed by the disaster, together with the replacement value of the furniture, equipment and other goods that were contained in the buildings and were destroyed, assuming in both cases that they are replaced or rebuilt using the same standards of quality and quantity they had prior to the disaster.⁸¹ Needless to say, these costs are to be based on the actual unit costs of construction and repair obtained by the tourism sector assessment team after visiting reputable building contractors, and/or after revising insurance companies' estimations when available.

It is to be noted that the estimated value of destroyed assets (damage) is not to be modified in the presence of partial or total insurance. Any existing insurance on assets is to be used subsequently in the estimation of reconstruction needs, as it would reduce the financial requirements for reconstruction instead.

In addition to the above, the tourism sector assessment team should ascertain information in regard to the age of destroyed buildings and equipment. This information is not to be used for the estimation of the value of damage, but should be delivered to the assessment team in charge of macro-economic impact assessment to utilize in the analysis of disaster impact on the capital account and in the estimation of global disaster impact.

As part of the damage assessment, a very clear definition of the time frame required for reconstruction and restoration of nominal bed capacity is to be made, which will be an essential input for the estimation of production flow changes.

In order to avoid double accounting in the assessment for the tourism sector, the team must make sure that damage to environmental assets and services that make tourism attractive to the users is duly included in the assessment of the environment sector. In addition, damage to roads leading to and within the premises of the hotels and damage to the services of water and sanitation, electricity and communications, is only included within the tourism sector in those cases where the roads and services are owned and operated by the hotels. Otherwise, they should be included in the assessment of the institutional sectors of transport, communications, water supply and sanitation, and electricity, respectively.

- **Disruption of sales and revenues**

The tourism sector assessment team may assume initially that production flow changes would occur over the time required to reconstruct bed capacity; however, afterwards the team should carefully introduce into the assumption the most likely recovery pattern of foreign tourist arrivals until full recovery of tourism demand is achieved.

⁸⁰Missing

⁸¹If the adopted strategy of reconstruction is that of "building-back-better", any desired improvement in quality and quantity and for disaster-risk reduction is to be included in the subsequent estimation of post-disaster financial requirements or needs.

The production flow changes are to be estimated over a period of time, which is defined by the combination of:

- The time required to repair or rebuild the physical or environmental assets that were subject to damage
- The time required for overcoming the fear or lack of information by foreign tourists.

The assessment team should be aware of the possibility of tourist arrivals from abroad to decline for an entire tourism season, in view of the time required to rebuild assets and the need to design and effectively carry out information and promotion campaigns abroad to re-attract foreign customers. The timing of the disaster within the calendar year and the previous experience from past disasters should provide insights to define this time frame. The demand of domestic tourists is likely to follow a different and more positive trend and timeframe, since the tourism operators may actually undertake special campaigns to attract more domestic visitors to partially offset the losses in the foreign market.⁸²

Summarizing, the tourism sector assessment team must develop the post-disaster schedule of sector performance, which combines a calendar of staged recovery of bed capacity (the supply side of the sector) with the schedule of possible recovery of domestic and foreign tourist arrivals, which covers the demand side. In turn, recovery of bed capacity would depend on the construction sector capacity of the affected State (since after a large disaster large numbers of housing units, schools, hospitals, roads and other infrastructure works would have to be rebuilt or repaired concurrently), the timing for availability of financing for reconstruction, and the existence and efficiency of bureaucratic requirements for reconstruction permits and licenses. Furthermore, that the recovery of demand will depend on the opportunity and efficiency of information campaigns to regain the trust of the usual foreign target groups and/or to capture new foreign target groups, or to capture an increased number of domestic tourists.

In addition to losses in revenue, the tourism sector may also sustain higher costs of operation that must also be included in the assessment, as they would affect enterprise financial performance. This may include, among others, overtime payment to personnel, temporarily paying higher costs to obtain water (for instance bringing in tanker trucks) and electricity (renting portable power units) while the regular services are being repaired by the appropriate utilities, and many other possibilities that are impossible to list.

Should there exist any insurance on possible revenue losses in the case of some or all of the affected tourism facilities, the tourism sector assessment team should not use the estimated insurance proceeds to reduce the estimated value of revenue losses. Instead, the value of insurance proceeds on revenue losses should be used to define the value of economic recovery needs in terms of post-disaster working capital that the sector may require, as will be discussed later on.

- Reference for assessment
 - o For Standard Procedures for tourism sector Assessment, please refer to India PDNA Handbook (Page number 97)
 - o To collect baseline information on tourism sector assets and production flows, please refer to India PDNA Handbook (Page number 98-102)

⁸²That was the case followed by the Mexican tourism authorities in the case of the recent swine flu outbreak in 2009, and domestic tourists that took advantage of special tourism packages partially compensated the loss of foreign arrivals in some tourism resorts and locations.

 Objectives

- To provide an overview of the status and performance as well as vulnerabilities of the Transport sector
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on Transport sector
- To identify needs for recovery of Transport sector

 Content

- **Introduction**

The system of national accounts for India includes the following under the transport sector:⁸³

- o Railway transport
- o Road transport
- o Water transport
- o Air transport, and
- o Services incidental to transport.

The transport sector is usually very complex due to the different modes of transport for persons and cargo, and several ministries or departments are actually involved in the management and delivery of transport services. After disasters, the transport sector may sustain destruction of its physical assets infrastructure and vehicular stock (damage) and changes in its production flows, which may include both decline in production and higher production costs.

The value of destroyed assets in the transport sector is estimated by first measuring the physical quantities that may have been destroyed and then multiplying them by the unit construction cost prevailing at the time of the disaster to replace the destroyed units with the same characteristics they had prior to the disaster event.

⁸³See National Account Statistics, 2013, Central Statistical Office (CSO), Ministry of Statistics and Programme Implementation, New Delhi, 2013.

On the other hand, the value of production flow changes in the transport sector may include both a temporary decline in quantity and value of the transport services of persons and cargo as well as a possible temporary increase in the costs of transport. Very often after a disaster occurs, traffic of persons and cargo is not necessarily fully or permanently interrupted after a disaster; instead, after a brief initial paralysis of traffic flows, part of the traffic may be delayed and another part may be re-routed via alternative roads or modes of transport. Therefore, the total gross value of transport service provision may not actually change very much, but its breakdown among sub-sectors or modes may be altered due to the disaster. However, when alternative routes are used having different characteristics in comparison to those of the destroyed road – changes in the total value added of transport production that are caused by changes in intermediate consumption (i.e. higher transport costs) may actually occur.

An example of higher transport costs in this sector refers to vehicular traffic that must utilize alternative, longer and lower-quality physical routes. Other higher costs are incurred upon when users are required to use alternative ports or airports that have higher operational costs than the ones used under normal conditions or which are located further away. In addition, transport production losses may be incurred upon when certain products cannot reach the intended markets opportunely due to damage in the normal routes of transport for the goods;⁸⁴ or when tolls or user fees are not collected because of damage to roads under concession.

Special care must be exercised therefore in separating disaster effects within the transport sector and those caused in other sectors that make use of the transport infrastructure and services.

To conduct a full assessment of the transport sector after disasters the sectorial assessment team must include civil, transport and structural engineers for the estimation of the value of destruction (damage), and transport economists with experience in the sector must participate in the estimation of changes in the production flows of transport services. This sectorial assessment team must be fully knowledgeable in the possible modification of traffic flows that may arise after a disaster, the possible shift of cargo and persons between transport modes or subsectors, and the manner to estimate the value of transport costs which is an essential part of transport economics.

- **Baseline information**

The estimation of disaster effects and impact requires the availability and collection of the following baseline information on the transport sector, which is the first stage of the assessment:⁸⁵

- o Location and capacities of each of the previously listed transport sub-sectors, and their main individual components;
- o Number and capacities of the vehicular stock for each of the sub-sectors (i.e. rolling stock and locomotives for railways, vehicles for road transport, boats and docking facilities for water transport, airport terminals and airplanes for air transport);
- o Most recent origin and destination surveys of traffic in the disaster-affected and nearby areas; and
- o Marginal operating costs in each of the transport modes for different types of vehicles.

⁸⁴That is the typical case of perishable agricultural and fishery products that do not reach the markets in time; however, these losses should be accounted under the primary production sector and not under transport.

⁸⁵Missing

This type of information is normally available from the central ministries or State departments of public works or transport; from private enterprises that operate roads, railways, ports and airports under concession arrangements; from building contractors and associations, civil defense institutions and – in some cases – insurance companies. Data on transport flows is usually available from the planning and operations units of ministry of public works and similar State departments, and may also be obtained from recent feasibility studies of new roads prepared by same government units at central and State levels.

In view of the complexity and extension of the entire transport sector, details will be provided on the procedures to estimate disaster effects and impact on the road transport subsector only. For the case of railways, air and water transport, the assessment procedures are similar, but special mention will be made of possible differences when required.

National highways runs through the breadth and length of India and connect major ports, State capitals, and large industrial and tourism centers; State highways are arterial routes linking District headquarters and important cities within the State and connecting them with national highways and those of neighboring States; major District roads are those serving areas of production and markets and connecting those with each other or with main highways; rural and other roads are those that serve areas of production and provide to them outlets to market centers, Taluka headquarters, block development headquarters or other main roads.⁸⁶

Furthermore, it is to be noted that in India road transport carries nearly 65 per cent of total cargo traffic in the country and about 80 per cent of passenger traffic; that national highways represent less than 2 per cent of the total road length but carry about 40 per cent of total road traffic; and that number of transport vehicles has been growing at an annual rate of 10.16 per cent in the past five years.

o **Post-disaster sector situation and performance**

The transport sector assessment team should undertake any field visits to obtain first-hand information on the destruction caused by the disaster on the sector assets and to develop a clear idea of the manner in which the sector will temporarily function until full recovery and reconstruction is completed. For that purpose, it is very likely that the appropriate government units responsible for the sector would have completed any emergency works to restore minimum traffic where feasible, including inter alia clearing landslides that impede traffic, setting up temporary bridges, or establishing alternative ways.⁸⁷

Before undertaking such field visits, the transport sector assessment team should collect all existing reports on damage and traffic interruption or disruption that may have been prepared by the first responders for the sector, no matter how preliminary or partial the data may be, as it will provide the first quantitative information that is available for the assessment.

⁸⁶See Handbook on roads and bridges, Comptroller and Auditor General of India, New Delhi, 1999.

⁸⁷Data on costs and expenditures to achieve such restoration of minimum traffic flows must be collected by the transport sector assessment team for use in the subsequent estimation of changes in flows for the sector.

In order to define typical unit costs of repairs and reconstruction for the sector as well as probable times required for repairs and reconstruction of the affected infrastructure, the transport sector assessment team should visit private contractors that may be involved in any transport projects under construction in the affected area, as well as the planning departments of the relevant transport of public works government offices. In addition, visits should be paid to local insurance companies that may have information on the type and coverage of insurance available for the damaged infrastructure and vehicular stock.

Whenever traffic has been interrupted or disrupted due to significant destruction of key infrastructure elements in any of the transport sub-sectors (such as destruction of bridges or of entire road sections) that require re-routing of traffic flows, the transport sector assessment team should interact with the local sector authorities to make preliminary field estimations of the changes in traffic flows, which will enable the estimation of temporary changes in transport costs.

On the basis of the information collected during these field visits, the transport sector assessment team should be able to develop a calendar of activities required to ensure reconstruction of the sector's infrastructure and full recovery of the sector's performance.

- **Estimation of Disaster Effects⁸⁸**

- **Destruction of physical assets**

As indicated before, procedures for the estimation of disaster effects in the road transport sector are described here; disaster effects on other transport sub-sectors may be estimated following similar procedures.

When undertaking the assessment, it must be remembered that elsewhere in the world transport is usually one of the most affected sectors in terms of disaster effects, whose value frequently exceed those of housing and agriculture. In addition, it must be borne in mind that destruction (damage) is not only sustained by road surfaces or structures, but by associated bridges, culverts and other drainage works; furthermore, in cases of earthquakes, damage is caused not only by the initial earth tremor but by aftershocks as well; in addition, floods may cause both the collapse of structures and the erosion of road surfaces and earth fills. Landslides and mudslides may destroy the road carpeting and interrupt vehicular traffic, and result in higher costs of transport.

In general terms, the value of damage in this sector may be estimated as the cost required to replace the physical assets of the sector, assuming the same physical characteristics as they had prior to the disaster and the unit costs prevailing at the time of the disaster.

It is customary to breakdown the entire road transport sector into the following three main sector components to undertake the assessment: primary roads network, secondary roads network, and tertiary roads network. This is so because their characteristics are usually different among the three types of roads, and also because different government level organizations usually undertake their construction, maintenance and operation. In India, the Ministry of Road Transport and Highways designs, builds and operates what is equivalent to primary roads; State governments take care of the

⁸⁸Missing

equivalent to secondary roads, and Districts and municipalities handle the equivalent to tertiary roads. Whenever roads under concession exist in the disaster-affected areas, they should be added as a fourth component, bearing in mind that their construction and operation may fall under ownership of the public or private sector.

During the field surveys, the assessment team must ascertain the extent and cost of rehabilitation or reconstruction of road transport works, based on the type and severity of destruction. To do that, the physical and traffic capacity characteristics of each affected component or road sections must be combined with the unit cost of rehabilitation or reconstruction.

Unit costs for rehabilitation or reconstruction may be obtained from the Ministry of Road Transport and Highways, and from equivalent government departments at the State level and below. In the case where rehabilitation or reconstruction is to be entrusted to private contractors, unit costs may be obtained from such private companies involved in the sector.

Destruction to vehicular stock – including automobiles, buses, trucks and other smaller vehicles – must also be estimated during the assessment for the transport sector. In addition, construction and maintenance equipment of the sector must be duly included. There are exceptions to the above general guideline: first of all, only vehicles used for collective transportation of persons and of cargo are to be included in the transport sector; second, destroyed household-owned vehicles for transport of family members are not usually included in the estimation of damage for the transport sector⁸⁹; and destroyed agricultural tractors and other equipment are included in the agricultural sector.

The number of destroyed vehicles is usually estimated during the emergency phase or may be estimated through consultations with transport enterprise associations and insurance company representatives. Their monetary value may be estimated on the basis of information given in the Highway Design Model (HDM) used by the World Bank. When vehicles have only been partially destroyed, simple assumptions on their repair value must be made in comparison to their full value, to facilitate estimations; consultations with local repair shops may be required to ascertain typical unit costs under assumed conditions.

Another important consideration to be made by the transport sector assessment team is that the value of destroyed assets that is required is that of the full replacement of destroyed infrastructure and equipment (including vehicles) and not that of the depreciated assets. However, the average age of the destroyed infrastructure or equipment should be delivered by the transport sector assessment team to the macro-economic impact assessment team for further utilization in their analysis of overall disaster impact.

In the case of air transport, the transport assessment team should estimate the value of destroyed air terminals, runways, associated facilities and equipment, as well as airplanes, which may limit the normal operations of the terminals. For railway transport, the value of destroyed locomotives and rail cars, as well as rail lines, train stations and associated buildings. In the case of water transport, the value of destroyed docking and port facilities and equipment, together with boats and ships, that may limit the capacity of the subsector.

⁸⁹The value of destroyed personal or family vehicles should be accounted for in the housing sector, as part of household goods, if the vehicles are destroyed while parked in the housing unit. Alternatively, the value of destroyed personal vehicles may be used by the human development team to ascertain decline in quality of life.

o Disruption of transport flows

Disasters may induce disruptions in transport flows, which last over the entire time period required for recovery and reconstruction of transport systems. These disruptions may include: (i) the value of transport flows that are interrupted after the disaster, and (ii) temporary higher transport costs that may be incurred when longer alternate routes are necessary, and/or when alternate modes of transport are adopted after disasters. In many cases, the value of such disruptions may exceed the value of destroyed infrastructure; hence, the importance of their inclusion in post-disaster assessments.

The following three key elements are required to estimate the value of traffic flow disruptions:

- Volume of traffic flows
- Higher unit operating costs of vehicles after the disaster
- Time required for rehabilitation or reconstruction to take place.

In regard to the time of rehabilitation and reconstruction, the usually accepted time periods range from a minimum of three months for full rehabilitation, to about six months for the construction of alternate short road sections, through 1 to 5 years for full reconstruction (which may involve mitigation works through redesign and reinforcement) of entire road sections.

To estimate the flows of traffic that will be involved in the assessment of higher transport costs, the traffic patterns and volumes under pre-disaster conditions must be obtained, and rapid, post-disaster manual counts must be made of the expected temporary changes of flow brought about by the disaster in the disaster-affected road sections or areas. Pre-disaster traffic flows can be collected directly from the local authorities through the appropriate unit of the Ministry of Road Transport and Highways and of the equivalent unit at State levels, using the most recent survey of origin and destination that might be available, duly updated when necessary. Post-disaster traffic flows must be rapidly measured in the field by the transport sector assessment team or by the pertinent national or State authorities.

The marginal operating cost of vehicles varies depending on the type of vehicle, type of terrain and quality of road surface. They include different cost components, such as fuel, repairs, tires, depreciation, crew salaries, additional time of passengers, etcetera. Data on marginal cost of operation for vehicles is available in the planning units of the Ministry of Road Transport and Highways and in its State equivalent institutions; in addition, it is normally included in feasibility studies of new roads that are submitted for financing to international financial institutions.

In order to estimate road transport flow changes, separate analyses are to be made of their possible components, and their total should be aggregated later on by the transport sector assessment team for delivery to the macro-economic assessment team:

- Gross value of temporarily-interrupted transport of cargo and persons, when significant in comparison to the non-disaster annual amount;
- Gross value of temporary decline in toll receipts in roads under concession agreements;

- Urgent expenditures made to re-open transport traffic under at least minimum conditions, during the emergency stage, after the disaster has caused traffic interruptions; and
- Higher cost of transport due to the temporary utilization of alternative (longer and lower quality) road sections, incurred by transport companies during the period of recovery and reconstruction, which in fact represents an increase in intermediate consumption for the sector in the analysis of macro-economic impact.

When analyzing disaster effects on public and private enterprises that administer or manage airports, ports, and other transport terminals, the transport sector assessment team should estimate changes in transport flows that include:

- Possible temporary decline in revenues earned by public and private transport enterprises caused by stoppage or slowdown of operations; and
- Possible higher costs of operation of the enterprise caused by the disaster.

It is essential that the transport sector assessment team be fully aware that the estimations of disaster effects to be made, and subsequently delivered to the macro-economic assessment team for the estimation of disaster impact, should include only those effects (i.e. damage and transport flow changes) to collective transport systems, whether publicly or privately owned. In addition, that any effects occurring in the transport flows of persons, using their family-owned vehicles, are not to be added to the total effects for the sector, since private personal transport is not included in the road transport sector accounts.⁹⁰

- **Reference for assessment**

- o For Standard Procedures for transport sector Assessment, please refer to India PDNA Handbook (Page number 151)
- o To collect baseline information on transport sector assets and production flows, please refer to India PDNA Handbook (Page number 152-155)

⁹⁰It is to be noted that estimations of the possible changes in private personal transport costs should be made by the transport sector assessment team, but used only to provide inputs to the assessment team in charge of estimating disaster impact on human development. The latter team will use such information to ascertain the aggregated impact of the disaster on human development, through analysis of household or personal income decline and of cost-of-living increases caused by the disaster.

 Objectives

- To provide an overview of the status and performance as well as vulnerabilities of the Communication sector
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on Communication sector
- To identify needs for recovery of Communication sector

 Content

- **Introduction**

The India system of national accounts includes the following under the communications sector:

- o Postal services
- o Telecommunications, and
- o Miscellaneous communications.

The relative importance of each of these activities within the communications sector is illustrated by the fact that in 2011 telecommunications provided nearly 97 per cent of the total value added for the sector, while postal services accounted for less than 2 per cent, and miscellaneous communications represented less than one per cent.⁹¹ It is to be pointed out that the annual growth of telecommunications in the past five years in India has been over 12 per cent, surpassing that of overall economic growth, while that of postal services has been very limited, which fact provides an insight of the trends of development for the sector.

It must be mentioned that the telecommunications sector development in India is very advanced; there were 933 million telephone connections – of which 804 million or 97 per cent are of the wireless type – in the country as of March 2014, and the network is only second to China in the world. Ownership of the telephone services falls within the private sector (87 per cent) and the public sector (13 per cent).

⁹¹See National Account Statistics, 2013, Central Statistical Office (CSO), Ministry of Statistics and Programme Implementation, New Delhi, 2013.

The Department of Telecommunications in the Ministry of Communications and Information Technology is responsible for the development of telecommunications in the country, while the Telecom Regulatory Authority of India (TRAI) oversees and regulates the participation of private companies in the sector.⁹² The Department of Posts (India Post) is also under the same Ministry of Communications and Information Technology and is responsible for the development of the subsector of postal services.

In view of the relative importance of telecommunications, a detailed description of the procedure for estimating disaster effects, impact and needs will be shown here, without going into full details for the case of postal services.

The communications sector may sustain negative effects after the occurrence of disasters, which can be:

- o Physical assets including premises, equipment, antennas, telephone lines and switchboards (damage)
- o Temporary disruptions in production flows, including possible revenue decline and/or increases in cost of operations.

Enterprises that operate in the sector may be either publicly or privately owned.

The value of estimated damage to assets is to be estimated first combining the number of physical items that may have been destroyed and their respective unit replacement or reconstruction costs prevailing at the time the disaster occurred, and assuming that their characteristics are to remain unchanged. In view of the fast evolution of specialized telecommunications equipment, it is possible that destroyed equipment may have to be replaced with more technologically advanced technologies and higher unit costs; in this situation, the higher costs involved should be introduced when estimating reconstruction needs, and the value of damage should refer to the original cost of the destroyed equipment.

Production flow changes caused by the disaster may include a decline in the revenues collected from consumers due to the temporary unavailability of the services, and a possible temporary increase in operational costs of the systems. Very often after a disaster, the flow of communications is briefly interrupted over a limited period of time, to be promptly restored after urgent repairs and replacement of key components are made by the sector enterprises on wireless telephone systems, for which a typical example is the case of dis-alignment of antennas for cellular phone systems caused by winds and earthquakes; in the case of fixed landline systems, communications may be suspended over longer periods while the damaged equipment and lines are replaced or repaired (such as in the case of flooding of switchboards and/or the breaking of poles and aerial telephone lines by winds and earthquakes).

The communications sector assessment team should be aware that the temporary decline in sector revenues is usually followed by a period of increased demand for communications after the system assets have been restored or replaced, in view of the higher demand for communications involved in the emergency phase after disasters.

⁹²See <http://www.dot.gov.in/>

The assessment team members need to be aware of the fact that due to the temporary unavailability of communication services after a disaster, production losses may be sustained by the consumers of these services both individual families and enterprises – but that those production losses are to be estimated and accounted for in the sector where the individual persons or enterprises operate (such as under agriculture, industry, etcetera), and not in the communications sector.

- **Baseline information**

To enable the estimation of disaster effects, impacts and needs, it is essential for the communications sector assessment team to ensure the availability and collection of the following baseline information, at the very start of the assessment:⁹³

- o The geographical location and capacities of each communication services (postal, wireless and wired communications, satellite stations, etcetera) within the disaster-affected area, including possible redundancy capacities for the provision of services;
- o Quantitative information on the evolution of communication services (postal, wireless and wired communications, satellite communications, etcetera) and of the differential rates charged to each type of consumer over the past five years; and
- o Annual reports to shareholders in privately owned communications enterprises that include details on their finances (volume and value of revenues, and costs of operations).

Such baseline information is available at

- o Central or national level in the Department of Telecommunications of the Ministry of Communications and Information Technology as well as in the Telecom Regulatory Authority of India (TRAI), and in the corresponding departments at State level.
- o In regard to the postal services is available in India Post, a department under the same Ministry of Communications and Information Technology.
- o It can also be obtained from the annual reports to shareholders issued by the private telecommunications service providers.
- o **Post-disaster sector situation and performance**

The assessment team for the communications sector should carry out field visits to obtain information on the post-disaster situation, after collecting and analyzing all baseline data. These field visits will enable the team to estimate the extent and value of destroyed components of the communications systems as well as the manner in which the sector will temporarily operate until full recovery and reconstruction is achieved. The communications assessment team should also collect and analyze any reports on damage and disruption of operation on the systems that may have been prepared by the communications service enterprises, no matter how preliminary they may be, which may also include the urgent repairs required to restore minimum communications in the systems after the disaster.

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The assessment team should also collect from the communications service provider companies on the cost involved in urgent repairs conducted during the emergency stage as well as unit costs of individual equipment and materials used for the same repairs as well to replace damaged units to restore service. In this regard, it is to be noted that communications companies usually carry in stock many of the equipment and materials that are usually damaged or otherwise affected during disasters, which fact facilitates and expedites any repairs and reconstruction.

The assessment team should ascertain during the field visits whether the damaged communications enterprises or service providers had insurance on possible destruction of assets and on interruption of normal operations, through meetings with both service providers and local insurance companies.

On the basis of the information collected during the field visits, the communications assessment team should be able to develop calendars of activities required for the sector to rebuild or replace destroyed assets and for the sector to return to normal level of operations.

- **Estimation of Disaster Effects⁹⁴**

- **Destruction of physical assets**

After disasters, the premises and equipment (including transport vehicles for distribution of mail) usually sustain destruction, and that the telecommunications facilities and equipment may also be destroyed, thereby causing communications service interruption. The latter are vulnerable to the action of hydro-meteorological events (rain, winds, flooding) and of earthquakes; however, telecommunications enterprises usually have in stock equipment and materials that enable the prompt replacement of damaged assets to promptly restore communications. These companies also have information on the unit replacement costs of such equipment and materials, which are required for the estimation of the value of total damage.

When estimating the value of destroyed goods or damage, the communications sector team should separately estimate the destroyed components of each sub-sector: i.e. fixed-line communications, wireless systems, satellite communications, and postal services. This is so because of the different times required for their restoration after a disaster. It is also essential to separate the value of damage sustained in private and public enterprises.

In addition, special note should be taken of any equipment and materials that may not be available in the warehouses of the communications enterprises, and which may need to be imported from other countries, as this fact would affect the time period required for reconstruction and restoration of the services, and may have an impact on the balance of payments at the macro-economic level.

While the value of damage is equivalent to the replacement value of the destroyed equipment, the communications sector assessment team should also ascertain the age of the destroyed goods, and deliver such information to the macro-economic impact assessment team to estimate disaster impact on the capital account. Another point to be considered is the fact that in certain cases,

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technological advances make it necessary for the replacement of destroyed equipment with more advanced models that may have a higher cost than the original ones; in those cases, the value of damage should be estimated on the basis of the destroyed assets, and the value of the more advanced equipment should be used for the estimation of reconstruction needs, which will be higher than that of damage.

The communications sector assessment team should inquire whether the disaster-affected communications enterprises had insurance on their assets, and the possible proceeds from such insurance policies to cover the value of destroyed assets. For this purpose, special meetings should be held with both the commercial units of the communications enterprises and with local insurance companies.

o **Disruption of communications service flows**

In order to estimate any disruption of communications services flows, the communications sector assessment team should make a comparison of the normal performance of the sector vis a vis the more limited post-disaster sector performance until recovery and reconstruction is achieved. Normally, each communications enterprise and/or the regulating telecommunications body has projections of their normal performance, which may be used by the communications sector team to develop such comparison.

The communications sector assessment team must estimate the value of the losses in sales of services arising from the disaster that the sector enterprises will sustain until full recovery and reconstruction is achieved. In order to accomplish that, the team must first estimate the time of complete service interruption in each subsector, the time and costs involved in the temporary partial operation of the damaged systems during recovery and reconstruction, and the lost revenues by each enterprise. It is also possible – in cases of widespread destruction as caused by earthquakes in urban areas that the consumers of the communications services may have sustained significant destruction of their premises and production processes, which may result in a lower demand for communications. Should that be the case, the communications sector assessment team should interact with the separate consumer sector assessment teams such as industry, commerce, etcetera to ascertain the time they require to recover and rebuild, which will provide the time required for communications demand to recover.

The communications sector assessment team should keep in mind for the estimation of sectorial flow changes that wind and earthquakes often cause dis-alignment of antennas in wireless systems which may partially or totally impede communications, but which may be promptly repaired in a few hours' time. In the case of flooding of land-based communications system, service restoration may actually take much longer from days to months in view of the damage caused in electronic equipment, and the time for recovery and reconstruction would be significantly longer.

In addition to possible decline in revenues, the communication enterprises may temporarily face higher costs of operation, when resorting to utilize alternative systems of higher unit costs while repairing the damaged ones, or when having to acquire electricity from the usual sources. Such higher costs of operation in fact result in lower value added for the sector, and should be reported to the macro-economic impact assessment team.

In summary, the total changes in communications service flows should be obtained by adding up the following cost components:

- Temporary losses in revenues due to the interruption of communications across the board, until repairs and replacement of damaged equipment and lines has been completed;
- Possible occurrence of an increase in revenues of communications enterprises arising from higher demands of communications during the emergency stage;
- Possible decline in demand for communications from consumers that have sustained significant damage in their premises and productive processes, in cases of major, destructive disasters;
- Possible higher costs of operations caused by temporary utilization of alternative, higher-unit-cost systems while undertaking repairs and replacement of damaged systems; and
- Possible higher costs of operation caused by temporary use of alternative electricity sources, when the electricity sector has sustained major damage and service interruption.

The communications assessment team should ascertain whether some or all of the disaster-affected communications enterprises had insurance on loss of income or revenues, and the possible amount of insurance proceeds due to these enterprises after the disaster. Visits to local insurance companies should be held for this purpose, and also to ascertain whether these local insurers had re-insurance abroad, whose amounts must also be estimated for purposes of determining a possible positive impact on the balance of payments.

- **Reference for assessment**

- o For Standard Procedures for communication sector Assessment, please refer to India PDNA Handbook (Page number 165)
- o To collect baseline information on communication sector assets and production flows, please refer to India PDNA Handbook (Page number 166-169)



Objectives

- To provide an overview of the status and performance as well as vulnerabilities of the Financing, Insurance, Real Estate and Business Services sector
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on Financing, Insurance, Real Estate and Business Services sector
- To identify needs for recovery of Financing, Insurance, Real Estate and Business Services sector



Content

- **Introduction**

Housing is often that sector of the society which sustains the most severe destruction to its physical infrastructure and assets (damage) as a result of a disaster (barring the case of slow onset disasters such as drought or disasters which are a result of health epidemics such as the Ebola outbreak as experienced in West Africa or SARS as was experienced in Asia in 2003).

Different types of events may result in more different types of effects, but that is not the only explanation of the difference in the effects of an event to the housing sector. The earthquake that occurred in 2001 in Gujarat State resulted in some one million houses being totally or partially destroyed.⁹⁵ The Report on the Koshi Floods in 2008 indicated that nearly 60,000 houses sustained total or partial damage as a result of the event.⁹⁶ The Uttarakhand Disaster caused by heavy rains and landslides in 2013 saw just over 3,000 houses affected in both the rural and urban areas.⁹⁷ The tropical cyclone in the State of Odisha in 2013 saw nearly 2 Lakhs homes being totally or partially destroyed as a result of the disaster.⁹⁸ The difference in the quality of housing is also a factor.

⁹⁵India: Gujarat Earthquake Recovery Programme Assessment Report 2001, The World Bank and the Asian Development Bank (ADB), 15 March 2001.

⁹⁶Koshi Floods 2008, United Nations Development Programme, India, 2009

⁹⁷India Uttarakhand Disaster 2013, Joint Rapid Damage and Needs Assessment Report, August 2013. Government of Uttarakhand, India, WB and ADB.

⁹⁸Phailin and the Subsequent Flood. Government of Odisha. Special Relief Commissioner. 2013

- **Baseline Information**

In order to conduct an assessment of an event in the housing sector, it is important to know the number of dwellings that existed at sub-national levels before the disaster occurred.⁹⁹ Information on the types of dwellings categorized by materials used in the construction of outer walls and roofs and the size of the dwelling, is essential. The ownership structure is also important, defining privately or publicly owned and the headship of the owner by the sex of the owner (female or male). Where traditional ownership patterns exist these should be described as well as any peculiar traditional building customs that may differ according to sex or any other significant demographic characteristic. If the dwelling used for income earning purposes or is it owner-occupied? All of these characteristics need to be described.

A quick review of the institutional construction sector is important to undertake, with information regarding how many houses are built in any given year in the State, the imported content in the sector (if all materials are sourced locally or what proportion are imported); how skilled is the labor force in the sector and is the sector guided by a building code, how current is it and is it enforced or complied with. Information on the housing deficit gap, both in quantitative and qualitative terms, with regard to the proportion of the households that are seeking housing and the numbers built in any given year is important information to gather.

The sources of data for the pre-disaster situation in the housing sector and its characteristics is most usually found in the Population and Housing Census, more recent household surveys, academic studies on the housing sector and other national and State reports. It is worthy to note that information on the contents of household goods can also be gathered from the same reports and studies, such as poverty assessment reports and household surveys and this too should be described.

Table 5.3 presents data on households in India based on the Population and Housing Census conducted in 2011, by materials used in the construction of walls. It allows us to see the difference in construction materials used between the rural and urban households and the changes that have occurred in the use of building materials between the 2001 and 2011 census period.

Table 5.3 Households by materials of walls in India, 2001 and 2011

Material	Households, %					
	Rural			Urban		
	2001	2011	Change	2001	2011	Change
Grass/Thatch/Bamboo	12.6	11.9	-0.7	3.9	2.7	-1.2
Mud/Unburnt bricks	39.7	30.5	-9.2	12.8	9.3	-3.5
Stone	10.5	13.0	3.1	6.7	15.0	8.3
- Packed with mortar	NA	10.0	NA	NA	12.3	NA
- Not packed with mortar	NA	3.6	NA	NA	2.7	NA
Burnt brick	34.2	40.0	5.8	68.5	63.5	-4.5
Others	3.0	3.9	0.9	9.5	9.5	0.9

Source: Dr. C. Chandramouli, Registrar General & Census Commissioner, India. 2011

⁹⁹Missing

The Uttarakhand Report categorized the housing structures in the State into three typologies:

- o Kutcha structures consisting of semi-permanent houses made in stone walls and with roofs of slate or other local materials
- o Pucca structures or houses made with reinforced cement concrete with reinforced concrete roofs or in brick/stone masonry with reinforced concrete cement roofs
- o Multi storied structures.¹⁰⁰

- **Estimation of Disaster Effects**

Estimating the effects of the event on the housing sector requires the collection of data on the number, size (sq. meters) and type of houses partially or totally destroyed, the contents therein and any other peripheral buildings that form part of the dwelling. This is reported as the effects of the damage to the physical infrastructure and assets of the sector. This should always be presented according to the geographic location of the affected houses. Many methods have been used to collect this data following an event, from self-reporting by the affected households, to systematic collection of data by Government appointed teams from the national or sub national levels and/ or reliance of the data collected by first responders. The verification of the data initially collected is always essential and is the work of the team of assessors. Where data gaps exist, the housing sector team may make recommendations as to how such data may be collected, through quick surveys or field visits. They may be supported by use of geo-spatial imagery of the before and after images of the particular community in which the event has occurred.

It would be important to ascertain the average age of the houses that have been affected.¹⁰¹

Once the effects of the event are satisfactorily captured, to the best of the ability of the assessors and within the time constraints of the assessment, then the estimation of the economic value of the effects can be carried out. Economic value should be estimated at current market prices at the level of the unit. That is, the construction cost of a house of a particular size, utilizing particular materials. Or in the case of partial destruction, the replacement cost of a roof, repairs to floors, windows or doors. These values can be supplied based on estimates by the Government's own Ministry of Works or Housing or from private developers and contractors. The value of the contents of the houses are also to be valued at market prices and should match as fairly as possible, the economic status of the affected communities as described in most recent State or national Household Surveys.

These values would provide an estimation of the economic value of the damage to the sector. Following the Koshi floods in 2008, the World Bank based on a request by the Government of India, State of Bihar, undertook a Needs Assessment to ascertain the extent of damage and the cost of recovery. The Report, as detailed in Table 5.4, indicated that the value of damage to the housing sector amounted to some Rs. 990 Crore, based on an average unit cost of some Rs. 63,000 per unit.

¹⁰⁰India: Uttarakhand Disaster June 2013. Report page 26

¹⁰¹This information is to be transmitted to the macro-economic assessment team for use in estimating disaster impact on the capital account. It is not to be used by the housing sector assessment team to estimate the depreciated value of destroyed houses.

Table 5.4. Estimate of economic value of totally destroyed houses in the State of Bihar as an outcome of the Koshi flooding in 2008

	Number	Unit Cost	Total
Fully damaged houses	157,428	63,000	Rs. 990 Crore (US\$ 225 million)

Source: Bihar, Koshi Flood 2008, Needs Assessment Report pg. 18

But other costs are incurred as a result of an event. Before repairs or construction can begin, the debris and mud, which have been left behind by the event will have to be cleared and this cost should be estimated. It is unplanned and an additional expenditure either absorbed by the homeowner or by the Government or so is represented as a change in economic flows for the sector. So too are additional expenditures utilized in the construction of temporary shelter to persons displaced as a result of the event. There is also the loss of income to the home-owners from those properties that were rented and this can be estimated by current market rental value and the data available in the Population and Housing Census, which usually indicates the proportion of rental properties at the various national and sub-national levels.

If Government's ability to properly coordinate or manage the sector has been disrupted as a result of the event, the additional costs, which have to be incurred, should be identified. These may manifest themselves as costs to hire additional administrative personnel. Costs incurred to reduce risk or vulnerabilities such as incurred through the hiring of security personnel to safeguard women and children in shelters or located in temporary housing schemes, should also be identified.

All these economic values combine to provide the total effects of the event on the housing sector.

Table 5.5 presents the economic value of the effects in the social sectors following the Gujarat earthquake of 2001. It can be noted that the housing sector accounted for some 85% of the value of the total effects on the social sectors combined. Changes in economic flows (or losses) in the sub sector were not identified at that time since the assessment team was not fully acquainted with the assessment methodology, thus resulting in an under-estimated economic value of effects and impacts of the event to the sector.

Table 5.5 Assessment of damage and losses in the 2001 Gujarat Earthquake (Million US Dollars)

Sectors	Total	Damage	Losses
Social Sectors			
Housing	1,110.97	1,110.97	0
Health	47.1	47.1	0
Education	144.09	144.09	0
Sector Total	1,302.16	1,302.16	0

Source: The World Bank

- **Reference for assessment**

- o For Standard Procedures for housing sector Assessment, please refer to India PDNA Handbook (Page number 178)
- o To collect baseline information on housing sector assets and production flows, please refer to India PDNA Handbook (Page number 179-181)



Community, Social and Personal Services



Objectives

- To provide an overview of the status and performance as well as vulnerabilities of the Community, Social and Personal Services sector
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on Community, Social and Personal sector
- To identify needs for recovery of Community, Social and Personal Services sector



Content

- **Introduction**

The education sector act as a shelter for those persons displaced as a result of a disaster in India like many other countries. Delays in the creation of temporary shelters or alternative accommodation for displaced persons may have significant effects on the disruption of children's education, their safety and well-being, the ability of their families, particularly mothers, to resume livelihoods and therefore the return to normalcy of affected communities and societies.

Disasters in India, such as the flash floods and landslides in Uttarakhand State, of 2013, suggest that not only is the infrastructure of the education sector affected as a result of an event but the school calendar may also be disrupted.¹⁰²

- **Baseline Information**

It is essential to know the number and typologies of the education facilities that exist at the national and State levels. It is important to understand the structure of the education system and the ownership arrangement, being able to categorize schools according to ownership: private, public, and combined ownership of public and private, or religious based. The normal number of classroom hours per day or annual days per student is also essential.¹⁰³

The UNDP Report on the Koshi Floods of 2008 indicated that the vulnerability of the affected Districts reflected not only the demographic, occupational and other characteristics of the population, but also in terms of acute shortages of basic facilities and social infrastructure. Table 5.6 presents the baseline data for basic educational facilities in selected villages in the State of Bihar, by District as presented in the UNDP report. Such information is essential to define the context of the education sector.

¹⁰²Uttarakhand Report 2013. Government of Uttarakhand, Asian Development Bank (ADB), World Bank, and Government of Uttarakhand. Pg 38

¹⁰³Missing

Table 5.6. The proportion and number of basic educational facilities in selected villages in the State of Bihar by District

District	% Villages with Primary Schools	% Villages with Middle Schools	% Villages with Secondary Schools	Number of Industrial Schools	Training Schools
Supaul	79.9	33.9	8.5	3	1
Araria	74.4	21.8	0.5	2	0
Purnia	52.8	15.4	2.3	0	5
Madhepura	70.7	44.3	8.6	0	0
Saharsa	79.9	38.0	6.0	0	0
Total in five Districts	67.9	28.4	4.7	5	6
Bihar	62.2	19.0	4.8	51	65

Source: Table 2.4 Basic Facilities in the Villages in Survey Districts as per Census India, 2001. Koshi Floods Report 2008. UNDP

o Key points in assessment

- The assessment team should be aware of the management structure of education at the national and State levels, detailing the work force employed in the sector: the numbers of educators and principals or head teachers and the number of assistant teachers. It would be important to explain if the sector is able to meet the needs of the population in terms of teacher/student ratios and where gaps exist.
- The infrastructure and assets of the sector, it would be important to present the socio- demographic characteristics of the population serviced by the sector, such as literacy levels and school enrolment rates and the proportion that is serviced by social programmes such as school feeding programmes. If different age groups use the school during the day of learning, then it should be specified.
- The sector team should have an inventory of what educational equipment and furniture exists in the various facilities, including sporting equipment and education materials.

o Sources of data

- For the pre disaster situation in the education sector and its characteristics, data is most usually found in the Ministry of Education annual reports and other administrative reports from the national and State levels.
- The most recent Population and Housing Census is a rich source of information on the socio-demographic characteristics of the population relevant to education.
- Academic studies and studies undertaken by international partners such as, UNICEF or UN Women.

- **Estimation of Disaster Effects¹⁰⁴**

It requires the collection of data on the number, size and type of educational facilities, and their contents, that have been partially or totally destroyed as a result of the event. The facilities include peripheral buildings such as toilet facilities, fences, teacher's houses or any other building that forms part of the education compound. The playing fields attached to the schools should be included. The contents of the facilities have to be taken into consideration including, education materials, laboratory equipment, computer equipment or books held by the school.

Both the affected buildings and their contents are to be reported as the effect of damage to the physical infrastructure and assets of the sector. This should always be presented according to the geographic location of the affected schools, indicating rural or urban and the ownership structure.

Many methods have been used to collect this data following an event, from self-reporting by the affected head teachers or principals, to collection of data by Government-appointed teams from the national or State levels and/ or reliance of the data collected by first responders. The verification of the data initially collected is always essential and is the work of the education sector assessment team. Where data gaps exist, this team may make recommendations as to how such data may be collected, through quick surveys or field visits. Just as with other social sector teams, the education sector assessment team may be supported by use of geo-spatial imagery of the before and after images of the particular community in which the event has occurred.

Table 5.7 presents a summary table, which was used detailing damage to physical infrastructure and assets of the sector as a result of floods in the state of Uttarakhand in 2013.

Table 5.7 Effects of the event to the infrastructure and assets of the educational sector

Educational Buildings Partially and Totally Destroyed			
Districts	Primary and secondary	Higher education / vocational Institutes	Totally affected facilities
	Number of Units	Number of Units	Number of Units
Bageshwar	82	0	82
Chamoli	153	1	154
Pithoragarh	32	0	32
Rudraprayag	54	0	54
Uttarkashi	166	1	167
Other Districts	379	5	384
Total	866	7	873

Source: India Uttarakhand Disaster June 2013.

Once the effects of the event are satisfactorily captured, to the best of the ability of the assessment team and within the existing time constraints, then the estimation of the economic value of the effects can be carried out. Economic value should be estimated at current market prices at the level of the unit. That is,

¹⁰⁴Missing

the construction cost of a school of a particular size, utilizing particular materials. Or in the case of partial destruction, the replacement cost of a roof, repairs to floors, windows or doors. These values can be supplied based on estimates by the Government's own Ministry or Department of Works or Education or from private developers and contractors. The value of the contents of the schools is also to be valued at market prices.

- **Estimation of Disaster Effects**

- **Damage:**

It provides an estimation of the economic value of the damage to the sector. Following the Tropical Cyclone Phailin and the subsequent floods in October of 2013, the Government of Odisha reported that some 5,825 primary schools were damaged and the cost of repair amounted to Rs.23858.61 lakh and 226 College and University buildings have been extensively damaged and economic value of that damage was Rs.4792.00 lakh.¹⁰⁵

- **Change in economic flows:**

But other costs are incurred as a result of an event. Before repairs or construction can begin, the demolition of badly damaged structures and the removal of debris and mud which have been left behind by the event. These costs should be estimated. It is an unplanned and an additional expenditure; either absorbed by the Government or the private educational institution. Such expenditure is represented as a change in economic flows in the sector. So too are additional expenditures utilized in the rental of alternative premises or in the construction of temporary schools to continue the education of the students, as a result of the event. If schools have to be relocated for safety and to reduce risk, then this cost of relocation, such as the acquiring of land, its preparation for building, will have to be identified and included as a change in economic flows either to the public or private sector. If income from student fees is not received, this too should be included.

Any repair of damage to facilities that have been used as temporary shelter or the sanitizing before students can once again use them, should be included as an additional cost. There may be increased costs for students assigned to alternative locations until repairs to their usual school buildings have taken place.

If Government's ability to properly coordinate or manage the sector has been disrupted as a result of the event, the additional costs, which have to be incurred, should be identified. These may manifest themselves as costs to hire additional administrative personnel. Costs incurred to reduce risk or vulnerabilities such as rental of temporary facilities for teachers, or security personnel to safeguard educational equipment or temporary facilities, should be identified.

All these economic values combine to provide the total effects of the event on the education sector.

- **Reference for assessment**

- For Standard Procedures for education sector Assessment, please refer to India PDNA Handbook (Page number 189)
 - To collect baseline information on education sector assets and production flows, please refer to India PDNA Handbook (Page number 190-192)

¹⁰⁵Phailin and the Subsequent Flood 12-15 October 2013. Government of Odisha, Special Relief Commissioner, Revenue and Disaster Management Department, Government of Odisha. Page 37



- To provide an overview of the status and performance as well as vulnerabilities of the Health sector
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on Health sector
- To identify needs for recovery of Health sector



• Introduction

The health sector often bears double burden at the time of a disaster: the effects of the event on the health of the affected population and the effects of the event on the infrastructure and assets and the resultant disruption of the services provided by the sector.

Even where the effects to the infrastructure and assets of the sector may have not been severe as a result of an event, the health sector may still be severely affected due to the increased demand for their services in the response to the event and the difficulty caused by the event, which may create challenges for delivery of health services and access to services. The sector may also have to address the subsequent health threats, which the population may face as a result of the disaster in view of changed environmental conditions. Table 5.8 presents a distribution of different diseases found in some 40 surveyed villages following the 2008 Koshi floods.

Table 5.8 Villages suffering from different diseases in the aftermath of Koshi Flood, 2008

Disease Type	Males		Females		All	
	Number	% of total Population	Number	% of total population	Number	% of total population
Cold and Cough	2,815	1.4	3,240	1.8	6,055	1.6
Water-borne Diseases	2,310	1.2	2,899	1.6	5,209	1.4
Digestive problems	550	0.3	600	0.3	1,150	0.3
Fever	5,950	3	5,514	3.1	11,464	3
Skin disease	11,139	5.6	7,681	4.3	18,820	5
Stomach problems	5,490	2.7	3,690	2.1	9,180	2.4
Others	713	0.4	445	0.3	1,158	0.3
Total Population	28,967		24,069		53,036	

Source: Koshi Floods 2008. UNDP Report

- **Baseline Information**

It is important to be able to paint a clear and concise picture of health care at the national, state and district levels, as it existed prior to the disaster. Such a description should entail the socio-demographic characteristics of the population with the main epidemiological indicators including incidence of different diseases relevant to the disaster situation.

The number of health facilities that exist at the national and State levels before the disaster occurred and the types of health facilities categorized by the nature of services which they provide and their location, should be presented. The ownership structure, defining privately or publicly owned, and the catchment area covered is important to present. The distribution of the services provided between the two sectors would be important information.¹⁰⁶ Table 5.9 presents the number of health facilities that existed in selected villages before the disaster occurred, by type of facilities, as reported by the UNDP study on the Koshi floods in the state of Bihar, 2008.

Table 5.9. Basic Health Facilities in Selected Villages, of Bihar per Lakh Population by Districts

District	Allopathic Hospitals	Maternity Hospitals	Primary health Centres
Supaul	1.3	0.3	1
Araria	0.5	0.1	1
Purnia	0.9	0.2	1
Madhepura	0.6	0.2	2
Saharsa	0.4	0	1
Total in five Districts	0.7	0.2	1
Bihar	1.3	0.3	2

Source: Koshi Floods Report 2008. UNDP

It is also important for the health sector team to describe the structure of health care in the country, detailing the management and numbers of health care providers and if the sector is able to meet the needs of the population and what are the gaps. If there are some particular or unique health challenges faced by the population in the affected area, this too should be highlighted.

As an example, the Government of Bihar State Report on the Koshi Floods noted that total health facilities coverage per 100,000 persons in the affected district was between 9 and 11 while the State average was 11 persons per 100,000. The report concluded that the basic health indicators such as crude birth rate, crude death rate, infant mortality rate and total fertility rates were considerably above the State and national average.

¹⁰⁶Missing

The fee structure for the delivery of health services should be explained, if such exists. If information is available on the health costs for particular services this should be provided.

It would be important for the sector team to be able to have an inventory of what medical equipment, supplies and furniture exists in the various facilities, including vehicles such as ambulances.

o **Sources of data**

- For the pre disaster situation in the health sector and its characteristics is most usually found in the Ministry of Health annual reports and other administrative reports from the national and State levels.
- Recent health surveys on the population, academic studies and studies undertaken by international partners such as WHO, FAO, UNICEF or UN Women may be helpful.

• **Estimation of Disaster Effects¹⁰⁷**

It requires the collection of data on the number, size and type of health facilities which were partially or totally destroyed, the contents therein and any other peripheral buildings that form part of the facility such as adjoining pharmacies, fencing, outside toilet facilities or storage facilities. Medications and supplies stored in the facilities should be included. This is reported as the effects of the disaster on the physical infrastructure and assets of the sector or damage. This should always be presented according to the geographic location of the affected health facilities and the ownership structure. This data following an event is usually collected by government health officials at the national and State levels and/ or collected by first responders. The verification of the data initially collected is always essential and is the work of the health sector assessment team. Where data gaps exist, the health sector assessment team may make recommendations as to how such data may be collected, through quick surveys or field visits. They may be supported by use of geo-spatial imagery of the before and after images of the particular community in which the event has occurred and key informant interviews.

o **Estimation of the economic value of the effects**

It can be carried out. Economic value should be estimated at current market prices at the level of the unit. That is, the construction cost for a health facility designed for a particular purpose, taking into consideration size and construction materials used. Or in the case of partial destruction, the replacement cost of a roof, repairs to floors, windows or doors or replacement of medical equipment damaged. These values can be supplied based on estimates by the State government's own Department of Works or from the procurement or maintenance departments of the Health Department. The value of the specialized equipment and furniture are also to be valued at market prices. This information can often be sourced from the procurement offices of the Health Ministry or from Ministry of Finance.

The health sector usually experiences significant additional expenditure and lower revenues as a result of a disaster. This expenditure results in a change in economic flows to the sector. Such expenditure may occur as a result of attempting to ensure that affected populations have access to

¹⁰⁷Missing

health services, through the establishment of mobile clinics or temporary health facilities. Costs may be incurred through higher expenditure for treatment of injured, such as incurred in the transporting of patients to non-damaged hospitals or other facilities, when required; higher expenditure on patients referred to other facilities; where applicable, lower revenues for attending to lower number of patients; additional costs incurred through the special monitoring and surveillance of epidemics; costs in vector control; and costs of prevention such as the distribution of vaccines and the promotion of health awareness activities such as advice on the boiling of water, etcetera. There may be increased costs for overtime for health care providers, transport costs, increased amounts of medicines and supplies, etc. and for the conduct of special programmes to address psychosocial trauma following an event.

Case: Government of Odisha, in their memorandum on Cyclone Phailin and the Subsequent Flood, October 2013, demonstrates the extent to which Health Sector officials must go to safeguard the health of the population. The report indicated that in order to restore health services in the affected areas, 185 medical teams and 338 medical relief centers were opened. Forty-seven medical officers, 132 paramedics were mobilized from medical colleges and unaffected areas to the districts such as Puri, Balasore, Bhadrak, Jajpur, Kendrapada, Mayurbhanj and Ganjam. Packets of ORS amounting to 1,249,670 and 9,655,000 Halogen tablets and 16, 700 ASVs were supplied. These items would require costing by the health sector assessment team so that an economic value could be applied to the additional expenditures of the health sector.

The costs for the removal of debris and sanitization of partially damaged facilities before use may also have to be taken into account. So too the costs of removal and safe disposal of bio-hazardous materials from damaged hospitals.

When all estimates have been completed, only then can a true picture of the total effects of the event on the sector be discerned.

- **Reference for assessment**

- o For Standard Procedures for health sector Assessment, please refer to India PDNA Handbook (Page number 199)
- o To collect baseline information on health sector assets and production flows, please refer to India PDNA Handbook (Page number 200-202)



- To provide an overview of the status and performance as well as vulnerabilities of the Culture sector
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on Health sector
- To identify needs for recovery of Culture sector



- **Introduction**

In the national accounts of India, culture is included within Arts, Entertainment and Recreation. Under this umbrella are such categories as creative arts and entertainment; libraries, archives and other cultural activities; and sports, entertainment and recreation.

UNESCO suggests further categories for examination when undertaking an assessment of the Culture Sector. These are:

- o Built heritage and cultural/natural sites
- o Moveable properties and collections
- o Intangible cultural heritage
- o Repositories of heritage (including museums, libraries, and archives);
- o Cultural and creative industry

It is important to remember that there will be heritage facilities, artifacts and intangible cultural products and processes that are of particular spiritual or cultural significance and may yet never be able to be fully recovered or restored through reconstruction and so defy economic valuation. The value of such tangible and intangible heritage, may be measured more in terms of its intrinsic value and its impact on the members of the community who hold it dear or in high esteem.

- **Baseline Information**

It is important to know the nature and number of cultural facilities or activities that exist at the national and State levels before the disaster occurred.¹⁰⁸ An examination of the culture sector should include

- o A general overview of the cultural activities within the affected areas, framed within a historic and geographic perspective.

¹⁰⁸Missing

- o Information on infrastructure and assets held within the sector.
- o Information on the types of cultural activities categorized by the number and characteristics of public heritage assets such as world heritage buildings, other heritage buildings, museums, archaeological sites, moveable goods, archives or documentary collections.
- o Number and characteristics of private historical heritage assets whether individually or institutionally owned, categorized into religious buildings, houses located in historic centers, libraries or collections located in foundations
- o Identify cultural programmes that occur among indigenous communities or cultural spaces or recreational parks.

After description of the pre disaster situation, detailing the number and location of the cultural assets, then the infrastructure should be categorized by the nature of facilities (i.e. materials used in construction, whether board, brick, mud), the size of the facilities and the furnishings and equipment, where specialized equipment is contained, should be highlighted.

The production of cultural goods and services and the numbers of persons who are engaged in such activities and the number of persons who normally have access to cultural activities in particular regions or spaces may be information of value. In addition, data is required on the number of persons employed in the culture sector by categorization of employment.

The sources of information for the pre-disaster situation in the culture sector and its characteristics is most usually found in reports of the Ministry of Culture as well as in cultural and academic studies and in labor force surveys. It is worthy to note that information can also be located through cooperative associations of cultural practitioners, craftsmen and women and through religious bodies.

• **Estimation of Disaster Effects¹⁰⁹**

Estimating the effects of the event on the culture sector requires the collection of data on the number, size and type of cultural facilities that have been partially or totally destroyed as a result of the event. These would include the partial or complete collapse of buildings, sites and related infrastructure. Collections and moveable properties that have been partially or totally destroyed should be identified.

o **Damage:**

Both the buildings and their contents are to be reported as the effect of damage to the physical infrastructure and assets of the sector. This should always be presented according to the geographic location of the affected cultural facilities, indicating rural or urban and the ownership structure.

Many methods have been used to collect this data following an event, from self-reporting by the managers of the facilities; by communities who use or hold responsibility for the facilities; by Government-appointed teams from the national or State levels; and/ or reliance on the data collected by first responders. The verification of the data initially collected is always essential and is the work of the culture sector assessment team. Where data gaps exist, the culture sector assessment team may

¹⁰⁹Missing

make recommendations as to how such data may be collected, through quick surveys or field visits. Just as with other social sector teams, the culture sector assessment team may be supported by use of geo-spatial imagery of the before and after images of the particular community in which the event has occurred, when available.

The Indian Ocean tsunami of 2004 was the most recent example of a disaster that caused, not only an appalling loss of human life and wholesale destruction of communities, but damage of several sites inscribed on the World Heritage List, including the Sun Temple of Koranak, in India. The Shore Temple at Mahablipuram in the Tamil Nadu State was declared a World Heritage Monument in 1984. It has a Somaskanda panel in one temple and a sculpture of the reclining Vishnu in the other. The twin-temple had around it a series of sculptures of bulls and Yalis and Varahas. To safeguard it from the threat of sea erosion, a groyne wall was erected to stop the sea. The Shore Temple was partially inundated by the tsunami of December 2004 but fortunately there was no serious damage.

Though the tsunami of 26 December 2004 that occurred in the Indian Ocean struck the temple and the surrounding garden, the Shore Temple was not badly damaged, as the water level returned to its normal level within a few minutes. The damage was to the foundation of the bali peetam (sacrificial altar) in front of the temple, the steps leading to the boat jetty, and the small shrine with the Varaha(Boar) sculpture at the basement of the Shore temple. As the temple foundation is on hard granite rock, it could sustain the waves created by the Tsunami; the groynes erected around the temple area on the coastline also aided its protection.

Once the effects of an event are satisfactorily captured, to the best of the ability of the assessors and within the time constraints of the assessment, then the estimation of the economic value of the effects can be carried out. Economic value should be estimated at current market prices at the level of the unit. That is, the construction cost of a building of a particular size, utilising particular materials. Or in the case of partial destruction, the replacement cost of a roof, repairs to floors, windows or doors. Unfortunately, it does not seem that an assessment of the value of the damage to the Shore Temple and its accompanying structures was undertaken.

Sector assessment teams may have to classify damage to some facilities as severe, moderate or slight and suggest where more in-depth structural analysis of their condition may have to be done.

These values can be supplied based on estimates by the Government's own Ministry of Culture or from specialized contractors or civil engineers. The value of the contents of the cultural sites should be detailed. Such contents may be historic documents, archival records or electronic databases. Specialists in the field should be contacted to provide valuations, where necessary. These values would provide an estimation of the economic value of the damage to the sector.

But other costs are incurred as a result of an event. Before repairs or construction can begin, the demolition of badly damaged structures and the removal of debris, which have been left behind by the event may have to take place. These costs should be estimated. It is unplanned and an additional expenditure, to be absorbed either by the Government or the Cultural institution and is represented as a change in economic flows.

Disruption of the production of cultural goods may also occur as a result of a disaster and lost revenue should be estimated. Any higher operational costs to produce the cultural goods as a result of the disaster should also be valued.

If it becomes necessary to construct temporary facilities to accommodate historic documents or artifacts as a result of the event, this cost should be identified. If additional costs have to be incurred to safeguard artifacts or sites, this will have to be identified and included as a change in economic flows either to the public or private sector. If income from fees is not realized, due to disruption of access to museums or historic sites as a result of a disaster, this too should be estimated. As in the case of the Temple by the Shore the income, which may have been disrupted a result of the lack of visitors to the site, during the time of its damage, should have been estimated.

If Government's ability to properly coordinate or manage the sector has been disrupted as a result of the event, the additional costs, which have to be incurred, should be identified. These may manifest themselves as costs to hire additional administrative personnel. Costs incurred to reduce risk or vulnerabilities such as bolstering falling structures or safeguarding artifacts from exposure to natural elements or from vandalism, looting, conflict, or the introduction of inappropriate cultural practices should be included.

All these economic values combine to provide a total effect of the event on the Culture sector.

- **Reference for assessment**

- o For Standard Procedures for culture sector Assessment, please refer to India PDNA Handbook (Page number 209)
- o To collect baseline information on culture sector assets and production flows, please refer to India PDNA Handbook (Page number 210-213)



- To provide an overview of the status and performance as well as vulnerabilities of the environment
- To provide step-by-step guidance on estimation of the effects and impacts of a disaster on environment
- To identify needs for recovery of environment



- **Introduction**

The environment is not an institutional sector of economic and social activity; rather, it is an issue that cuts across all sectors of economic and social activity. It is not included in the worldwide system of national accounts, which is what countries use to keep track of the production of goods and services in all sectors of activity. One of the reasons for such exclusion is the fact that not all environmental assets and services have market values. Some industrialized countries are making use of a satellite account for the environment, which are often called “green accounts”; India does not have as yet a satellite account for the environment.

Nevertheless, it is possible to apply the existing methodology of assessing disaster impact and effects and of estimation of post-disaster needs for recovery and reconstruction to the case of the environment.¹¹⁰ To be sure, disasters may generate changes that may destroy environmental assets or capital and/or to works, which have been built to take advantage of the assets, and may produce losses when the associated environmental services are reduced, diminished in quantity or rendered more costly.

For the analysis, it is essential to differentiate between built environment and natural environment, and to realize that essentially the formal sectors of agriculture, fishery, forest and tourism utilize the natural environment, while all other formal sectors of economic and social activity make use of the built environment.

For purposes of the assessment, environmental assets – which are subject to disaster-induced destruction – may be divided as follows:

- o Physical (climate, air, soil and water);
- o Biotic (human beings, flora and fauna);
- o Perceptual (landscape, scientific and cultural resources); and
- o Interactions between them.

¹¹⁰The reader is referred to the thorough discussion on this available in Handbook for Estimating the Socio-Economic and Environmental Effects of Disasters; Section Five, Environment, United Nations Economic Commission for Latin America and the Caribbean (UN-ECLAC), Santiago, Chile, 2003.

Damage to the environment may be estimated as the value of fully or partially destroyed assets. If the destruction is permanent, the value of damage is equivalent to the commercial value of assets if there is a market for them. If there is no such a market and a reversal of the environmental change is deemed feasible, the value of damage may be indirectly estimated as the cost of rehabilitating the affected assets. As an example of this, if agricultural lands are completely destroyed and there is no possibility of rehabilitation (because of technical or economic reasons), the value of damage will be the value of the land. If there is hillside soil erosion, the value of damage may be estimated as the cost of stabilizing the slopes through soil conservation works.

It is recognized that the existence of values not associated with the use of the environment and the lack of markets for some environmental goods and services pose obstacles for evaluating the value of damage, and a solution is to make indirect estimations of such values. As an example, the full destruction of soils by a mudslide may be estimated as the present value of the agriculture or forestry production which would not be obtained over a relatively long time period as to represent a total loss of the lands (i.e. 10 years). On the other hand, when the damage to the same soils may be restored naturally over a given period, the value of damage to the soils may be estimated indirectly as the value of production not obtained over the period required for their recovery.

The services that those environmental assets provide to the society and economy include:

- o Regulation of the water cycle;
- o Carbon sequestering;
- o Maintenance of the biodiversity;
- o Recreation, and
- o Degradation and transformation of waste.

It is important to mention that the value of environmental losses accruing to build natural resources are routinely estimated under the formal sectors of economic and social activity that utilize them. On the other hand, the value of such services obtained from natural or unbuilt resources have been determined or measured only in a few countries of the world; India is not amongst them. However, it is possible to transpose the values obtained in other countries to the conditions of India using as a basis the characteristics of the services and of the natural assets that render them possible.

Therefore, special care must be exercised by the environment assessment team not to duplicate the estimations of damage and losses of the environment that have been made, or which are to be made, by the separate assessment teams that cover the formal or institutional sectors of social and economic activity that utilize the environment. Stating it differently, the environment assessment team should concentrate its efforts in estimating damage to natural or unbuilt resources and estimating losses in natural environment services only, to avoid double accounting of disaster effects.

Therefore, for purposes of applying the methodology to estimate disaster effects and impacts in the environment the same definitions of disaster effects, as used for all formal sectors of economic and social activity in this methodology would remain valid; i.e. (i) the destruction of physical assets of the environment would be considered as damage, and (ii) the disruption of production flows would refer to the temporary changes in the flows of environmental services. Note that the disruption or losses of environmental service flows would occur from the time of the natural event that caused the disaster, to the time when the environmental assets have been rebuilt, either naturally or through man-made interventions to restore or rebuild them.

Disaster impact would refer to the consequences of the disaster effects in the environment. Post-disaster needs for recovery would be the value of activities designed to enable the return to normalcy of the services of the environment, while reconstruction requirements refer to the cost of man-made interventions to assist nature in rebuilding the assets of the environment to normal or pre-disaster conditions, when they are economically feasible.

- **Baseline information**

While the system of national accounts offers an accounting framework for analyzing and evaluating the performance of an economy, it does not cover the environment, as has been pointed out earlier. The concept of environmental accounting has arisen recently as a solution to such limitation, and involves the segregation and elaboration of accounts that include the assessment of environmental costs and benefits, as well as the accounting for the maintenance of tangible wealth.¹¹¹

India has been closely following such recent developments and, as a result, the Central Statistical Office in the Ministry of Statistics and Programme Implementation, through its Social Statistics Division, publishes an annual Compendium of Environment Statistics for India; its most recent version provides information updated through 2013.¹¹² The data included therein provides some of the baseline information required for disaster impact and post-disaster needs assessment, as it includes data on biodiversity, the atmosphere, land and soil, water and human settlements.

For the estimation of disaster effects and impact on the environment, baseline information must be collected in regard to the following assets and services of the environment within the disaster-affected areas, as the first stage of the assessment.¹¹³

- o Characteristics, extent and location of forests:
 - Reserved forests, protected forests, and unclassified forests;
 - Very dense forest, moderately dense forests, open forests;
 - Biosphere reserves, protected areas (incl. national parks, wild life sanctuaries, etcetera);
- o Characteristics, extent and location of mangroves;
- o Characteristics of protected areas, wildlife sanctuaries, and national parks; and
- o Characteristics of physical infrastructure – such as bridges, roads, research facilities, observation towers, etcetera) available within protected areas or national parks.

The environment assessment team should also collect any existing reports that may provide information on the economic valuation of environmental services, which may be used in the estimation of the value of disruption on environmental service flows.

¹¹¹See System of Environmental-Economic Accounting 2012, Central Framework, United Nations, New York, 2014.

¹¹²See Compendium of Environment Statistics, India, 2014, Social Statistics Division, Central Statistical Office, Ministry of Statistics and Programme Implementation, New Delhi, 2014. Available in <http://www.mospi.gov.in/>.

¹¹³Missing

- **Post-disaster sector situation and performance**

After collecting and analyzing baseline information and any existing preliminary reports on possible damage to environment assets and disruption of environmental services caused by the disaster, the environment assessment team should undertake field visits to the disaster-affected areas to obtain first-hand information on disaster effects and impacts on the environment.

During these field visits, the team should obtain or verify data on the geographical extent and intensity of destruction that the environmental assets may have sustained, as well as of quantities and type of debris and mud that may have resulted after the disaster and which may need to be removed to appropriate and environmentally safe sites. In that respect, the environment assessment team should coordinate with the separate sectorial assessment teams to ensure that no duplication of efforts is made, bearing in mind that the sectorial assessment teams will be responsible for estimating damage and losses sustained by the environment in their respective areas of jurisdiction (i.e. in the built environment that each sector makes use of).

In respect of environmental services that may have been affected, the environment assessment team should collect information concerning the geographical extent of such affected services and the degree of affectation or destruction that has been caused by the disaster (i.e. that 85 per cent of the area where carbon sequestering is normally made has reduced its capacity by, say, 50 per cent of the normal).

On the basis of the information thus collected in the field, the environment assessment team should be able to (i) determine which environment assets have been permanently destroyed and will not be able to recover at all; (ii) develop a calendar for the (natural or man-assisted) recovery of environmental assets and services that can be achieved; and (iii) estimate the financial requirements for such recovery activities.

- **Estimation of Disaster Effects¹¹⁴**

- **Destruction of environmental assets**

As indicated before, an estimation of the value of destroyed environmental assets that are under natural or non-built conditions is to be made by the environment assessment team, while the separate sectorial assessment teams are to estimate the value of destroyed environmental assets in the built environment, since they are better positioned to make such analysis and quantification for use in the evaluation of disaster effects.

Therefore, the environment assessment team should concentrate its estimations on the value of destroyed environmental assets of natural forests, mangroves and protected areas. Such assessment involves the estimation (by actual physical measurement and/or by using aerial photography or satellite imagery) of the disaster-affected area of such resources, and of the degree of disaster-induced destruction.

¹¹⁴Missing

In connection to the latter, the following qualitative classification may be adopted for subsequent quantification of damage or destruction:

- Total destruction of environmental assets. This may occur when it is deemed impossible for the affected ecosystem to recover over, say, a period of 25 years or more, and the likelihood that the affected areas may be put to future use is nil.
- Severe destruction of environmental assets in extensive areas, but there is a possibility that they may partially recover over the medium to the long term, at a very high cost.
- Moderate destruction, but is feasible to recover these areas in the short to medium term through introduction of costly to moderately costly remediation measures.
- Slight destruction of assets which may be subject to natural or low-cost assisted remedial measures that ensure short-term recovery.

In the case of timber products, since they have associated market values, the procedure for estimating the value of damage involves the estimation by the assessment team of the following:

- i. Define the extent of forest that is commercially harvestable in the disaster-affected area (as a percentage of the total affected area);
- ii. Define the relative extent of tree affection using the previously-listed classification (i.e. total destruction, severe destruction, moderate destruction and slight destruction) expressing it in percentage terms of the total harvestable forest affected;
- iii. Obtain the equivalent harvestable area affected, using the aforementioned weighting factors;
- iv. Estimate timber yield per hectare of harvestable area (in cubic meters per hectare);
- v. Obtain average unit price of timber (Rupees per cubic meter); and
- vi. Estimate the value of the damage to timber in the affected area (multiplying iii, times iv, and v).

Other non-timber forests products that may have associated market values (such as honey, mushrooms, nuts, etcetera) may be subject to a similar procedure for the estimation of disaster damage.

The value of damage to destroyed infrastructure assets in natural parks and forest preserves (including, roads, bridges, observation towers, housing units for park rangers, research stations, etcetera) may be obtained from the government institutions that operate them, and should be estimated by the environment assessment team using the same characteristics they had before the disaster in combination with the unit construction costs for them that prevailed at the time the disaster occurred.¹¹⁵

¹¹⁵Should design and construction standards for these works be required to improve disaster resilience or to reduce disaster risk, the additional costs (in comparison to the normal construction costs) are to be considered when estimating reconstruction requirements.

The value of possible destruction or degradation of soil, water and air is to be estimated in the sectors where these environmental assets are directly utilized. In the case of agricultural lands and soils, they may be rendered useless for agriculture production through either erosion or sedimentation. The United Nations Food and Agriculture Organization (FAO) has defined standards for soil erosion in agriculture lands;¹¹⁶ when these standards are exceeded, the lands may not be usable for production and the value of damage would be equal to the pre-disaster commercial value of the land. In certain areas, sediment deposition may be so high – in some cases, more than 50 centimeters – that the soils may not be able to sustain agricultural production or may require remedial measures so costly as to render the operation un-economical, so that the value of damage may be equal to the pre-disaster commercial value of the land. In the case of damage to water resources, the estimation of its value is quite complicated; but it may be possible to equate the value of damage to the cost of the remedial measures or investment required to restore the assets to its initial quantity and quality. In any case, such estimations are to be made by the water and sanitation assessment team, as its members are in the best position to make the required analysis, as well as to avoid double accounting. In the case of damage or pollution to air, since there is no experience of costs to clean up and restore air quality after a disaster (such as after a volcanic eruption), the only indirect manner available is to equate the damage to the summation of the costs to treat patients for the disease caused by inhaling polluted air, the additional costs of deviating air traffic to avoid passing through the areas where ash is present in the vicinity of the volcano, and the losses in tourism revenues caused by the disaster.¹¹⁷ Again, the separate assessment teams of health, transport and tourism sectors would estimate such values of damage.

o **Disruption to environmental service flows**

In order to estimate the possible, temporary disruptions to the flows of environmental services the environment assessment team may resort to the utilization of use and non-use values. Use values of environmental services may be direct and indirect. Direct use values refer to the goods and services produced by ecosystems, which may be used as inputs in productive processes; some of them have market values, such as timber, fuel wood and carbon. Indirect use values refer to environmental services provided by forest and other ecosystems including, inter alia: regulation of the water cycle, carbon sequestration, maintenance of biodiversity, recreation and degradation and transformation of waste, as was pointed out earlier.

While it has not been possible to locate quantitative information on the economic valuation of environmental services of forests in India, which could be used to estimate possible changes on environmental flows caused by disasters, indirect estimations on the economic loss of environmental service flows may be made using data from other countries. The environment assessment team should be aware that in recent years, efforts have been made to estimate the value of such services in ecosystems associated to the various life zones as defined by Holdridge, as shown in the table 5.10:¹¹⁸

¹¹⁶See A Provisional Methodology for Soil Degradation Assessment, Food and Agriculture Organization of the United Nations, Rome, Italy, 2008.

¹¹⁷The reader should be aware that in the absence of a procedure to estimate the value of degradation of the quality of air (damage, under the current methodology for disaster effects assessment), it has been necessary to equate damage to the resulting costs of solving the problems caused by the disaster, which are in fact changes in the flows of production under the same methodology.

¹¹⁸See Mawdsley, Jonathan, O'Malley, Robin, and Ojima, Dennis S., A Review of Climate-Change Adaptation Strategies for Wildlife Management and Bio-Diversity Conservation, in Conservation Biology, Volume 23, No. 5, October 2009.

Table 5.10 Average values of eco-systemic environmental services in the Holdridge life zones (US Dollars at 2000 prices per hectare per year)

	Average value, US\$/hectare/year
Polar desert	94.22
Boreal rainforest	106.25
Cool temperate desert	56.09
Cool temperate desert scrub	117.00
Cool temperate steppe	90.73
Cool temperate rainforest	86.32
Cool temperate wet forest	62.77
Warm temperate thorn scrub	108.86
Warm temperate dry forest	171.46
Warm temperate wet forest	130.58
Subtropical thorn woodland	128.56
Subtropical dry forest	196.84
Subtropical moist forest	263.70
Subtropical wet forest	77.06
Subtropical very dry forest	77.16
Tropical dry forest	101.32
Tropical wet forest	149.72

For some Central American countries, in an assessment of disaster impact caused by Hurricane Felix, data on the economic values of environmental services of forest ecosystems was utilized, as shown in Table 5.11¹¹⁹

¹¹⁹See Impacto del Huracán Felix en la Región Autónoma del Atlántico Norte y de las lluvias torrenciales en el noroeste de Nicaragua, United Nations Economic Commission for Latin American and the Caribbean, Mexico, 2008, Carranza, C. et al, Valoración de los servicios ambientales de los bosques de Costa Rica, Ministry of Environment and Mining, San José, Costa Rica, 1996; and Constanza, Robert, et al, The value of the world's ecosystem services and natural capital, University of Maryland, <http://www.esd.ornl.gov/>.

Table 5.11. Reference Values of Environmental Services Provided by Forest Ecosystems in selected countries of Central America (US\$ at 2007 prices per hectare per year)

	Costa Rica		Honduras	Nicaragua
	Primary forest	Secondary forest		
Carbon sequestration	38.00	29.26	35.00	35.00
Water cycle protection	5.00	2.50	9.00	9.00
Bio-diversity protection	10.00	7.50	9.00	9.00
Ecosystem protection	5.00	2.50	3.60	3.00
Total	58.00	41.76	56.60	56.00

The environment assessment team should be aware that data on the reference value of environmental services provided by other ecosystems – including coastal systems (mangroves and sea grass meadows), coral reefs, and others, are available as well in the scientific literature, which may be used in India with the necessary adaptations to supplement those shown above.¹²⁰

For the estimation of changes and losses in environmental service flows due to damage to different ecosystems, the environment assessment team may use the above reference values, duly adapted to India conditions, and follow the steps:

- i. Ascertain the extent of destruction in the affected ecosystems;
- ii. Adopt the appropriate reference values per hectare per year for each type of environmental service normally obtained from the affected ecosystems,
- iii. Estimate the time required for recovery of the disaster affected ecosystems; and
- iv. Estimate the present value of the losses in services over the entire recovery period required, adopting the typical discount rate for development projects used in India.

As an alternative to the above procedure, it would be possible to use the concepts and methods of contingent valuation, travel cost valuation, hedonic pricing and others, in the estimation of losses in environmental services.

• Reference for assessment

- o For Standard Procedures for environment sector Assessment, please refer to India PDNA Handbook (Page number 224)
- o To collect baseline information on environment sector assets and production flows, please refer to India PDNA Handbook (Page number 225-227)

¹²⁰In that regard, see The Economics of Ecosystems and Biodiversity (TEEB), Ecological and Economic Foundations, London, 2010. (<http://www.teebweb.org/>).



Key learning's

- Agriculture Sector include sub-sectors namely crops, livestock, fisheries and forestry. The physical assets within this sector can be classified into six broad categories: a) Soil (agricultural land); b) irrigation system; c) agricultural infrastructure; d) agricultural machinery and equipment; e) agricultural stocks; and f) perennial crops. The assessment of damages will be on the effects of the assets while the economic flows should be based on the value of foregone production.
- Mining and Quarrying Sector in India are classified into the following subdivisions: Fuel minerals, including coal, lignite, petroleum and natural gas; Metallic minerals: iron ore, manganese ore, bauxite, copper ore, gold and others; and Non-metallic minerals, including limestone, mica stone and others.
- The manufacturing sector in India comprises 20 industries, as per the System of National Accounts. Depending on the areas affected by the disaster, the assessment team for this sector must be able to know beforehand the types of industries and industries in the areas affected by the disaster
- The Electrical Sector comprises the following activities or components: a) generation of electricity in different types of power plants; b) transmission of electricity from the generation plants to the distribution grids; and c) distribution and sales of electricity to the end-users. Each of these components of the electrical sector may be owned and operated either by public sector or government-owned enterprises, or by privately owned companies. Despite their ownership, they may be affected by any type of disaster and must be included in the assessment of disaster effects, impacts and recovery needs.
- Water Supply and Sanitation covers four separate activities: Water collection, treatment and supply; Sewerage; Waste collection, treatment and disposal activities; materials recovery; and Remediation activities and other waste management services.
- Trade or Commerce Sector includes wholesale trade, retail trade, sales and maintenance of vehicles, as well as hotel and restaurant services. Any post-disaster needs assessment should include the estimation of damage and sales decline in the public and private trade sector, and its subsectors, to ascertain disaster impact on the traders and estimate their recovery and reconstruction requirements. Leaving them out of the assessment is a way to leave unattended a sizable fraction of the affected population, which would lose employment and income.
- Tourism Sector is composed mostly of infrastructure and facilities that cater to tourists whether foreign or locals. Assets in the sector will include hotels, resorts as well as other natural attractions.
- Transport Sector includes Railway transport; Road transport; Water transport; Air transport, and Services incidental to transport. The assessment team should avoid double counting since the transport sector is usually very complex due to the different modes of transport for persons and cargo, and several ministries or departments are actually involved in it.
- Communications Sector includes postal services, telecommunications, and miscellaneous communications.

- Housing Sector requires the collection of data on the number, size (sq. meters) and type of houses partially or totally destroyed, including the contents therein and any other peripheral buildings that form part of the dwelling. Houses for rent must be identified too for purposed of assessing the losses of the owners.
- Education sector: In addition to the infrastructure and assets of the sector, it would be important to present the socio- demographic characteristics of the population serviced by the sector, such as literacy levels and school enrolment rates and the proportion that is serviced by social programmes such as school feeding programmes. If different age groups use the school during the day of learning, it should be specified.
- Health Sector is very critical as even where the effects to the infrastructure and assets of the sector may have not been severe as a result of an event, the health sector may still be severely affected due to the increased demand for their services in the response to the event and the difficulty caused by the event, which may create challenges for delivery of health services and access to services.
- Culture Sector: UNESCO suggests further categories when undertaking an assessment namely built heritage and cultural/natural sites; moveable properties and collections; intangible cultural heritage; repositories of heritage (including museums, libraries, and archives); and cultural and creative industry.
- The Environment is not an institutional sector of economic and social activity; rather, the environment is an issue that cuts across all sectors of economic and social activity.



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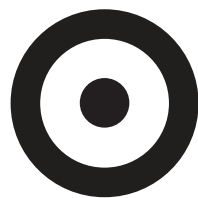
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CHAPTER 6

Learning Unit 5: Aggregation of Disaster Effects and Impact Assessment



Objectives

- To understand process of aggregation of the damages and losses of all the sector
- To estimate of disaster impact at the macro-economic, macro-social and personal/household levels.



Duration

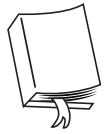
Total: 210 minutes

- Aggregation of the damages and losses of all the sector: 20 60 minutes
- Assessment of Impacts:
 - o Personal and Household Level: 25 minutes
 - o Sector Impacts (with Cross sectoral impacts): 60 minutes
 - o Macroeconomic Impact Assessment: 45 minutes
 - o Social Impact Assessment (with Gender Impact Assessment): 60 minutes
 - o Environmental Impact Assessment: 30 minutes



Tools/Methodology

- Training methods: Lecture, Case Study and Group Work
- Material required: Projector, screen, laptop, chart paper and marker.



Contents

• Aggregation of Total Disaster Effects

The aggregation of sectorial assessment is the next step to obtain the total value of effects caused by the disaster in the affected area or society.

- o Avoid double/multiple counting: During the aggregation process, special care must be exercised to avoid double or multiple accounting, since the boundaries between sectors may not be fully known to the individual sector assessment teams. Some common duplications are:
 - When the production losses in agriculture, livestock and fishery sectors are estimated using unit prices at wholesale or retail market levels; instead, for that purpose use should be made of prices paid at the levels of producers.¹²¹
 - When the value of damage to the systems of water supply and electricity, located in adjacent streets to the housing units, are included in the value of damage to the housing sector; instead, the value of damage to housing should include only the damage to the water supply, sanitation and electricity components that are located within the housing units, while the damage to assets in the systems of water supply, sanitation and electricity distribution – which reach to the street adjacent to the housing units – are to be accounted for under the sectors of water and sanitation and electricity, respectively.
 - To include damage to roads within farms in the road transport sector, when it should be part of the agriculture sector; the transport sector should include only the value of damage to primary, secondary and tertiary.
 - Damage and production flow changes to built-environmental assets and services should be included in the sectors of economic activity that utilize them; damage and production flow changes to natural environment assets and services should be accounted for under the environment.¹²²
 - Damage to water and sanitation, electricity, transport and communications systems is to be included under the institutional sectors of water and sanitation, electricity, transport and communications, respectively, even if they are used by the tourism sector.¹²³

¹²¹Using wholesale or retail unit prices to value such losses would result in including parts of the losses of the manufacturing and trade sectors into the losses of the primary sectors of agriculture, livestock and fishery.

¹²²In this regard, the value of agricultural soils that have been destroyed through erosion or siltation is to be included as damage in the agriculture sector; the value of urban soils that may have sustained destruction is to be included as damage in the housing or urban sector; damage or production flow changes to natural forests are included under the environment.

¹²³The only exception to this rule is when the hotels own and independently operate such systems; in this case, damage to such systems should be accounted for under tourism.

- Production flow changes in productive sectors that are caused by the interruption of basic services such as water supply or electricity are to be accounted under those production sectors; losses in revenues of water and sanitation and electricity enterprises that interrupt the provision of those services to consumers due to the disaster are accounted as production flow losses in the sectors of water and electricity, respectively.
- In the aggregation of total effects, personal or household income decline and higher expenditures should not be included in the estimation of sectorial damage and production flow changes. It must be recalled that the analysis of disaster impact at personal level represents a different point of view than that of the analysis of macro-economic impact, and that aggregating such personal effects would produce double accounting, as personal losses are already included under sectorial production losses and higher costs.

The aggregation of disaster effects is made for different objectives:

- o To learn the value of the global effects of the disaster
- o To obtain a quantitative basis for estimating the impact of the disaster on overall socio-economic development
- o To serve as the basis for the design or modification of public policies to lessen or shorten the impact of the disaster in the short to long term
- o To provide a first idea of priorities for recovery and reconstruction among sectors
- o To provide a quantitative basis for the estimation of the financial requirements for economic recovery and disaster-resilient reconstruction.

The validity of the aggregation of assets and flow will be undertaken in subsequent steps of the assessment. The aggregated values of changes in the production of goods and services flows are to be used for the analysis of macro-economic impact; and the values of destruction of assets are to be used independently to ascertain disaster impact on stocks or capital. Furthermore, the values of changes in production flows will be used separately for the estimation of recovery requirements, and the values of damage are to be used separately as a basis for the estimation of reconstruction requirements.

Certain types of disasters may sometimes, in addition to their negative effects, bring about positive socio-economic effects. Whenever that happens, the value of such positive effects should be factored in the aggregation of total damage and production flow changes to obtain the net total value of damage and losses.¹²⁴ An example of a summary of total disaster effects is shown in Table 6.1 to illustrate the desired end result of the aggregation.

¹²⁴Examples of such positive effects are the higher-than-normal agriculture crop yields that may be obtained after floods caused by intensive and longer rains or the possibility of increasing hydro-power generation in dams that, due to the same more intensive rains which caused flooding, have filled the dams and enabled the substitution of thermal power generation. The higher crop production obtained may offset, however partially, the losses in production caused by the flooding; and the lower costs of hydropower generation may also partially offset the higher production costs of thermal power generation.

Table 6.1 Aggregation of total disaster effects after Thailand floods in 2011
(in million Thailand Baht)

	Damage			Losses			Total effects		
	Value	Public	Private	Value	Public	Private	Value	Public	Private
Housing	45,908.0			37,889.0			83,797.0	37,889.0	
Education	13,051.0	8911.0	4140.0	1798.0	1654.0	144.0	14,849.0	10,614.0	4,235.0
Health	1684.0	728.8	954.6	2133.0	898.6	1234.4	3817.0	2861.8	2189.0
Culture	4428.8	2415.0	2013.8	3076.5	8.5	3068.0	7505.3	5491.5	5081.8
Agriculture Crops	5184.0		5184.0	31135.0		31135.0	36319.0	31135.0	36319.0
Livestock	344.0		344.0	2771.0		2771.0	3115.0	2771.0	3115.0
Fishery	137.0		137.0	809.0		809.0	946.0	809.0	946.0
Water resources development	8715.0	8715.0	17430.0	37889.0		37889.0	46604.0	46604.0	55319.0
Manufacturing	513881.0		513881.0	493258.0		493258.0	1007139.0	493258.0	1007139.0
Banking and Finance	943.0		943.0	115276.0	74075.8	41200.2	116219.0	115276.0	42143.2
Tourism	5134.4	403.1	4731.3	89673.4		89673.4	94807.8	90076.5	94404.7
Electricity	3185.8	760.7	2425.1	5715.6	4623.8	1091.8	8901.4	6476.3	3516.9
Water and Sanitation	3497.0		3497.0	1984.0		1984.0	5481.0	1984.0	5481.0
Transport	23538.0	23538.0		6938.0	6788.0	150.	30476.0	30476.0	150.0
Communications	1289.6	506.5	783.1	2558.3	1090.6	1467.7	3847.9	3064.8	2250.9
Environment	375.0	47.0	328.0	178.0	165.0	13.0	553.0	225.0	341.0
Total	631295.6	46025.1	556791.9	833081.8	89304.3	705888.5	1464377.4	879011.9	1262631.5

(Source: Government of Thailand, 2012)

• Development and Analysis of Useful Comparators and Indexes

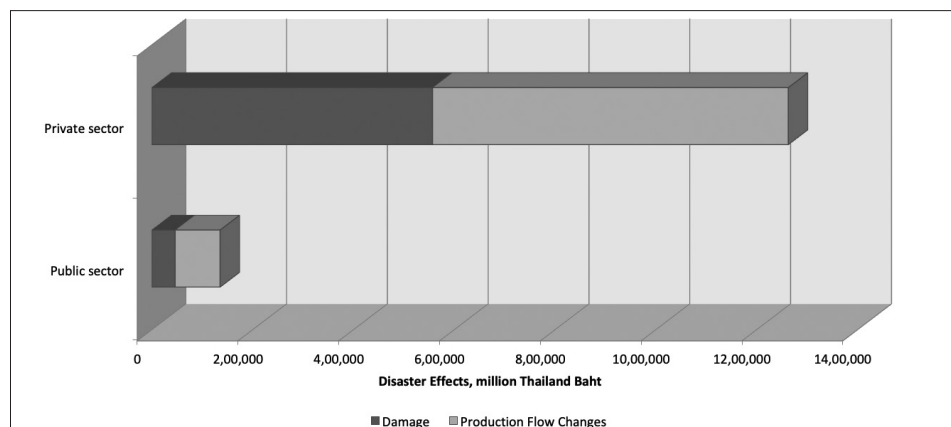
After completing its estimation, the total value of damage and production flow changes must be broken down into its different components.

- o Breakdowns between public and private sector for ownership of disaster effects:¹²⁵ It provides a first indication of the relative weight that each of the two should bear in the execution of post-disaster activities for recovery and reconstruction (See Figure 6.1).¹²⁶

¹²⁵Public sector ownership refers to damage and production flow changes that falls within the purview of the central and State governments; private ownership may be held by either individual persons or households or by private enterprises of different size and characteristics.

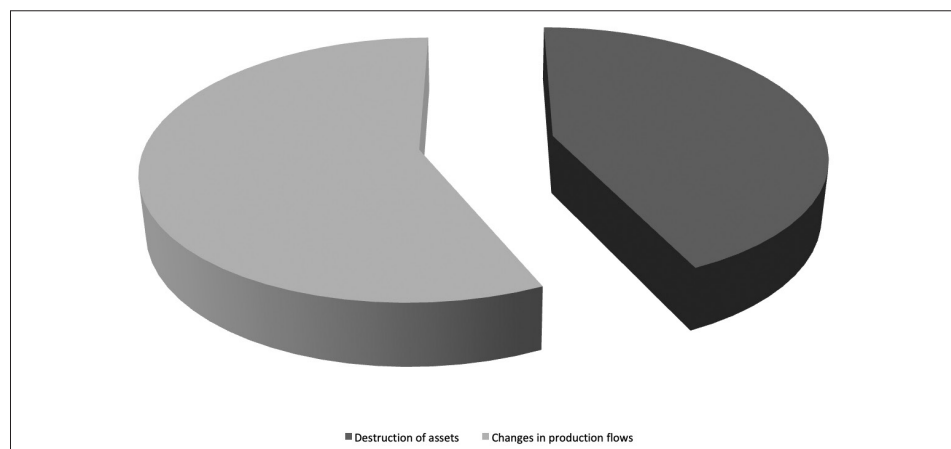
¹²⁶Since very often national governments would assist private individuals, especially those that belong to the lowest-income strata, through the provision of cash grants, credit, and/or other incentives for recovery of production and for reconstruction of their assets after a disaster, the final breakdown of efforts between public and private sectors for reconstruction may differ from what is indicated in the previous chart.

Figure 6.1 Breakdown of Public vs Private Ownership of Disaster Effects, 2011 Thailand Floods



- o Breakdown between damage and production flow changes: It will illustrate whether the disaster has caused more destruction of capital or more negatively affected production of goods and services,¹²⁷ and would provide a first indication of the possible relation between the amount of reconstruction investment requirements and the required increase in expenditures necessary to achieve economic and social recovery. Figure 6.2 shows such a breakdown between damage and production losses in the case of the Thailand Floods in 2011.

Figure 6.2 Breakdown between damage and production flow changes, 2011 Thailand Floods



- o Geographical or spatial breakdown of damage and production flow changes: It enables the identification of the most affected sub-national political divisions, such as Districts within States, which might help in defining the assignation of resources for recovery and reconstruction later on. Evidently, to enable such breakdown, the assessment should consider the collection and analysis of disaster effects at the lowest possible administrative divisions, which would result in the possibility of developing analysis. Table 6.2 captures the effect of Uttarakhand Floods of 2013 on urban housing at district level.

¹²⁷After conducting many assessments of the effects of disasters, it has been found that the relationship between damage and losses varies roughly in accordance to the origin of the natural event that causes the disaster. The DaLA database available at the Global Facility for Disaster Reduction and Recovery (GFDRR) of the World Bank, which includes disasters assessed during the 40-year period between 1972 and the present time (www.gfdr.org/), shows evidence that events of geological origin (such as earthquakes and landslides) normally cause more damage than production flow changes. Disasters of hydro-meteorological origin – such as floods and drought – normally cause more production flow changes than damage.

Table 6.2 Damage to Urban Housing, Uttarakhand

District	Building Typology	Number of units affected
Bageshwar	Pucca	5
Chamoli	Pucca	132
Pithoragarh	Pucca	-
Rudraprayag	Pucca	382
Uttarkashi	Pucca	150
Total		669

(Source: GoU, 2013)

- o **Sectorial breakdown of disaster effect:** It helps to better understand the main disaster-affected activities and to provide a first indication of priorities for recovery and reconstruction. Table 6.3 captures example of sectorial effect of 2004 Indian Ocean Tsunami in India.

Table 6.3 Effect of 2004 Indian Ocean Tsunami on sectors (in USD million)

Sectors	Damage	Losses	Total
Housing	193.1	35.4	228.5
Education	10.7	12.9	23.6
Agriculture and livestock	15.1	22.4	37.5
Fisheries	229.6	338.2	567.8
Livelihoods (Microenterprises and other)	20.0	37.5	57.5
Rural and municipal infrastructure	28.0	1.6	29.6
Transportation	35.2	0.3	35.5
Coastal protection	42.8	0	42.8
Total	574.5	448.3	1022.8

(Source: ADB, & et al. 2005)

Impacts of the damages and losses to the Sectors

The damages and losses to individual sectors will cause impacts the macro-economy, the people and the environment.

Agriculture

In addition to causing destruction of assets, and changes in production flows, a disaster may also have secondary impacts, some of which may last for several years. These secondary impacts include, but are not limited to

- o Macroeconomic impact
- o Socio-economic impact
- o Impact on strategic agricultural indicators.

In addition, disasters do cause stress and thus have a major psychological effect on rural households as well as on human health, nutrition and productivity.

- o **Macroeconomic Impacts**

The macroeconomic impacts fall into four broad categories: gross domestic product (GDP), balance of payments, fiscal balance and inflation.

- **Gross Domestic Product:**

Since GDP and production losses due to disaster are flow concepts, the estimated magnitude of loss in agriculture (by sub-sectors or an aggregate) are used by the macro-economic team to determine the likely reduction in agriculture GDP (as well as for GDP in general) during the year of disaster and over several years after the disaster in some cases. However, in order to undertake this type of analysis, production losses in individual agricultural sub-sectors must be multiplied by the value added coefficients in order to estimate the value added losses. These value added coefficients capture the effect of linkages between the different sectors. In addition to the direct impact of production losses on the level and growth of GDP, the likely secondary impacts of a disaster will also affect the level and growth rate of GDP.

- **Balance of Payments:**

As a result of a disaster, India may have to either import more of certain type of foods or other agricultural commodities, agricultural inputs and equipment and/or reduce exports of agricultural commodities that the country generally exports. This will adversely affect the balance of trade (and hence the balance of payments).

- **Fiscal Balance:**

Following any disaster, the government may have to allocate additional budgetary resources to finance emergency relief, recovery and reconstruction work in the affected agricultural rural areas of the country. In order to finance activities due to a disaster, India may either have to increase budget deficits and/or divert scarce financial resources from public investment for agricultural development to finance post-disaster needs in the agricultural sector. In either case, it will have serious consequences for the annual budget.

- **Inflation:**

Depending on the disaster and its impact on both the demand and supply of agricultural goods and services, it is likely to have consequences on the prices of essential commodities and services and hence inflation. An increase in prices for affected food commodities, following a disaster, is a good example. Similarly, prices for the reconstruction material may also increase during the reconstruction period. The actual impact on inflation would, however, depend on the relative share of affected goods and services in the consumption basket that is used to determine the consumer price index. However, any price impact of the disaster is likely to be temporary.

- o **Socio-economic Impacts**

The socio-economic impact of a disaster may have consequences on employment, livelihood, household income and gender in the agricultural sector. In order to estimate the socio-economic impact there is a need to supplement the relevant secondary information from the disaster areas with appropriate randomly selected sample surveys; focus group discussions; and discussions with the local, State and national NGOs actively operating in the affected area.

- ***Rural Employment:***

The direct and indirect production losses caused by a disaster may result in decline in employment in the short and medium-term. This decline in employment (in person months) in each of the agricultural sub-sectors can be estimated by multiplying the value of production loss with a corresponding labor coefficient that relates the value of production with the number of people employed. The decline in employment in the agricultural sector can be estimated by adding decline in employment in each of the sub-sectors. This decline in employment will affect both family labor and hired labor. India has initiated a national program called NREGA that provides guarantee for a maximum of 100 days per year to the unemployed.

- ***Rural Livelihood Opportunities:***

The livelihood opportunities in rural areas depend primarily on the agricultural and rural non-farm (which depend directly or indirectly on agriculture) activities. The disaster triggered damage to physical assets and production losses will have significant implications on rural livelihood opportunities for the marginal and small farmers and the landless rural households in the short and medium-term. The assessment of the impact on rural livelihood opportunities, however, would require both qualitative and quantitative analysis based on focus group discussions and survey based on randomly selected farming and rural landless households.

- ***Rural Household Income:***

Depending on the type and severity of the disaster, the average income for the farming as well as landless rural households will decline as a result of agricultural production losses, reduction in employment and decline in livelihood opportunities in the agricultural and rural non-farm sectors. Again, an accurate assessment of the decline in household income would require focus group discussions and appropriate household surveys.

- ***Rural Women:***

The likely impact of a disaster on rural women would vary by State and depends on the nature and degree of involvement of women in carrying out agricultural operations. In India, women in the rural areas are actively involved in agricultural and rural non-farm activities such as household gardens, dairy, poultry, harvesting, post-harvest management and marketing. Women are also very active in cash earning backyard economic activities. The information based on secondary data does not always give an accurate picture of the role of women. Hence, this information must be supplemented by focus group discussions and special field surveys.

- o **Impact on Strategic Agricultural Indicators**

- ***Impact on Food Balance, Food Security and Nutrition:***

Disasters that have major effects on the agricultural sector may also have serious consequences on the food balance and food security at the national as well as household level. Until the international food crisis of 2007, most food-deficit countries were gradually increasing their dependence on trade to meet their national food security needs. However, most of them now would like to increase domestic food self-sufficiency and/or food stocks to improve their food security and thereby minimize exposure of their population on the uncertain international market for critical food commodities, particularly rice and wheat. Hence, it is very important to analyze the impact of a disaster on the food balance and food security at the national, State and household levels. However, at present, India is in a position to export both wheat and rice but is net importer of pulses.

This analysis would require a careful examination of food requirements and elements of food supply, including domestic production, stocks (both public and private), and net imports. Requirements for increased food imports have direct implications for foreign exchange needs and balance of payments as well as impacts on the fiscal budget. In addition to the adequacy of food supply in physical terms, it is very important to analyze the implications for access to food by the poor segments of the society that have been affected by the disaster. In this context, food is also an important component of national social safety net and food for work programs that may follow or become even more important after a major disaster. In this context, India has passed the National Food Security Act (NFSA) in 2013 that provides minimum food to qualified citizens at low prices.

- ***Impact on Rural Poverty:***

While there are many poor households in the urban areas, the existence of poverty in India is generally a rural phenomenon. For example, at the national level, approximately 75% of the poor in India live in the rural areas and mostly depend on agriculture for their livelihood. Any disaster that negatively affects agriculture and rural population may seriously increase rural poverty. The small and marginal farming and landless rural households are generally part of the poor households. Disasters have serious consequences for these households. The existence of poverty, however, varies a great deal from one region to another, from one State to another, from one productive sector to another and from rural to urban. With the increasing frequency and intensity of floods and cyclones in India, the likely impact of these disasters on rural poverty would be high.

- ***Impact on Agricultural Natural Resources:***

Some of the environmental and natural resource assets that are either an important part of agriculture or have significant impact on agricultural production are biodiversity, soil, water, forestry and fisheries. Disasters can either damage these natural assets and/or increase production losses. The magnitude of damage and production losses, however, would depend on the type and severity of the disaster. Since most of the environmental and domestic natural resource assets are not tradable, it is difficult to determine their market value. Hence different methods of assessment will be used to estimate the value of damage and losses on environment and natural resources. In order to avoid double accounting, any of the items under this category that are included in the agricultural sector (i.e. agricultural land, fisheries or flood protection) should not be included here. In case of serious damage to agricultural land (soil), the value of the damage can be calculated by using the market value for a comparable land quality. On the other hand, loss can be estimated from the value of lost production until such time that the land quality is fully recovered.

- ***Impact on the Availability of Agricultural Inputs:***

A disaster may affect the quality and quantity of agricultural inputs, including destruction of agricultural land; death of draft animals; damage to the irrigation system and equipment; damage to stored seeds, feed, fodder and fertilizer; agricultural equipment and machinery. Unless transferred from other parts of the country (which will not be possible in case of damage to land or the irrigation system anyway), the availability of most of the affected agricultural inputs will decline and market prices will go up. Since most of the rice crop is transplanted, depending on when the flood came, either the whole crop production is lost (if there is no time to replant) or agricultural inputs used for the crop are lost and have to be replanted (if crop is affected at the early stages). Under these circumstances, disaster may cause lower farmer revenues from crop production due to production loss (loss of crop or decline in crop yield) and/or higher production costs. Again, one must be very careful in making sure that there is no double accounting.

Mining and Quarrying

The assessment team must make additional estimations, beyond the values of damage and changes in production flows for the sector, in order to provide inputs to the macro-economic assessment team to estimate disaster impact at the macro level and to the separate team in charge of estimating disaster impact at personal or household levels.

In that regard, note should be taken that disasters that have affected the mining and quarrying sector have caused significant macro-economic impact due to the strategic importance of the sector. In the case of Ecuador in 1987, a net oil exporter country, overall GDP growth declined by nearly 5 per cent due to the losses in production and exports. The floods in Serbia in 2014 caused the national economy to recede because coal production, which is essential as an input for electricity generation, declined significantly, and the country had to import electricity from neighboring States in order to meet its energy demands during the winter. After the Nigeria floods in 2012, the country faced a slight decline in oil production but still maintained a positive overall GDP growth. The above is of importance for India since the country is a net importer of oil, and any negative disaster impact on this sector may bring about the need for importing larger amounts of oil and the corresponding impact on the balance of payments and trade.

Inputs for the macro-economic impact analysis would include, in addition to the estimation of gross production decline and of higher production costs (which are essentially higher values of intermediate consumption at the macro level), the following items:

- o Estimations of the value of imported components for the reconstruction and replacement of physical assets and equipment and machinery that cannot be produced domestically in India and that must be imported from abroad, as this will have a negative bearing on the balance of payments (BoP) and trade (BoT);
- o Estimations of possible decrease in exports of mining and oil-related products and possible increase in imports of same, arising from the decline in production caused by the disaster, as this information will also be required for the analysis of disaster impact on BoP and BoT; and
- o Estimations of possible lower revenues and higher expenditures in government-owned enterprises that operate in the sector, as this combination may have an impact on the fiscal position of the country.

The sector assessment team should also analyze possible disaster impact on the final sale prices of fuel and natural gas to consumers as a result of the disaster, and estimate the possible value of such price increases in order to provide elements to the government to decide on possible transference of such higher costs to the consumers via an increase in retail prices vis-à-vis the possibility of establishing temporary subsidies to the products involved. Whatever the decision on that issue is, it would cause either a further negative impact on the fiscal position or a negative impact on the quality of life of individual or household consumers, and the results of the analysis must be transferred opportunely to the macro-economic assessment team and to the team in charge of analyzing disaster impact at the personal/household level.

In addition to the above, the mining and quarrying assessment team must deliver the estimated values of sectorial production decline to the team in charge of estimating disaster impact at personal and household levels, so that they may use such values as input to estimate possible income decline of the labor force employed in the sector.

Manufacturing

The industrial or manufacturing sector assessment team must make additional estimations in this sector that may have an impact at both the macro-economic and personal or household levels, and deliver them to the separate assessment teams handling those issues.

o **Macro-economic impact analysis: The following must be estimated:**

- The estimated value and calendar of industrial production flow changes (including gross production decline and possible higher production costs), expressed in current value, to be used for the analysis of disaster impact on gross domestic product and growth
- The estimated value of industrial goods that will not be possible to export to other countries due to the estimated decline in production, and/or the estimated values of goods that may need to be imported from abroad due to shortages in their domestic production, since they will have a bearing on the balance of trade and payments
- The estimated imported component of the industry sector reconstruction costs (including the items that are not produced locally in India and that will have to be imported from abroad), expressed in percentage (%) terms of reconstruction needs once they have been assessed, to be used for the analysis of disaster impact on the balance of payments
- Estimated values of tax revenues that will not be accrued by the Central or State governments due to the decline in industrial production, to be used for fiscal sector impact analysis
- Values of decline in production and higher production costs arising from the disaster in the case of government-owned industrial enterprises, to be used in the analysis of disaster impact on the fiscal sector.

In order to estimate possible disaster impact at personal or household levels and on human development, estimates of industrial production decline and of associated employment losses are to be delivered to the team in charge of the subject. It is to be remembered that the subsequent losses in personal or household income that arise from production losses in the industry sector are not to be added to the estimated value of production flow changes, since that would result in double accounting of disaster effects. Rather, these losses in personal and household income are disaster effects measured at a different level of analysis.

Electricity and Gas

Disaster impact may be measured at different levels: sectorial, macro-economic and personal or household levels.

- o **Impact at sector level:** It may be expressed through the decline in electricity production or sales caused by the disaster. As such, it may be expressed in terms of the percentage decline in production or sales of electricity caused by the disaster.
- o **Impact at macro-economic level:** It is to be estimated separately by the macro-economic assessment team, using quantitative information on the decline of electricity production and sales and their consequences estimated by the electrical sector assessment team.

For that purpose, the electrical sector assessment team must furnish the following quantitative results to the macro-economic assessment team:

- The value, in current monetary terms, of the post-disaster production and sales of electricity for the current calendar year of the disaster and for at least two sub-sequent years, in comparison to the equivalent values that had been expected if the disaster had not occurred.

- The estimated cost of economic recovery needs, as derived from the estimation of changes in production and sales of electricity flows; of special importance here would be the quantification of possible higher imports of fuel for generation of electricity that may arise due to the disaster.
 - The estimated cost of reconstructing the destroyed assets in the electrical system and a calendar of the annual investments required for it. This cost would be equal to the estimated value of damage, duly increased by the cost to introduce disaster-resilient features to the system and thus reduce disaster risk in the future.¹²⁸
 - The estimated values of the imported component of reconstruction costs (i.e. of items that are not manufactured in India and must be imported from abroad, such as certain equipment, machinery and other construction materials), so that the macro-economic assessment team may be able to estimate disaster impact on the balance of payments and trade.
 - The estimated values of government costs involved in economic recovery that are over and above the government's regular contribution to the sector, so that the macro-economic assessment team may estimate disaster impact on the fiscal budget position.
- o **Impact at the personal or household level:** It must be estimated through two different ways. First, a comparison is to be made of the percentage of number of households connected to the electrical grid and having direct access to electricity supply, prior to and after the disaster. Such indicators of pre-disaster and post-disaster household access to electricity are to be used by the macro-social assessment team to estimate overall macro-social impact of the disaster, combining it with other similar indicators from other sectors of activity such as household income decline, access to water supply and sanitation, food security, health, and others. In addition, the disaster may have induced delays in achieving Millennium Development Goals (MDGs) in regard to access of urban and rural families' direct access to electricity; such facts must also be reported to the macro-social assessment team for use in estimating human development impact.

Second, estimates are to be made by the electrical sector assessment team of the possible household cost arising for the need to substitute non-available electricity for cooking, heating and other uses, which the households may have to spend in purchasing fuel or other energy substitutes. This higher cost to households is to be delivered by the electrical sector team to the macro-social assessment team.

Water supply, sewage and waste management

In addition to the estimation of the value of destroyed assets and production flow changes, the water and sanitation assessment team is required to carry out some additional estimations, and their results are to be transferred to the macro-economic assessment team, since they may have a bearing on the macro-economic performance of the State or affected areas, and on the overall well-being of individuals and families affected by the disaster.

In regard to the macro-economic impact analysis this would include: first, the possible impact of production flow changes on GDP; second, on the balance of trade and payments and, third, on the fiscal budget, especially when the water and sanitation sector enterprises are government-owned or are privately-owned but receive subsidies from the government.

¹²⁸Experience acquired in many cases of disaster assessment conducted in the past 40 years shows that to estimate reconstruction requirements in the electrical sector, a range of 10 to 20 per cent over the value of damage may be adequate to ensure disaster risk reduction in the electrical sector; however, the actual percentage to be used is to be determined by the electrical sector assessment team on the basis of the specific conditions of each case.

The impact of production flow losses on the government budget is to be estimated in terms of temporary increased operational costs and lower revenues. If the government directly owns the sector enterprises, losses will be sustained by the fiscal budget. In the case of a private sector enterprise that receives a government subsidy, the water and sanitation assessment team should ascertain whether the subsidy would remain uninterrupted and at the same level during the post-disaster recovery and reconstruction stages, or whether it may need to be temporarily increased, as indicated before.

In the damage assessment, estimates are to be included to ascertain the value of assets including equipment, machinery, parts, materials that will require to be imported from abroad for the reconstruction stage when they are not produced in India, since this would have a negative impact on the balance of payments.

The above information is to be supplied by the water and sanitation assessment team to the separate team in charge of undertaking the overall, macro-economic impact analysis.

In order to ascertain disaster impact at the personal or household levels, the water and sanitation assessment team must estimate possible higher costs to obtain the sector's services that would affect personal or household well-being, and deliver the results of such estimations to the separate assessment team in charge of estimating disaster impact on human development. In the case of urban households, such higher service costs may occur due to an increase in monthly service charges and/or to the purchase of bottled water; in rural households, these may be in the form of longer times required by household members to fetch water from far-away sources, and through additional expenditures to purify water, deepen and clean wells and other similar expenditures. The value of these additional or higher household costs are to be delivered to the separate assessment team that is quantifying disaster impact on human development. Furthermore, quantitative information on the post-disaster decline in water supply and sanitation service coverage and access for the population in the affected areas¹²⁹ is to be delivered by the water and sanitation team to the separate team in charge of estimating human development impact. Lastly, any quantifiable setbacks caused by the destruction of water and sanitation assets in the attainment of Millennium Development Goals (MDGs) are also to be delivered to the same team in charge of estimating human development impact.

Trade, hotels and restaurants

The trade, hotels and restaurants (commerce sector) assessment team must make additional estimations in this sector that may have an impact at both the macro-economic and personal or household levels, and deliver them to the appropriate assessment teams that are handling disaster impact analysis.

o Macro-economic impact analysis:

The following values must be estimated by the assessment team and delivered to the macro-economic impact assessment team:

- The estimated value and calendar of changes in the flows of sales (including lower sales levels, and possible higher cost of sales,¹³⁰ expressed in current value, to be used for the analysis of disaster impact on gross domestic product and growth;

¹²⁹This refers to the pre-disaster and post-disaster rates or percentages of persons or households that have access or have domestic connections to the water and sanitation systems in urban and rural areas, which are to be used in estimating changes in quality of life.

¹³⁰These are in fact higher values of intermediate consumption.

- The estimated value of goods that will not be possible to export to other countries due to the shortages of production, and/or the estimated value of goods that may need to be imported due to shortages in their domestic or local production, since this would have a bearing on the balance of trade and payments of India;
- The estimated imported component of the commerce sector reconstruction costs (including the items that are not produced locally in India and that will have to be imported from abroad), expressed in percentage terms of reconstruction needs once they have been assessed, to be used for the impact analysis on the balance of payments;
- Estimated values of tax revenues (sales taxes or value added taxes, depending on the tax scheme of India that will not be accrued by the government due to the decline in commerce sector sales, to be used for fiscal sector impact analysis; and
- Values of decline in sales and higher production costs arising from the disaster in the case of government-owned commerce enterprises, to be used in the analysis of disaster impact on the fiscal sector.

o **Impact on personal wellbeing and on human development**

The following values must be estimated by the trade sector assessment team and delivered to the human development impact assessment team:

- The estimated value of sales that will not be made by trade enterprises after the disaster, which may translate into possible employment and personal income losses of the commerce sector labour force
- The estimated value of informal-sector sales obtained from the separate sample survey of informal traders conducted in the shelter camps, which would translate into livelihood and income losses.

The assessment team for the sector should be aware that any losses in personal or household income are not to be added to the value of losses in trade sales; otherwise, double accounting of disaster effects would occur. Instead, the team should realize that these losses in personal or household income are disaster effects measured at a different level of analysis.

Tourism

The tourism sector assessment team must carry out additional estimations in the sector that may have an impact at the macro-economic and personal or household levels, and transfer the data to the respective teams in charge of disaster impact analysis (the macro-economic impact analysis team and the human development impact analysis team).

o **Macro-economic impact analysis:**

The following items must be estimated by the tourism sector assessment team and be provided to the macro-economic assessment team:

- The estimated value and timeframe of decline in tourism services flows and of higher intermediate consumption or higher production costs, both expressed in current or nominal values, for use in the subsequent analysis of disaster impact on gross domestic product (GDP);
- The estimated corresponding values and time frame of foreign exchange losses due to the temporary non-arrival of foreign tourists, for use in balance of payment (BoP) analysis;

- The estimated value and timeframe of the information and promotion campaigns to regain foreign tourists trust, also for use in balance of payments analysis;
- The estimated value of temporary decline in government revenues corresponding to the decline in foreign tourism arrivals, including tourism and sales taxes, tourist visas and permits, etcetera, for the analysis of fiscal impact;
- The cost of the possible share of the government in the financing of the information and promotion campaign, for fiscal sector impact analysis;
- The estimated value of imported assets (of both construction materials and equipment and furniture) that are not manufactured locally and that must be imported from abroad for the reconstruction program, for use in the analysis of balance of payments
- The estimated value of re-insurance proceeds that may be received in India after the local insurers request for reimbursement from foreign insurance companies, to be used in the analysis of balance of payments.

The tourism sector assessment team should deliver its estimation of the value and expected time frame of losses in tourism services revenues to the assessment team in charge of estimating disaster impact on employment and personal or household income. Based on the value of tourism sector revenue losses, that team should estimate possible losses in employment and personal income of the tourism-sector labor force.

Transport

After the estimation of the value of destroyed assets and of production flow changes for the sector has been completed, the transport sector assessment team is required to carry out additional estimations of possible impact at the macro level, and their results are to be delivered to the team in charge of the assessment of macroeconomic impact and to the team entrusted with analyzing disaster impact on human development.

- o Additional estimations are to be made of the possible macro-economic disaster impact referred to the country's gross domestic product (GDP), on the balance of payments (BoP) and trade (BoT), and on the fiscal budget. These estimations are to be made regardless of whether the transport facilities and services are government owned or under concession to private enterprises. In that regard, the transport sector damage assessment should include the necessary breakdowns so that estimations can be made of the value of rehabilitation and reconstruction items that must be imported from abroad – including equipment, machinery, construction materials and skilled labor – due to absence of domestic production (the so called “imported component” of damage).
- o Estimations must be made of the impact of transport flow changes on the country's balance of payments and trade, through the estimation of any significant amounts of increased imports or decreased exports of fuels for the transport sector arising from the disaster.
- o The impact of losses on the government budget must be ascertained in terms of increased operational costs and lower revenues when the government directly owns transport enterprises and services.
- o The team should estimate the possible lower fiscal revenues arising as a result of the disaster due to temporary interruption of traffic flows and the corresponding decline of fees for the operation of transport facilities under the public sector domain, as well as the possible higher costs of vehicular fleet operations, for use in the estimation of fiscal impact.

The above information is to be delivered by the transport sector assessment team to the separate assessment team in charge of overall macro-economic impact analysis.

In addition to the previously described estimations, once the transport sector assessment team has completed the estimation of higher transport costs faced by households and individuals when using private transport means (i.e. their own vehicles) such additional costs are to be delivered to the assessment team in charge of analyzing disaster impact on human development.

Communications

The communications sector assessment team, after completing the estimation of the value of destroyed physical assets and of the disruption of communication flows, must undertake further estimations of disaster impact at macro-economic and individual or household levels for delivery to the separate assessment teams in charge of such impact assessment.

In the case of the macro-economic impact, the communications sector team must estimate the relevant amounts to ascertain the possible decline in growth of gross domestic product at the State level (GSDP), the possible changes to the balance of trade (BoT), and the possible deterioration of the State fiscal position. In that respect, the communications sector assessment team must estimate and deliver to the macro-economic impact assessment team the following information:

- o Possible decline in revenues of the communications enterprises – both publicly and privately owned companies arising after the disaster, and the possible increase in their operational costs which are in fact an increase in intermediate consumption, arising from the disaster, for use in the analysis of impact on overall economic growth;
- o The estimated value of the imported component of recovery and reconstruction requirements, including the equipment and construction materials that are not produced in India and must be imported from abroad, for use in the analysis of the impact on the balance of trade;
- o Any possible losses in foreign exchange earnings that may arise when damage to the communications system impedes or slows down the international flow of communications, for use in the analysis of disaster impact on the balance of trade;
- o Possible temporary lower revenues and higher costs of operations faced by government-owned communications enterprises as a result of the disaster, that may have a negative impact on the fiscal position; and
- o Possible lower tax revenues arising as a result of lower sales of communications revenues and possible temporary increase of any government subsidies required during recovery and reconstruction in lieu of an increase in communications tariffs and charges, to be used in the analysis of the fiscal position.

In addition to the above, the communications sector team must estimate information on any required increase in the tariffs and rates charged to consumers arising from the higher costs of operation of the communications system as a result of the disaster, and deliver such costs to the separate human development impact assessment team.

Financing, Insurance, Real Estate and Business Services

The scale or magnitude of the event to the sector must be fully understood to assess the impacts of this sector. One way to do so is to examine the proportion of houses of the national housing stock that has been either destroyed and/or partially damaged. Another is to present the number of households that require

temporary shelter and for how long. The change in economic flows collected, as part of the assessment should be presented so that they can be taken into account in the examination of the overall economic impact. It may be found that Government's unexpected expenditure to safeguard the well-being of the populations, who have been displaced as a result of the effects of the event on the housing sector, may affect the Government's fiscal position.¹³¹

The imported content of the sector and thus the likely impact of the construction requirements for new building materials on the country's net import earnings should also be examined. It would be important for the age of the houses totally or partially destroyed, to be ascertained, as this may have an impact on the capital account, which is to be analyzed by the macro-economic team.

The impact on the construction sector, which supports the housing sector, should be considered. The realistic capacity of the construction sector to meet the additional demands of the construction of the temporary shelters, filling the housing gap or deficit that has been created by the destruction of already existing houses and the demand for reconstruction from other sectors whose assets have been destroyed as well, while engaging in their normal construction activities needs to be evaluated. Are the skills in the sector available and capable to meet the higher overall post-disaster demand or is additional capacity required? Where homeowners are involved in the construction of his own house, community-based skills training to impart risk reduction techniques should be considered and its cost estimated. The impact analysis should speak to the adherence and or relevance of the country's building codes to the future risk in the sector.

It should answer whether or not the private owners will require Governmental support to rebuild or if their costs of rebuilding will be adequately met, and from which sources. Can it be met by the level of insurance in the sector? In the case of India, the lowest income sectors are without insurance suggesting that when a disaster occurs, private home owners look to Government for support in the rebuilding efforts or they rebuild on their own using inadequate standards. Government has supported the rebuilding efforts through the disbursement of an initial gratuitous relief. Unfortunately, as was noted earlier, because such grants have not always been tied to robust estimation of the disaster effects in the sector, the rebuilding efforts may have led to continued and even higher inherent risks and vulnerabilities.

Community, Social and Personal Services

Options for estimating disaster impacts:

- o Examine the proportion of educational facilities damaged and destroyed as a proportion of the national or State stock.
- o Estimate the number of students that will either be affected by the event and for how long and the number of school days lost in the calendar year. The value of GDP for the education sector is defined by the number of hours of education time provided to students.

Thus, we need to know if the disaster causes school interruptions, which are not compensated in the same calendar year of the event. The change in economic flows collected, as part of the assessment should be presented to the macro-economic assessment team so that this can be taken into account in the examination of the overall economic impact. It may be found that Government's unexpected expenditure to keep children in schools through the rental of facilities or the creation of temporary facilities may affect the Government's fiscal position.

¹³¹The government of India provides an initial gratuitous relief ranging from Rs 2,000 to Rs 25,000 to households who have suffered total or partial damage to housing as a result of an event. As was noted following the Koshi flooding report by the WB, this grant should not be considered as a viable reconstruction cost, since it is far below the actual cost of damage and reconstruction and may lead to poor quality housing and increase vulnerabilities in the future.

The imported component of the sector (i.e. the value of items not produced in country, and which must be imported from abroad) and thus the likely impact of the construction requirements for new building materials on the country's net import earnings should also be examined.

The impact analysis should also address the social dimension of the event. How has the quality of life been affected due to the lower number of school days or time spent in school? Will the event affect the completion of examinations unfavorably for a particular group of students? Will it result in certain students being kept away from school for a period of time, which may result in discouraged students or early transition into the work force? Will teachers suffer hardship through relocation from unaffected areas to affected areas? And what of the psychosocial trauma suffered by both students and teachers, what may be the effects and for how long may they be so affected?

There may also be impacts at the household or personal level caused by having to acquire books and training materials, school uniforms, etcetera that were destroyed by the disaster; or maybe caused by the increase in school fees or transport, etc. There may be additional costs to the household food bill as children no longer receive supplemental meals at school. These additional household costs, are not to be added to the changes in sector flows to avoid double accounting; instead, these additional costs of living should be delivered to the assessment team in charge of estimating disaster impact at household or personal level.

In the final analysis it would be important for the sector team to ascertain the extent to which the event may delay the government meeting its stated development goals in the education sector.

Health

The key points are:

- o Examine the proportion of health facilities to the national or sub national stock of health facilities that have either been destroyed and/or partially damaged
- o Present the time required to continue the temporary health facilities until the rebuilt permanent facilities come on stream.
- o The economic impact should be reflected in the change in economic flows collected as part of the assessment presented, so that this information can be taken into account in the examination of the overall economic impact to be done by the macro-economic team. It may be found that Government's unexpected expenditure to safeguard the health of the population who have been affected as a result of the effects of the event may affect the Government's fiscal position.
- o The imported component of the sector which includes the likely impact of the construction requirements for new building materials and the importation of damaged or destroyed health equipment and medical supplies may impact negatively on the country's net import earnings and this should also be taken into account. This will become apparent on the impact of the country's balance of payments (BOP).

The assessment team is expected to address the consequences of the event on the health status of the population or address the social impacts. Will there be any long-term effects of the event, or threats of new epidemics? Will the effects of the event impact negatively on the government being able to meet its stated health goals? These are some of the issues that will be explored in the impact analysis.

The assessment team needs to address the impact of the event on the workers in the health sector and to ensure that the differential impact on male and female workers is taken into consideration, in light of the usual preponderance of females in the health sector workforce. Issues such as overtime, deployment in faraway locations and that of safety, will have to be explored.

Culture

The key points:

- o Examine the proportion or significance of cultural facilities damaged and or destroyed as a proportion of the national or global stock.
- o Estimate the number of persons who would not have access to the historical site or would be affected as a result of the disruption caused by the event and for how long will this disruption may last.
- o The change in economic flows collected as part of the assessment should be presented so that this can be taken into account in the examination of the overall economic impact of the event to the national, State or regional economy. Does the culture sector, or some particular part of it, provide a stream of foreign exchange earnings or revenue and if so how has this been affected by the disaster? It may be found that Government's unexpected expenditure to provide access to religious or other heritage facilities, may affect the Government's fiscal position.
- o The impact analysis should also address the social impact of the event. The impact of the event at the personal and or household level should be examined, in terms of lost household income and livelihoods.

One may look at the impact of the event on persons who have been involved in the production and sale of cultural products. This information should be disaggregated according to the number of women and men who work in the creation of cultural products and how their income earning potential has been affected. This information may be captured by the trade and commerce sector but it is important for the culture sector team to bring this to the attention of the commerce team if they have not picked it up.

The cultural sector assessment team would be expected to speak to the possible threats or opportunities for conflict resolution or exacerbation, which may arise as a result of the impact of the cultural sector in a disaster.

Environment

The impact of the disaster on the environment may be expressed in terms of the percentage reduction in total environmental assets that existed prior to the disaster and of the fraction of carbon sequestration, regulation of the water cycle, and other environmental services that has resulted after the disaster. These are the consequences of the effects of the disaster on the environment in the affected area.

The environment assessment team should be aware that the estimated values of environmental asset destruction and of losses in environmental services are not to be used to estimate the macro-economic impact of the disaster, since these values are not used to estimate gross domestic product (GDP) at national or State levels. However, after the recovery and reconstruction requirements for the environment have been estimated, it is possible that the implementation of such programmes may involve the need to import assets or construction materials that have no domestic production in India, or the need to reduce exports of domestic products to meet the post-disaster internal demands. The environment assessment team should estimate the cost of those additional imports and the cost of the possible non-exports arising from the post-disaster recovery and reconstruction stages, and inform the macro-economic assessment team accordingly.

Furthermore, should any of those activities involve additional expenditures or any change in collection of taxes of any kind (increases in import duties or decline in export duties, as an example), such amounts are to be estimated by the environment assessment team and delivered to the macro-economic impact assessment team for inclusion in the analysis of fiscal impact.

Overall Macro-Economic Impact Estimation

o *General Comments*

Macro-economic impact is defined as the consequences of the effects of a disaster on the overall economic performance of the affected country or States. A number of individual analyses are to be made to define the macro-economic impact of a disaster, as there does not exist a single parameter for that purpose. Indeed, the estimated sectorial values of disruptions in the flows of production of goods and services are to be used to examine disaster impact on the value and performance of the gross domestic product (GDP or GSDP) at national and State levels, the balances of trade and payments, and the fiscal position.

There is a need to carry out a step-wise approach for the analysis of post-disaster impact at the macro-economic level. This is due to the fact that negative setbacks are likely to occur initially at the macro level in response to the decline in sectorial production, and because positive impacts may be obtained subsequently after recovery expenditures are introduced and eventually by reconstruction investments, depending on the effectiveness and degree of inclusiveness of the same.¹³²

Therefore, macro-economic disaster impact assessment should involve a distinction between the impact caused by the disaster itself and the subsequent impact of post-disaster activities or interventions aimed at recovery, reconstruction and risk reduction.

The following subsequent steps:

- Analysis of isolated disaster impact, bearing in mind that such impact is to be measured immediately after the disastrous event has occurred, and which would remain in place if no recovery and reconstruction activities were undertaken¹³³
- Analysis of the separate and subsequent impact of the post-disaster recovery expenditures and reconstruction investments.

The macro-economic assessment team should be aware, however, that not all disasters may cause a measurable impact at the macro-economic level which may warrant the introduction of interventions to stabilize the overall economy, since a disaster may only cover and affect limited geographical areas of a country or a State, or an event may not affect strategic sectors of economic activity. In fact, many events are likely to have only a localized impact on the geographical areas covered by the natural phenomenon causing the disaster without negatively impacting, in significant terms, the macro-economic position of the country or of the State. On the other hand, it is to be pointed out that all disasters whether large or small may cause significant impact and suffering at the personal or household levels, which would require the undertaking of interventions to lessen such negative conditions in the very short term. In addition, while

¹³²Many persons tend to erroneously combine the negative impact of the disaster itself with the possible positive impact of post-disaster activities of recovery and reconstruction, and as a result may state that disasters bring about (net) positive results on the macro-economic performance of a disaster-affected economy. In fact, such net positive outcome is not likely to occur in all cases of disaster, but only in industrialized countries that have a significant capacity to develop and to face economic crises. In developing countries – and India is no exception – the total effects of disasters are not defined and the national capacity to undertake and finance recovery and reconstruction which fact may lead to the result that the net negative impact of a disaster is never fully overcome.

¹³³It is precisely based on such isolated disaster impact – assuming no recovery and reconstruction activities are carried out – how a strategy and goals for recovery and reconstruction are defined right after a disaster occurs.

disasters may have a negative impact on specific sectors of economic and social activity, they also may – directly or indirectly – induce positive effects on other sectors, and thereby affect different population groups in both negative and positive manners.

The impact of the disaster is to be measured with respect to the baseline given by the expected or forecasted performance of the national or State economy if the disaster had not occurred. That is to say, the value of sectorial production flow changes is to be superimposed on the performance of the economy that had been forecasted by the central or State authorities before the disaster occurred for the current and several subsequent years. This superposition would enable measuring the “delta” on economic growth caused by the economic shock imposed by the disaster at the national or State levels.

Disaster impact is not expected to be the same at different levels of aggregation in the analysis. The estimated isolated disaster impact at the macro-economic level may not be significant for the country as a whole, while it may be significant at the State level; in addition, it may be substantial in specific, individual affected sectors depending on which activities have sustained more disruption of productive activities. Moreover, sector-level impact may vary from one sector to the other, as a function of the degree of affectation of their respective activities; in many cases, the negative impact may be very high, while it is quite possible that other sectors (such as that of construction, industry and trade) may actually derive positive benefits during recovery and reconstruction.

- **Use of the System of National Accounts for Macro-Economic Impact Assessment**

As has been pointed out before in this handbook, the System of National Accounts consist of a coherent, consistent and integrated set of macro-economic accounts, balance sheets and tables that have been defined on internationally-agreed concepts, definitions, classifications and accounting rules. These accounts provide a comprehensive record of most of the complex set of economic activities occurring at all times in an economy, and of the inter-action between economic agents and groups of agents that goes with it. It may be stated that the National Accounts System is a quantitative macro-economic representation of the national income cycle that uses the principle of double-entry bookkeeping of business accounting as well as several accounts, in order to show existing relationships between the various economic variables.

Use is to be made of the System of National Accounts for the estimation of the macro-economic impact of disasters. Experts in the macro-economic assessment team should be fully acquainted with the use of such tool (UN, 2003), and should apply their knowledge to convert into added value the data received from the sectorial assessment teams, which will normally include gross production values.

Application of the National Accounting falls within the institutional domain of the Central and State Statistical Offices in India. It seems therefore advisable that representatives of such government agencies should be part of the macro-economic assessment team.

- **Baseline Information for Macro-Economic Impact Assessment**

The undertaking of the analysis of macro-economic disaster impact assessment requires the availability of baseline information on pre-disaster conditions. Two types of information are required: first, historical data on the performance of the main macro-economic aggregates for the disaster-affected country and State, including gross domestic product (GDP or GSDP), balance of payments (BOP), fiscal sector position and consumer price information for recent years¹³⁴; second, the most recent forecasts available on the same variables for the current and subsequent years of the disaster.

¹³⁴Missing

On the basis of such information the scenario of macro-economic performance that would have prevailed in the country if the disaster had not occurred is to be developed by the macro-economic assessment team. The economic flow changes arising from the disaster, as estimated in the analysis of sectorial disaster effects are to be superimposed on the “non-disaster” scenario, so that the “economic growth delta” caused by the disaster in question can be estimated, assuming that as a first stage in the analysis – no post-disaster interventions are to be made. Afterwards, as subsequent steps in the analysis, the estimated positive values of recovery interventions and reconstruction investments are to be superimposed, with the anticipated appropriate time delays, to forecast their positive impact on the performance of the economy.

Another item required as part of the baseline for the assessment of disaster impact is the full list of technical coefficients or ratios that relate value added over output for each sector of economic activity included in the GDP or GSDP figures. These coefficients or ratios are obtained from the supply-and-use tables of the National Accounts, which are normally developed by the Central Statistical Office and its State equivalent institutions.¹³⁵ Table 6.4 shows such values of the technical coefficients, as derived from the most recent published national account statistics.¹³⁶

Table 6.4 Technical coefficients that relate value added to output for all sectors of economic activity in India for year 2011-12

Sector and Sub-sector		Technical Coefficient
Agriculture, forestry and fishing		
	Agriculture	0.772
	Forestry	0.845
	Fishing	0.861
Mining and quarrying		0.786
Manufacturing		0.191
Electricity, gas and water supply		0.432
Construction		0.347
Trade, hotels and restaurants		0.840
Transport, storage and communications		
	Railways	0.592
	Other transport	0.376
	Storage	0.606
	Communications	0.884
Finance, insurance, real estate, business		
	Banking and insurance	0.798

¹³⁵These value added/output ratios are developed on the basis of detailed census on output and costs which are conducted by Statistical Offices in benchmark years; the same Offices estimate the value of these ratios for non-benchmark years.

¹³⁶See Sequence of National Accounts, India, 2013, National Accounts Division, Central Statistical Office, New Delhi, 2013.

	Real estate, ownership of dwellings	0.830
Community, social and other services		
	Public Administration	0.758
	Other services	0.778

(Source: Central Statistical Office of India)

Annual historical data on the current account balance of the balance of payments is required together with the forecasted balance information for the current and two or three subsequent years after the disaster.

Annual values on both historical and forecasted series of revenues and expenditures, showing the current, fiscal and primary accounts, will be required as baseline for analysis of the fiscal sector. A table showing the current types of taxes is another essential element of baseline required for this analysis of fiscal sector impact.

Baseline data on the historical annual variation of consumer price indexes (CPI), together with forecasted quarterly variation for the current year of the disaster, and annual forecasted values of the same variable for the years after the disaster are also to be obtained in order to enable the conversion between nominal and constant values for the analyses.

Lastly, a set of historical data on official exchange rates between the national currency and that of the United States Dollar may also be required for the assessment, and should be obtained from the proper authorities.

o **Procedures for the Estimation of Macro-Economic Impact**

The macro-economic assessment team should follow a step-wise approach for the estimation of the possible impact of disasters at the macro-economic level. The UN-ECLAC Handbook provides the required theoretical background for such type of analysis (UN-ECLAC, 2003), the practical aspects of the analysis that members of the macro-economic assessment team are described here¹³⁷. It should be recalled that the process first analyzes the impact of the disaster in isolation, and later on examines the possible positive impact of activities designed to achieve economic recovery and reconstruction.

Three stages are required in order to determine any resulting negative or positive impact on the macro-economic performance of a country affected by a disaster:

- i. Considering only the isolated effects of the disaster in terms of changes in economic flows, and assuming no recovery and reconstruction interventions;
- ii. Considering the positive impact of economic recovery activities, after the needs for economic recovery have been estimated separately for each of the sector teams; and
- iii. Considering the positive impact of disaster-resilient reconstruction, after the needs for reconstruction with risk reduction features have been estimated for each sector.

¹³⁷ Advantage is taken here of the detailed procedures prepared by the same author of this document for publication under the macro-economic impact analysis chapter of the European Union (EU)-United Nations-World Bank PDNA Handbook, which is about to be released shortly, duly adapted to Indian conditions.

o Possible disaster impact on gross domestic production performance

The macro-economic assessment team should first estimate the possible disaster impact on the performance of gross domestic production after a disaster, as part of a three stage approach. The first one assumes no recovery and reconstruction activities and enables to estimate the isolated impact of the disaster, which in fact is a worst-case, post-disaster scenario.

1. Determine the value of gross domestic product that is to be used as baseline for comparison in the analysis of GDP or GSDP impact after the disaster, for the current and for several (1 to 3) subsequent years, depending on the possible duration of disaster effects as indicated by sectorial assessment teams.
 - i. Obtain the most recent – but as yet not affected by any disaster effects value of gross domestic product for the affected States, using constant values, in the year of the disaster.
 - ii. Prepare a table showing gross State domestic product for the year of the disaster and for several subsequent years, for use as the basis for comparison of isolated disaster impact, expressed in constant terms.
2. Using data from the sectorial assessments, already converted into constant values by using deflation coefficients obtained from Central Bank or Bureau of Statistics, develop sectorial tables to estimate disaster impact using the model spreadsheet presented in the next page. These sectorial tables should have three main columns for the estimation of disaster impact per calendar year of the analysis, beginning in the current year of the disaster and continuing on with subsequent years during which disaster impact is expected. Referring to the spreadsheet shown below, fill in the required information and make the following estimations:

A	B	C	D	E	F
1			Non Disaster	Post Disaster	Disaster Impact
2	Gross production, Rupees		$D2=D3*D4$	$E2= E3*E4$	
3		Quantity produced, tons	D3	E3	
4		Producer price, LCU/Ton	D4	E4	
5	Intermediate consumption, Rupees		$D5=(1-D6)*D2$	$E5=(1-D6)*E2$	
6		Value-added coefficient	D6	D6	
7	Post-disaster higher cost of production, Rupees			$E7= E8$	
8		(From sectorial assessment)		E8	
9	Value Added, Rupees		$D9=D2-D5$	$E9=E2-E5-E7$	$F9=E9-D9$

In the column for non-disaster or baseline conditions, again using data already converted into constant values, enter the data obtained from the forecasted performance of each sector for the current year of the disaster:

- i. Estimate the quantity of production expected (D3) and multiply by the forecasted price paid to the producer (D4) to obtain the non-disaster forecasted value of gross sectorial production (Cell D2);
- ii. Use the value of sectorial value added coefficient obtained from Table 5-1 (D6), to obtain the forecasted value of intermediate consumption under non-disaster conditions (filling in cell D5 using the formula provided in the spreadsheet);
- iii. Obtain the non-disaster forecasted value added of production for the sector (D9) by subtracting intermediate consumption (D5) from the value of gross sectorial production (D2) and fill in cell D9 using the formula provided.

In the column for post-disaster conditions enter the data (again using constant values) obtained by the sectorial assessment team for each sector for the current year of the disaster, and carry out the necessary estimations as follows:

- i. Estimate the sector-estimated quantity of post-disaster production (E3) and multiply by the estimated price paid to the producer (E4) to obtain the estimated post-disaster value of gross production (fill in cell E2);
- ii. Estimate the normal value of intermediate consumption, using the same value of the technical value-added coefficient as used for non-disaster conditions, filling in cell E5;
- iii. Fill in cell E7 with the sector-estimated higher production costs taken from the assessment;
- iv. Estimate the post-disaster value added of production for the sector (E9) by subtracting the normal intermediate consumption (E5) and the post-disaster higher cost of production (E7) from the estimated post-disaster value of gross production (E2) and fill in cell E9.

Disaster impact: Estimate the value of disaster impact in the last column of the spreadsheet to obtain disaster impact (in cell F9), by subtracting the post-disaster value added of production for the sector (cell E9) minus the non-disaster forecasted value added of production (D9), which will yield the impact of the disaster on production for the sector analyzed. Repeat the procedure for all sectors of economic activity that may have been affected by the disaster and for the subsequent calendar years during which impact may still be significant, and aggregate them to obtain the total impact of the disaster.

In preparing this table, the macro-economic assessment team (using their knowledge of national accounting) must ensure that only production losses and higher production costs that are included in the national accounts are taken into consideration¹³⁸. For this purposes, readers are referred to the section on Production boundary and principles of valuation, included in the United Nations Handbook of National Accounts.

3. In addition to the above, the estimated post-disaster higher production costs (as exemplified under cell E8 in the above spreadsheet, and expressed in constant values) are to be taken as increases in production in the sectors where they will be actually produced, and similar spreadsheets are to be developed in order to estimate their value added for addition to the forecasted GDP, as shown in the following additional spreadsheet:

¹³⁸In that regard, higher values of personal consumption (for instance in the sectors of water and transport) should not be included in this analysis.

A	B	C	D	E	F	G	H
1	Higher production costs		Post-disaster higher production				
2	Sector/Item	Gross value, LCUs	Sector	Item	Gross value, LCUs	Value-Added Coeff.	Value Added, LCUs
3	Agriculture						
4	Seeds provision	350.0	Trade	Import of seeds	350.0	0.35	122.5
5	Fertilizer costs	650.0	Industry	Fertilizer production	650.0	0.45	292.5
6	Pesticide costs	350.0	Industry	Pesticide production	350.0	0.45	157.50
7	Transport						
8	Fuel consumption	2,100.0	Trade	Sales of fuel	2,100.0	0.35	735.0
9	Maintenance costs	1,800.0	Services	Vehicle maintenance	1,800.0	0.35	630.0
10	Health						
11	Vaccination costs	450.0	Industry	Vaccine production	450.0	0.45	202.5
12	Information campaign	250.0	Industry	Printing costs	150.0	0.45	67.5
13			Services	Dissemination fees	100.0	0.35	35.0
14	Total						2,242.5

In the above spreadsheet use is made of several examples that require clarification and explanations to ensure clear understanding. First, in the agriculture sector, higher expenditures are required for the post-disaster acquisition of agriculture inputs (seeds, fertilizers and pesticides for replanting of the seasonal crop) which increase the intermediate consumption in the sector; these translate in sales of seeds in the commerce sector and in production of fertilizers and insecticides in the industry sector. Second, in the transport sector, the higher costs of transport involved in the utilization of longer alternative roads that must be used because of destruction of certain road sections that result in higher costs of transport sector costs (which again increase intermediate consumption in the transport sector), would translate in additional fuel sales in the commerce sector and in more vehicle maintenance in the services sector. Third, the health sector requires conducting a vaccination campaign together with an information campaign to control an increase in morbidity after a disaster, which is taken as an increase in intermediate consumption in health, but this also translates into higher production of vaccines and information material in the industry sector as well as a sale of consultancy fees in the advertisement or commerce sector.

The value added for each of the activities under the sectors listed under column D is to be obtained from multiplying the value of each activity listed under column E times the value added coefficient listed for each sector of economic activity under column F. Once each cell of column F is estimated, the total of column F is obtained and filled in cell F14, which is to be added to the value of pre-disaster GDP forecast.

4. Convert the value of houses destroyed by the disaster into value added losses, using the discount coefficients normally included in the GDP component of “ownership of dwellings” or “rental of dwellings”.¹³⁹
5. Prepare a summary table showing the annual values of production losses (as described under point 2 in this section) and higher intermediate consumption production (as described under point 3 of this section), expressed in constant values by deflating nominal loss values using the implicit price deflator in each calendar year as estimated by the sectorial assessment teams, ensuring no duplication among sectors exists.
 - i. Estimated sectorial output losses should be included as having a negative sign (After adding up all sectorial losses as described under point 2 above).
 - ii. Estimated higher intermediate consumption production should be assigned to the sectors where the additional production are actually going to be made in a proportion defined by the sectorial specialists, and should have a positive sign (As described under point 3 above).

The table should have as many columns as the number of years that each of the negative or positive production flow changes would cover, on the basis of the sectorial specialists’ findings.

6. Estimate post-disaster gross domestic product (GDP), for the year of the disaster and for several subsequent years.
 - i. Subtract the disaster-induced, value-added production losses -ii) from the non-disaster forecasted GDP figures, and subtract the value of dwelling ownership destroyed by the disaster as given in point 4), using constant values.
 - ii. Determine the resulting annual post-disaster GDP growth rates, for the entire period of analysis, and compare them to the forecasted growth rates if the disaster had not occurred, to ascertain disaster impact (as shown in Table 6.5 in the following page), and prepare a time chart showing GDP change over time. In order to do that, if a significant modification has arisen in the labor force due to the action of the disaster i.e. a sizable number of deaths, and/or of temporary or permanent disability of workers, or of prolonged illness the additional sudden decline in GDP for the first subsequent year is to be introduced.¹⁴⁰

The step-wise procedure described above applies to all three stages of the analysis of disaster impact on GDP: the first, to estimate isolated disaster impact, when no recovery and reconstruction activities are included; the second, including the positive impact of recovery activities, once recovery needs have been estimated; and, the third, superimposing the positive impact of disaster-resilient reconstruction investments, after reconstruction needs have been estimated.

¹³⁹In this case, only the damage value of houses for which formal ownership is defined is to be considered; informal housing damage is not to be included in these calculations.

¹⁴⁰This would imply the availability of detailed information on the number of deaths, in terms not only of number, but of age, sector of employment, etcetera. Should this breakdown of data be unavailable, average values may be utilized and factored in the estimations, as was done in the recent case of the Haiti earthquake in 2010.

Table 6.5: Example of GDP Impact Analysis after the 2000 Mount Merapi Volcanic Eruption in the Sleman District, Indonesia, 2010 (In Constant-Value, billion Rp)¹⁴¹

	2009	2010	2011	2012
Non-Disaster GDP Performance				
GDP, real billion Rp	12,504	13,285	14,133	15,031
Forecasted annual growth rate, %	5.11	6.25	6.38	6.36
Disaster Induced Losses				
Production decline, real billion Rp		- 229	- 585	--
Intermediate consumption production, real billion Rp		22	47	--
Losses in destroyed house ownership ¹⁴²		...	...	...
Net production losses, real billion Rp		- 207	- 538	--
Post-Disaster Impact on GDP Performance				
Post-Disaster GDP, real billion Rp		13,079	13,595	15,031
Post-Disaster annual growth rate, %		4.60	2.33	6.36
Post-Disaster GDP Impact, %		- 1.65	- 4.05	--

o Possible disaster impact on the balance of payments

This part of the macro-economic impact assessment should only be conducted only for the case of disasters that affect the entire country of India or significant parts thereof. It needs not be carried out for the analysis of disaster impact at the State or District level.

The following steps are to be followed to estimate the possible impact of a disaster on the balance of payments in India after a disaster.

1. Determine the information on the current account of the balance of payments that is to be used as baseline for the analysis of post-disaster impact, for the current and subsequent years, depending on the likely duration of disaster effects as indicated by the most affected sectors.
2. Obtain from sectorial estimations of production flow changes, those that would have an impact on increasing imports or decreasing exports of both goods and services (on the Balance of Trade), over the current and subsequent years where disaster-induced production flow changes are to be spread over.
3. Subtract the higher imports and lower exports obtained in step 2 from the value of the different components of the current accounts in the Balance of Payments, to obtain the resulting post-disaster value of BOP.

¹⁴¹See World Bank, Damage, Losses and Needs Assessment, Mount Merapi Volcanic Eruption, Jakarta, Indonesia, 2010.

¹⁴²In this case, most of the houses that were destroyed were of the informal type; thus, losses on home ownership in the national accounts are negligible.

The example shown in Tables 6.6 and 6.7, which refer to the impact of the recent swine flu pandemic in a small Caribbean island country, illustrates the procedure described above for the estimation of the disaster impact on the current account of the balance of payments.

Table 6.6: From Value of Production flow changes to Impact on Balance of Trade, after Swine Flu Pandemic in a small Caribbean country, in million J\$

Sector	Production flow changes		Imported or exported component, %	Disaster impact on: (million J\$)	
	Type of flow change	Value (Million J\$)		Exports	Imports
Agriculture	Plantation production	23.1	30	6.9	
Manufacture	Large industry output	5,479.8	30	1,643.9	
Tourism	Tourism sales	8,465.0	100	8,465.0	
Mining	Mining production	144.9	100	144.9	
Health	Anti-viral medication	142.9	100		142.9
Total		14,255.7		10,260.8	142.9
Goods				1,795.8	142.9
Services				8,465.0	

Table 6.7: Estimation of Disaster Impact on Current Account of Balance of Payments, in million US\$

Component	Non-Disaster	Value of production loss	Post-Disaster
Goods balance	- 545		- 570.8
Exports	378	23.9	354.1
Imports	923	1.9	924.9
Services balance	148	112.9	35.1
Other income	- 124		- 124.0
Current transfers	313		313.0
Current account balance	- 209		- 346.7

Needless to say, should production flow changes arising from the disaster last for more than one year, the above tables would need to show data for each of the subsequent years. At the time of the second stage of macro-economic impact analysis which is to estimate the possible impact of recovery activities – the macro-economic assessment team must include the value of imports that may be required during the recovery period, such as food which may be required if domestic production is insufficient to ensure food security after the disaster. When stage three of the macro-economic impact analysis is carried out – i.e. to ascertain the impact of disaster-resilient reconstruction the macro-economic assessment team should

bear in mind that the value of the imported component of reconstruction investments must be factored in when some construction materials and equipment or machinery are not produced in India, as estimated by the sectorial assessment teams. Furthermore, that the receipt of any re-insurance proceeds coming from abroad and with their estimated delays would also have a positive impact on the balance of payments, only if and after such amounts are received and invested in India.

Any foreseen increase in the amount of family remittances coming from abroad to assist disaster-affected persons or households in their recovery and reconstruction must also be factored in by the macroeconomic assessment team into the analysis of post-disaster impact on the external sector.

o **Possible disaster impact on public-sector finances**

After a disaster, the normal levels of expenditures and of expected receipts or revenues may be negatively impacted, due to the need to finance recovery and reconstruction, provide temporary tax exemptions to affected individuals and enterprises, and due to the lower revenues collected because of declines in production and sales.

A list of such individual impacts on government finances follows:

- i. Decline in current revenues caused by decrease in tax revenues: the tax base, tax rates, possible temporary reductions in import duties, and non-tax revenues;
- ii. Decline in capital revenues due to destruction and damage to property;
- iii. Possible increase in current expenditures: increases in operations outlays, increases in transfers and decreases of interest on public debt; and
- iv. Increase in capital expenditures: increase in direct investment, capital transfers and financial operations.

Some of the items described above would result from post-disaster recovery and reconstruction such as possible temporary tax holidays to enterprises to assist them in recovery, and increases in capital expenditure that occurs during reconstruction and should be isolated and dealt with after the first stage of impact analysis.

In India, such fiscal budget disruptions are likely to occur at the State level, and also at the central level. The macro-economic impact analysis should be first conducted at the State level and, if warranted, expanded to the national level.

The fiscal impact of the disaster should be analyzed by estimating the gap between State government operations and their financing, taking into consideration as that of State enterprises.

The first stage of the analysis is intended to quantify the isolated disaster impact on public finances that assumes no activities or interventions to achieve recovery and reconstruction are ever conducted, which in fact is a worst-case post-disaster scenario. Later on, subsequent stages of the analysis involve the quantification of the possible impact of recovery interventions as well as the possible impact of disaster-resilient reconstruction investments.

The following are the steps that the macro-economic assessment team should carry out to estimate the possible isolated impact of a disaster on the State fiscal sector:

1. Obtain the available information on State government revenues and expenditures, referred to the situation before the disaster, that is to be used as baseline for the analysis of post-disaster impact, for the current and for several (1 to 4) subsequent years, depending on the likely duration of disaster effects as indicated by the most affected sectors.
2. Obtain the different prevailing rates of taxes applied to production and sales that constitute the total revenues for the State government. On that basis and in combination with production and sales flow changes estimated during the assessment in each sector of economic activity, estimate the reduction or decline in revenues that arise after the disaster, during the current and subsequent years, as needed.
3. Obtain the extraordinary expenditures that the State government has had to make to face the post-disaster emergency situation (without including recovery and reconstruction activities) that may result in other development activities not receiving their intended funding.¹⁴³
4. Superimpose the value of losses in revenues and of higher, unforeseen expenditures on the baseline on the State government budget, and ascertain how the State government budget has been affected due to the disaster.

An example of estimation of disaster fiscal impact on a small island economy where flu pandemic occurred is given in Table 6.8. First of all, the second column shows the “non-disaster” fiscal situation if the disaster had not occurred; the third column shows the lower revenues on sales taxes and export duties that would not be collected due to lower production caused by the disaster, as well as the bauxite extraction levy that would not be collected for the same reason; as well as the increased expenditures for medical attention and other services that were required. The last column on the right shows the resulting fiscal sector position after the disaster. The impact of the disaster and the fiscal sector may be obtained from the comparison of values from the “non-disaster” and the “post-disaster” columns.

Table 6.8: Estimation of Flu-Pandemic Disaster Impact on Fiscal Sector

Non-Disaster Losses due to Pandemic		Million J\$		
		Post-Disaster		
Revenue and grants		41,054		39,246
Current revenues		39,651	-1,807	37,844
	Tax revenues	36,522	-1,798	34,724
	Non-tax revenues	2,399		2,399
	Bauxite levy	731	-9	722
	Capital revenues	711		711
	Grants	691		691
Total expenditures		45,057		46,244

¹⁴³The following State government expenditures for the emergency stage after a disaster: costs of setting up and running temporary shelter schemes, costs of providing medical attention to injured persons and of monitoring and controlling higher morbidity arising from the disaster, costs of providing temporary education facilities and services, costs of re-opening road traffic, cost of emergency food provision, costs of relief assistance given to affected population, et cetera, which are not covered from the State DRF and central DRF funds, and which may have to be financed from the regular development budget.

	Current expenditures	39,648	1,187	40,835
	Programs	8,716		8,716
	Wages and salaries	13,626	1,187	14,813
	Interests	17,306		17,306
	Capital expenditures	5,409		5,409
Current balance		3		-2,991
Fiscal balance		-4,003		-6,998
Primary balance		13,303		10,308

It is to be noted that in the above example, only taxes on production were considered since there was no destruction of assets, as may occur in the case of earthquakes, landslides and floods. Needless to say, when assets are destroyed, property taxes should also decline and be included in the analysis.

The macro-economic assessment team should again conduct the above-described impact analysis in the three post-disaster stages mentioned above: i.e.

- First: assuming no recovery and reconstruction
- Second: assuming only recovery activities are conducted
- Third: after disaster-resilient reconstruction is undertaken.

• Social Impact Assessment

Following a disaster, individuals and their households usually suffer significant harm. In addition to the destruction of assets there may be unfortunate loss of life, injuries, homelessness and loss of livelihoods. Social protection measures, which were being provided by the state, may be disrupted.

It is the task of the social assessment team to ascertain the details of the effects of the event on the population, their employment, livelihoods and social protection and make clear the differential impact of the disaster on women and men, including the psychosocial impact, both at the household and personal level. Finally, as far as possible, the impacts, which the event may have at the macro-social level should be clearly and concisely presented, and recommendations for recovery should be made to address the identified needs of the population arising from the disaster.

The social assessment team should comprise, in addition to government officials from the Ministries responsible for people's conditions such as Social Development, Labor, Social Welfare, Gender and Children's Rights, anthropologists, sociologists, gender experts and economists.

o Pre Disaster Situation or Context

The social assessment team should collect and describe the pre-disaster situation of the population in the affected areas. The number of people and households living in the affected areas, disaggregated by age and sex, is essential. Information on the prevailing cultural norms and social structures, living conditions, livelihood patterns and any on-going social protection measures afforded them, should be described.¹⁴⁴ What proportion of the population makes use of such social protection measures and for what period of time in any given year should be ascertained? All of this information should be disaggregated by the sex of the population, where possible. ¹⁴⁵

¹⁴⁴Some of this information should be available from the sectorial assessment reports.

¹⁴⁵Missing

Special attention should be placed on particularly vulnerable groups such as children, the differently abled or the aged, and the varying positions of scheduled castes. The Central and State statistical offices should be a rich source of the most recent information about the population. Other information, both quantitative and qualitative, can be sourced from past household surveys, poverty assessments, labor force surveys, reports on women and children, academic studies and other relevant reports prepared by State, national and international agencies.

o **Post Disaster Effects**

Following a disaster, it is essential to be able to assess the situation of the population as a result of the event. Governments are anxious to know the number of people who have lost their lives, who have suffered injury, who are made homeless, and who may have lost their livelihoods. They want to know the demographic characteristics of the affected population and they want to understand the extent of the effects and the distribution of the affected population, at the level of the State, the Districts and the panchayats or talukas (administrative districts) as the case may be.

Usually the first respondents, who are engaged in humanitarian relief efforts, collect information on the affected population. Sector specialists, who visit into the communities seeking to verify the effects in their particular sector, may also collect it. But it is the duty of the social sector team to verify the data collected and present it in such a manner that the government is able to ascertain the extent or magnitude of the event, its geographic spread, the extent of the State or national level population affected and the socio-demographic characteristics of the affected population.

Table 6.9 presents the details of the affected population from the Gujarat Earthquake January 26, 2001 according to Deaths and Injuries, by affected districts and talukas. The PDNA methodology allows for standard definitions of the affected population grouped into the primarily affected, the secondarily and the tertiary affected persons. Such a classification allows the policy makers to be able to set priorities for action with regard to not only relief but recovery and reconstruction as well.

- o **Primary affected population** is that category of population affected by the direct effects of the disaster and consists of the dead, the injured and the disabled (primary trauma victims), as well as those who suffer material losses as a direct and immediate consequence of the disaster (such as the homeless and displaced). This segment is made up of people who were in the affected area at the time the disaster occurred.
- o **Secondary affected** persons are classified as those, living in the affected areas that have sustained losses in production, income and access to services.
- o **Tertiary affected** persons are that are sustaining higher costs of services (transport, water, sanitation and electricity) as a result of the disaster but may not be living in the affected areas.

Table 6.9 Gujarat January 26, 2001 Earthquake: Deaths and Injuries

Districts	No. of Affected Talukas	Population1 (September 2000)	Deaths	Injuries	Death Rate (per thousand)	Percentage share of total death	Percentage share of total injuries
Seriously affected districts							
Ahmedabad	11	5,367,464	750	4,037	0.14	4.03	2.42
Jamnagar	11	1,829,397	119	4,930	0.07	0.64	2.96
Kutch	10	1,477,160	17,030	136,000	11.53	91.55	81.57
Patan	8	1,516,584	34	1,695	0.02	0.18	1.02
Rajkot	14	2,941,577	422	11,946	0.14	2.27	7.16
Surendranagar	10	1,414,406	112	2,907	0.08	0.60	1.74
Other districts:							
Amreli	11	1,544,746	-	5	-	-	0.00
Anand	8	1,927,914	1	20	-	0.01	0.01
Banaskantha	8	2,318,413	32	2,770	0.01	0.17	1.66
Bharuch	8	1,343,480	9	44	0.01	0.05	0.03
Bhavanagar	11	2,408,570	4	45	-	0.02	0.03
Gandhinagar	4	1,034,505	8	241	0.01	0.04	0.14
Junagadh	14	2,446,752	8	89	-	0.04	0.05
Kheda	10	2,098,010	-	28	-	-	0.02
Mehsana	9	1,827,351	-	1,339	-	-	0.80
Navasari	5	1,270,283	17	52	0.01	0.09	0.03
Porbandar	3	549,269	9	90	0.02	0.05	0.05
Sabarkantha	8	2,060,509	-	56	-	-	0.03
Surat	8	3,975,616	46	184	0.01	0.25	0.11
Vadodra	6	3,554,674	1	256	-	0.01	0.15
Valsad	5	1,272,960	-	-	-	-	-
Total	182	44,179,641	18,602	166,734	0.42	100	100

(Source: *Economic Consequences of the Gujarat Earthquake*. Ashok K. Lahiri, Tapas K. Sen, R. Kavita Rao, Pratap Ranjan Jena. 2001 page 7)

• Impact analysis

The social sector team has the responsibility for helping policy makers understand how the event has impacted on the people and their well beings. The results of the impact assessment should be presented concisely and clearly. The team should always make clear the differential impact of the event on men and women. Gender analysis allows for an understanding of gender as a social stratifier similar to other stratifiers such as class, ethnicity, caste and age, which should comprise the analysis.

Consequences of the effects: Impact speaks to the consequences of the effects of the event, which may be manifested in the short, medium or long term. Impact analysis can be defined as conjecture based on sound knowledge following a scrutiny of the results of the PDNA assessment, taking into account the pre and post disaster situation and the country's development goals.

The impact analysis, as far as is possible should be presented at two levels, the micro level and the macro level.

Micro-level social impact: At the micro level the social impact, where data is available, should be presented at the level of the household and that of individual persons. When examining the situation at the level of the household, issues such as the impact of the event on household heads – male and female with regard to changing roles and responsibilities, increased or decreased dependency (or burden of care) as a result of the disaster, on changing patterns of income and consumption, changing risks to health and on changing housing conditions and geographic location, are to be analyzed fully. With regard to the individual, the most significant indicator is change in personal income.

Important for India are the ex-gratia payments, which are made to affected persons and households as a result of a disaster. These payments are expected to support personal and household income and thus reduce the social burdens following a disaster. Table 6.10 presents the amounts of such ex-gratia payments that were made to persons following the Gujarat earthquake. The extent to which these payments address the full or partial impact of a disaster on the population and allows them to buffer from the worst effects of the disaster or to buffer from the likely long term impact is difficult to ascertain as extensive assessments of the full effects of a disaster (delineating the estimation of damage and changes in economic flows) have not been undertaken in each sector following disasters.

In order to understand the actual social impact of a disaster on a given population, sector assessment teams should capture the extent of the change in economic flows and disruption in access to goods and services as a result of the event in each sector of activity. This information, when examined, would provide the necessary information to undertake an impact analysis at the level of the household and the individual.

Table 6.10 Gujarat Earthquake January 26, 2001, Ex-gratia Payments to Victims

Relief to next of kin in the case of death	
Death relief:	Rs.1 lakh for a major and Rs.60, 000 for a child
Additional death relief:	In addition to the death relief, Rs.50, 000 to government employees and school children.
Relief in the case of injury	
Injury above 40 per cent: (permanent disability):	Rs.50, 000
Less than 40 per cent:	Rs.25, 000
Major Surgery:	Rs.10, 000
Minor Surgery:	Rs.5, 000
Minor Injury:	Rs.2, 000

(Source: *Economic Consequences of the Gujarat Earthquake*. Ashok K. Lahiri, Tapas K. Sen, R. Kavita Rao, Pratap Ranjan Jena. 2001 page 10)

Over 90% of India's labor force is engaged in the informal sector, suggesting that following a disaster many informal sector workers may have their income-earning activities disrupted. Since salaried workers (mainly found in the formal sectors) often do not face income disruption as a result of disasters, the social sector team should focus its attention on income earned through wages with special attention to the wages of the informal workers. Data on earnings among informal workers by sector is available from the labor force survey reports.

On the basis of information received from the sectorial assessment teams, the extent and value of production losses and information on how long a time activities in a particular sector of activity may be disrupted (such as roads and transport after flooding), the social impact assessment team should be able to arrive at an estimate of income losses for informal workers (such as those engaged in the transport, trade or other sectors). A gap analysis should be conducted comparing what was their expected normal income before the event and what they actually earn as a result of the event. This should be captured for all sectors of activity. Loss of income will result in deterioration of the living conditions of households and individuals.

Box 6.1 Treatment of Informal Sector in Impact Analysis

- Establish the average daily, weekly or monthly wages of informal sector workers by the different sectors
- Collect from Sector specialists the length of time disruption of process in their sectors are expected to continue
- Estimate the loss of income earning by the informal workers in the sector
- Analyse what the social and economic results may be on the well-being of the informal sector workers (identifying which group may be most at risk and which will have the most advantage) as a result of the combination of increased expenditure of households due to possible increased costs of food, transport and medical expenses and decreased earnings over a period of time.

In addition to lost income, persons and households may be expected to face increased expenditure to cover higher food costs, higher transport costs and possible increased medical costs. The combination of income loss and increased expenditure may have the result of decreased overall well-being for the individual or the household.

Because male and female heads of households have different productive and reproductive roles and burdens, the effect of loss of personal income to a head of household who is male or female, may result in differing levels of hardship to the household.

Loss of income may in turn, result in increased poverty levels in the areas affected by the disaster. The social impact assessment team should examine the household incomes and the poverty threshold to ascertain how many households and /or individuals may fall below the poverty levels as a result of reduced income and over what period of time. By undertaking a gap analysis utilizing baseline data from selected indicators from the multi-dimensional poverty assessment surveys such as income and expenditure data, and labor force data, it is possible for the social impact assessment team to ascertain the change in status of the affected population following a disaster; and the proportion of population that may fall deeper into poverty. Geographic areas of the country or State should present this information, if data is available.

o **Macro-Social Impact**

At the macro level the social impact assessment team should consider the utilization of a selected number of indicators available at the national or State level that would be sensitive to disasters for use in measuring the impact of the disaster on the quality of life of the members of the community.

Indicators that may be sensitive to define the macro-social impact would be those whose data sets have been used in sectorial assessments and where a marked change is measurable in the limited time period of a PDNA. The availability of such data sets would enable a gap analysis between the pre disaster situation as defined by the baseline indicators and the post-disaster situation as captured in the sectorial assessment reports. Data such as the number of children enrolled in the school system in a specific geographic area, within a specific period of time is one such data set (it may be presented as the number of days lost to education during the school year). As part of the assessment, the education sector assessment team would collect from the ministry or department of education the post-disaster enrolment data, thus enabling the possibility of calculating a change in the gross enrolment ratio.¹⁴⁶

The number of families or households whose homes have been destroyed may be another indicator, which can be used. The existing housing deficit could be used as the benchmark for what the country or the State considered as goal for achieving a particular standard in the housing sector. The fact that the disaster may cause an increase in the housing deficit would be cause for concern. The delay in the State or the country meeting its housing goal may provide a sound indicator as a measure of the quality of life.

Another possible macro-social indicator could be the number of households with access to potable drinking water. This baseline indicator is usually available in the national population and housing census, or in the most recent household survey or the report on the MDGs. From the data set produced by the water and sanitation assessment team that examined the effects of the disaster on the water production and distribution in the country or State, the social impact assessment team should be able to ascertain the change in the number of persons with access to potable water as a result of the disaster ¹⁴⁷.

Table 6.11 presents data from the Uttarakhand disaster assessment report on the reduced capacity of potable water production and distribution to the number and percentage of urban population by affected District as a result of the disruption of services. The report had noted that some 80% of the urban population had access to piped water before the disaster. This was reduced to as low as 8% to a high of 23% in the different districts.

¹⁴⁶The United Nations Educational, Scientific and Cultural Organization (UNESCO), describes 'Gross Enrolment Ratio' as the total enrolment within a country "in a specific level of education, regardless of age, expressed as a percentage of the population in the official age group corresponding to this level of education. In other words the GER = number of actual students enrolled / number of potential students enrolled (the total number of school age individuals).

¹⁴⁷The MDG Report 2014, noted that during 2012, in rural India, 88.5% households had improved source of drinking water while in urban India 95.3% households had improved source of drinking water. The prevailing trend over time, suggests attainability of nearly 100 cent percent coverage by 2015, including both rural and urban sectors.

Table 6.11. Summary of damage sustained in the urban water supply system in the State of Uttarakhand following flash floods and landslides, June 2013

Districts	Number of affected towns	People directly affected	% urban population of the district	Average reduction in level of supply (in lped)	Potable water production capacity reduced (in MLD)	Number of intakes/ tube-wells damaged	Pipeline damaged (in km)
Bageshwar	1	2,000	8%	20	0.50	1	0.2
Chamoli	9	26,900	23%	20	2.20	24	12.5
Pithoragarh	2						0.3
Rudraprayag	2	2,900	10%	27	1.00	8	9.1
Uttarkashi	2	9,900	13%	55	3.60		3.5
Almora	1	-	-	-	0.30		
Champawat	2						0.1
Dehradun	4				6.00	4	1.0
Haridwar	3	42,535	5%	3	10.50	4	0.2
Nainital	6	-	-	1	0.80		0.4
Pauri	4	14,400	12%	40	6.60	8	7.65
Tehri	5	13,430	16%	17	1.20	1	5.5
Total	41	112,105				50	40.45

(Source: Uttarakhand Assessment, Joint Rapid Damage and Needs Assessment Report 2013)

Other indicators that may be sensitive to disasters are those that address population density, the quality of housing as defined by the materials of construction used in the outer walls or materials used in the construction of roofing, or the use of pit latrines. In regard to the use of pit latrines, the population and housing census, 2011, indicates that more than 50% of the households of India did not have a latrine facility within premises, though this was an improvement of 10 percentage points compared to the corresponding percentage recorded during the last decade.¹⁴⁸

Using damage data from the housing sector assessment on the number of pit latrines totally or partially destroyed as a result of a disaster, the social impact assessment team can undertake a gap analysis using the data from the pre-disaster situation to measure the change in number of latrines existing. Table 6.12 presents data collected following the Uttarakhand floods on the number and percentage of destroyed pit latrines.

¹⁴⁸In 2011, the percentage of households with no latrine was reduced to 53.1% from 63.6% in 2001 at all-India level as reported by the MDG Report 2014

Table 6.12. District-wise sanitation damage assessment, 2013 Uttarakhand floods

Districts	Total no. of HHs accessing toilets before calamity	Total no. of damaged HH toilets	Damaged SLWM infrastructure	
			Soak Pit	Drains (m)
Part A-Worst five affected Districts				
Bageshwar	37138	45	60	3080
Chamoli	53047	398	369	5080
Rudraprayag	31760	296	224	1332
Uttarkashi	46920	51	110	1454
Pithoragarth	67392	140	130	3580
Total	2,36,257	930	893	14,526
Part B-Other eight affected Districts				
Almora	72126	229	260	3910
Champawat	33513	863	765	3507
Dehradun	57866	84	90	2509
Haridwar	117706	69	70	4312
Nainital	48001	164	170	2503
Pauri	81089	185	205	5511
Tehri	82084	165	185	2112
Udham Singh Nagar	91514	649	690	2880
Total	5,83,899	2,408	2,435	27,244
Grand Total-A and B	8,20,156	3,338	3,328	41,770

(Source: Uttarakhand Assessment, Joint Rapid Damage and Needs Assessment Report 2013)

Once the social impact assessment team is satisfied with the soundness of the analysis undertaken with regard to the separate indicators, then the findings may be constructed into a composite index, which can represent a post-disaster quality-of-life measure. Such an index may be constructed with a 0 to 1 scale so that the index that is close to zero (0) would represent a low impact on the quality of life and close to one (1) would represent a high impact on the quality of life.

It has been argued that a composite index or indicator can summarize complex, multi-dimensional realities with a view to supporting decision makers. Such composite indices may be easier to interpret than a battery of many separate indicators; can assist in the assessing progress on recovery over time; and can reduce the visible size of a set of indicators without dropping the underlying information base.¹⁴⁹ The data that is selected to become part of the composite index should be selected on the basis of their analytical soundness, measurability, country or State coverage, relevance to the phenomenon being measured and relationship to each other.

¹⁴⁹See Handbook on Constructing Composite Indicators: Methodology and User Guide. 2008. OECD. In <http://www.oecd.org/std/42495745.pdf>.

o The Psycho Social Dimension

Impacts also have a psychosocial dimension, which should be considered. Crises of a psychosocial nature are described as such because they involve situations where the psychological needs of the individual (i.e. psycho) are in conflict with the needs of society (i.e. social).¹⁵⁰

The literature suggests that most people will recover from traumatic events such as emergencies and disasters without professional intervention. Some will require assistance. A small minority of people (10-20%) is at risk of developing significant mental health conditions and will require specialized mental health care.¹⁵¹ Table 6.13 presents the possible differential responses between women and men as a result of stressors caused by a disaster. The stressors identified are the death of a family member or loved one and personal trauma, which could result from injury or shock caused by loss of home or as a result of experiencing flooding or an earthquake.

Table 6.13 Psychosocial dimensions of responses to disasters by distress and gender

Distress	Female	Male
Death	Signs of hopelessness; Suicide ideation	Suicide; Increased Consumption of alcohol; Inability to resume work;
Trauma	Weepiness, difficulty in decision making, unable to engage in loving relationships, intrusive memories, nightmares, sleeplessness; Reduced appetite	Sleeplessness Abandonment of family; Dysfunctional behavior

(Source: Study on Psychosocial Trauma)

The World Health Organization (WHO) has warned that following a disaster; a 'disaster syndrome'¹⁵² may become apparent in as many as 75% or as low as 25% of those affected. The WHO has defined the disaster syndrome as a specific behavioral pattern that is characterized by stunned, dazed and apparently disengaged behavior.

The social impact assessment team should ascertain the quality of services that may be required to support such persons suffering from some level of post-traumatic stress disorder or are affected by the 'disaster syndrome' and over what period of time. In addition, the impact of such responses on the recovery and reconstruction of the community should be considered.

o Recommendations for macro-social recovery

Arising from the social impact analysis and consultation with the affected population and key stakeholders, the social impact assessment team should develop recommendations for a recovery strategy. The government may have its own social goals so it is important to review recent sector, national and State development plans or budget statements. Having included a social impact assessment team as part of the assessment should result in deeper appreciation of the social dimensions of the disaster and will make a profound difference in enabling the authorities to shift the paradigm from humanitarian relief and response to long term resilient recovery and development.

¹⁵⁰Adapted from Erik Erikson. Source: <http://www.simplypsychology.org/Erik-Erikson.html>.

¹⁵¹Overview of the Psycho-Social view of Disasters. Source: <http://www.ncbi.nlm.nih.gov/pubmed/15453154>.

¹⁵²The Psycho-Social Consequences of Disasters. WHO 1992

Among the key questions, which the Government wants answered is what is an indicative cost of recovery in the sector and how long is recovery estimated to take. To arrive at the cost of recovery it is important to take into consideration the cost of increasing resilience of the population and thus reducing future risk. Measures that can catalyze livelihoods, offer income generating activities and social protection measures to safeguard the communities to future risks will have to be identified and their costs should be estimated.

How long recovery may take is a factor of not only the measures for financing for recovery but the capacity in related sectors such as the construction sector and infrastructure as road or bridges may affect access, education, health, and the Government's own financial capacity to meet the demands for supportive social protection measures.

When all of these and other measures are taken into account, a realistic time frame can be provided to answer how soon recovery may take place in the sector.

- **Case study: Analysis of Indian Ocean Tsunami 2004 impact and effect**

Introduction: The 2004 Indian Ocean Tsunami affected more than a dozen countries across Asia and Africa and the five worst affected countries were India, Indonesia, Maldives, Sri Lanka and Thailand. A regional study was conducted to analyze the economic impact of the Tsunami with the objective to understand the spatial distribution of effects, identify priority sectors and vulnerability.

Findings: The total impact of the disaster was estimated at USD 9,930 million, which included USD 5,597 million (56 per cent of total effect) as damage while USD 4,333 million as losses. The damage and losses in five worst affected countries are at Figure 6.3, while impact in the worst affected states/provinces are at Figure 6.4.

Figure 6.3 Damage and losses in five worst affected countries

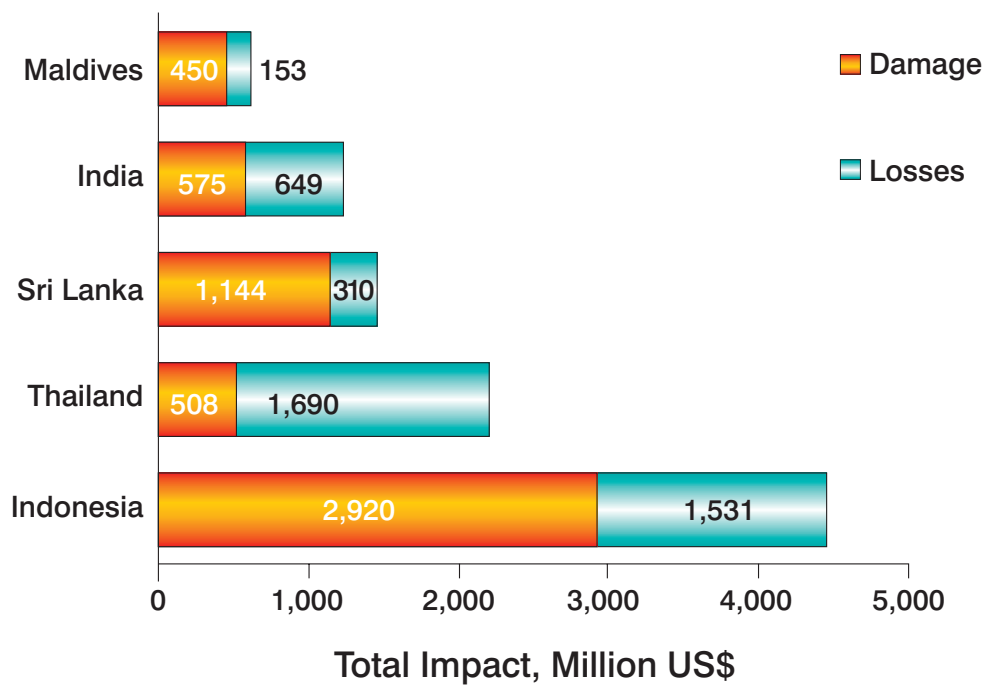
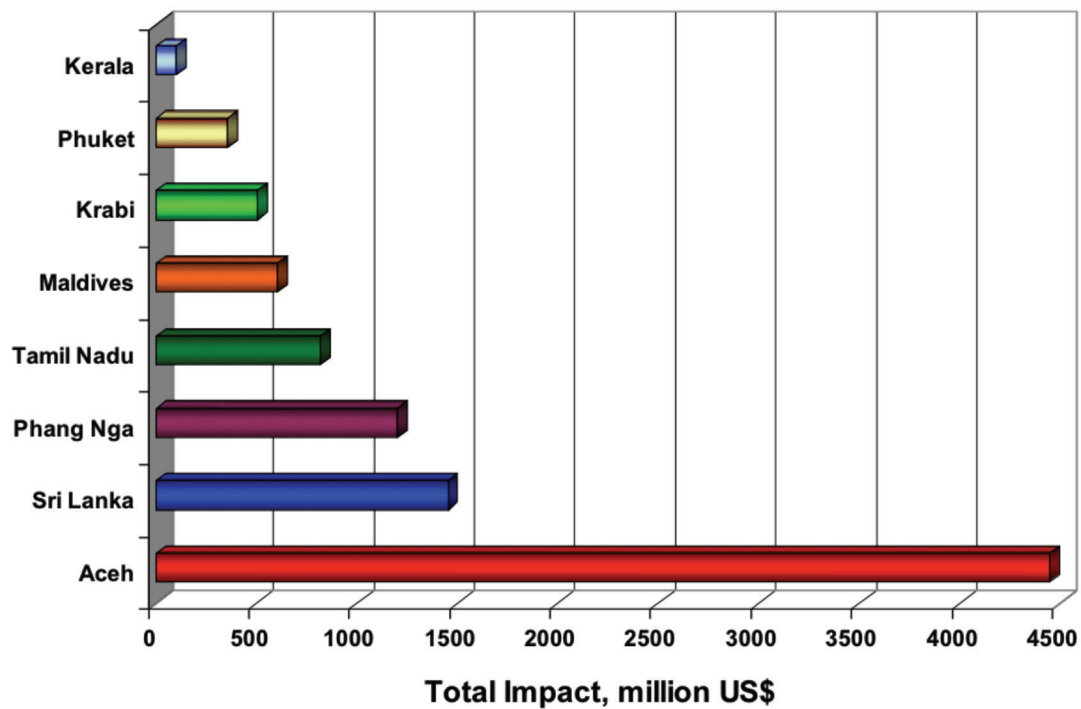
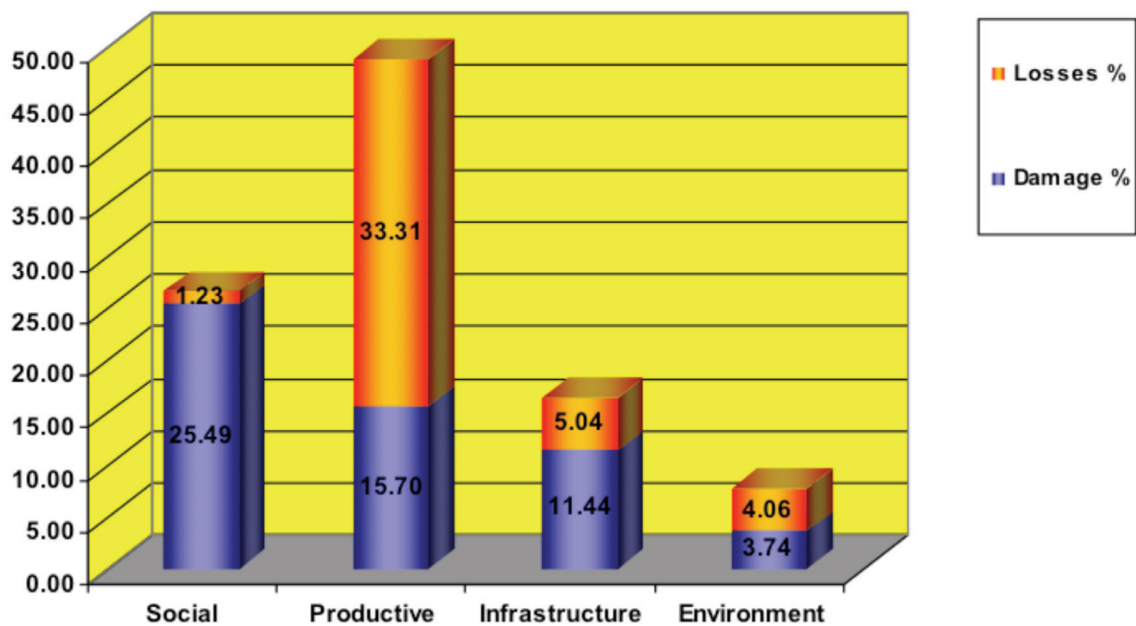


Figure 6.4 Disaster impact to worst affected states/province



The impact was also analyzed at sector level to identify the priority as well as vulnerability. The damage and loss to primary sectors is at Figure 6.5

Figure 6.5 Disaster impact to sectors



Other key findings of the study are as follows:

- Housing and transport were the most affected sectors in terms of assets, followed by tourism and fisheries
- Losses were concentrated in the sectors of tourism, fisheries, and industry and commerce
- Lower income individuals lost their home assets as well as their income and livelihood, mostly from tourism employment, fisheries, and small to medium sized enterprises
- Entrepreneurs sustained very high asset destruction and significant income losses in tourism and in other productive sectors
- Government assets and services in the transport and other sectors were destroyed and interrupted

The study also analysed that the larger the economy of the affected country, the lower the economic impact from the disaster. India, which is the largest economy among the affected countries, will sustain virtually zero impact on growth while the Maldives, the smallest, faces the highest impact. The exposure of physical assets in the affected areas was significantly high in Indonesia and Sri Lanka while countries had very less. Another aspect is impact to sector i.e. in Maldives and several provinces in Thailand the affected areas are highly dependent on the disaster-vulnerable sectors of tourism and fishery (ADPC, 2005).



Key learning's

- Macroeconomic impacts are those that are related to indicators that affect the country or a region. They are the gross domestic product (GDP), gross state domestic product (GSDP), balance of payment (BOP), budget balance, employment, livelihood, inflation, food supply, etc.
- Social impacts are the consequences of the effects of the disaster to the people whether on a personal, household or community levels. They are mainly concerned about health, nutrition, education, poverty, migration, violence, child labor, etc.
- Crosscutting issues/concerns are those that transcend beyond sectors like gender, environment, disaster risk reduction, etc.



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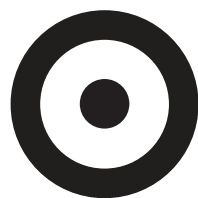
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CHAPTER 7

Learning Unit 6: Estimation of Post-Disaster Recovery and Reconstruction Needs



Objectives

- To identify and prioritize recovery needs based on the impact assessment.
- To understand the development of the recovery framework using the 'build back better' principle



Duration

Total: 180 minutes

- Understanding recovery: 30 minutes
- Identification and prioritization of needs: 60 minutes
- Disaster Recovery Framework (policy, program, implementation, M&E): 30 minutes
- Exercises: 60 minutes



Tools/Methodology

- Training methods: Lecture, Case Study and Group Work
- Material required: Projector, screen, laptop, chart paper and marker.



Contents

- **Introduction**

The purpose of a PDNA is to undertake an estimation of the financial requirements to achieve a return to normalcy in the life of the affected population and in their socio-economic development process after a disaster. Such estimation of needs should be based on an evidence-based, quantitative process that begins by the estimation of disaster effects and impacts at macro, sector and personal or household levels, in order to provide a reliable justification required for the assignment of financial resources for recovery and reconstruction. After estimation of disaster effects and impact, the development of a recovery and reconstruction framework is the next step.

- **Understanding recovery**

Recovery includes many different terms such as Recovery and reconstruction, Rehabilitation and reconstruction, etc., and is used differently by its various stakeholders.

- **The World Bank**

'Decisions and actions taken after a disaster to restore or improve the pre-disaster living conditions of the affected communities while encouraging and facilitating necessary adjustments to reduce disaster risk. Focused not only on physical reconstruction, but also on the revitalization of the economy, and the restoration of social and cultural life' (The World Bank, 2010).

- **UNISDR**

'Restoration, and improvement where appropriate, of facilities, livelihoods, and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors' (UNISDR, 2009).

- **FEMA**

It categorized recovery into intermediate and long-term. Intermediate Recovery –Phase of recovery, which involves returning individuals, families, critical infrastructure and essential government or commercial services to a functional, if not pre-disaster, state. Such activities are often characterized by temporary actions that provide a bridge to permanent measures. Long-Term Recovery – Phase of recovery that may continue for months or years and addresses complete redevelopment and revitalization of the impacted area, rebuilding or relocating damaged or destroyed social, economic, natural and built environments and a move to self-sufficiency, sustainability and resilience (FEMA, 2011).

- **India**

It has defined reconstruction as 'construction or restoration of any property after a disaster (Gol, 2005)

- **Recovery as a continuum**

Opinions differ with regards to the starting point of recovery, ranging from the day the disaster strikes to the period after emergency relief has been completed. According to UNISDR, “the recovery task of rehabilitation and reconstruction begins soon after the emergency phase has ended”. It is important to consider recovery as a continuum rather than as a distinct phase of the disaster management cycle. Recovery usually begins in the early days of emergency relief efforts and continues downstream in form of development programmes, recovery continuum should be seen as stretching from pre-disaster planning, to relief and reconstruction, to development (TGLL, 2015).

An anecdotal example from the Aceh-Nias, Indonesia 2004 Indian Ocean Tsunami recovery is provided (Refer Table 7.1).

Table 7.1 **Recovery Continuum**

	Recovery Continuum	Recovery Continuum: The Experience of Aceh-Nias
Disaster Response	0–10 Days Rescuing Life and Property	30 Days Aceh, Jakarta, New York, Geneva
Disaster Relief	0–25 Days Cash grants, food relief, restoring critical public services, temporary employment generation, emergency needs assessments	90 Days Food, Water, Medical Care, Roof, Mobility, Empathy, Information
Damage and loss assessment	14-45 Days Baseline data, physical damage, economic losses, impact, needs, disaster risk management	120 Days Mobilisation, Data, Analysis, Planning, Confirmation, Legitimation
Recovery and Reconstruction	20 Days to few Years Cash grants, asset replacement, temporary employment generation, infrastructure and microfinance projects, medium- and long-term planning	4 To 5 Years Beneficiary Confirmation, Plan Calibration, Organization, Implementation, Monitoring And Evaluation
Risk Reduction	Continuous Building codes, retrofitting, risk transfer mechanisms, risk assessments, land use planning, awareness raising, institutional development	Disaster Risk, Reconstruction Risk, Impact Risk, Etc.

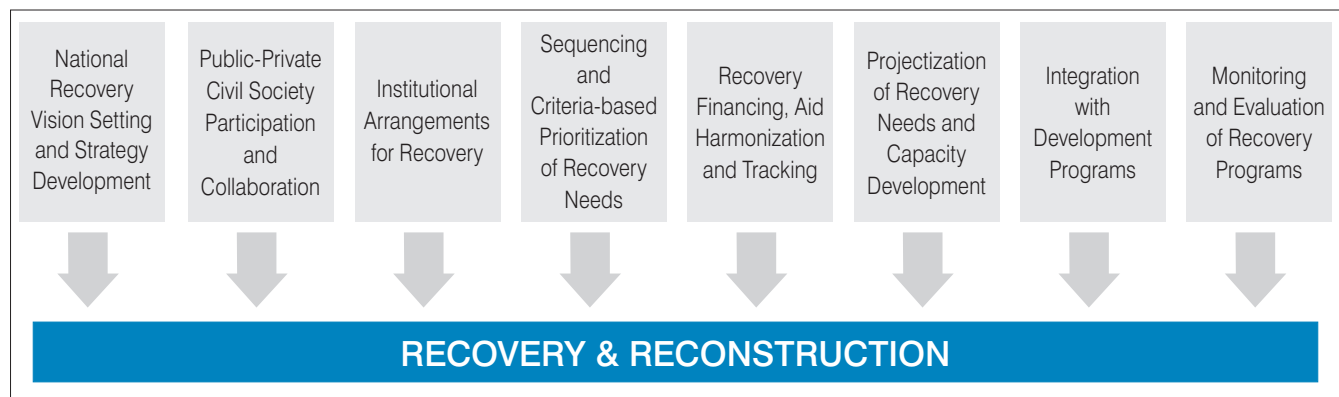
Development	From 20 Days Local resource based infrastructure development, regular micro-finance projects, local baseline studies, counseling of local governments	Shifting strategies, approach, organization, processes, hand-overs
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(Source: TGLL, 2015)

o Overview of Recovery framework

Recently the World Bank and et al have tried to identify the core functions and processes involved in the development and implementation of a Recovery Framework (Refer Figure 6.1). It has many planning and implementation functions that feed into such a framework (The World Bank & et al, 2014).

Figure 7.1 Core functions and processes involved in the development and implementation of a Recovery Framework



Source: The World Bank and et al, 2014

• Scope of Post-Disaster Recovery

Experience reveals that post-disaster recovery activities should be grouped around the following themes or components:

- o Recovery of production levels in the productive sectors of agriculture, livestock, fishery, forestry, industry, trade or commerce, mining, and tourism;
- o Recovery of supply and access to basic services of education, health, housing, transport and communications, water supply and sanitation, and electricity;
- o Recovery of personal or household income; and
- o Recovery of physical assets or reconstruction, with introduction of disaster-resilient standards.

- **Procedure to Estimate Recovery Needs**

- **General Comments**

Financial requirements for recovery must be estimated as a function of the values of destroyed assets, of the changes in the flows of the economy, and of the decline in personal or household income, as arising from the assessment of disaster effects.

The needs for recovery in the productive sectors agriculture, manufacturing, trade, mining and tourism are represented by the amounts of working capital required by producers to achieve recovery of production levels. The needs for recovery in services sectors education, health, culture, transport and communications, electricity and water and sanitation are the amounts required to restore supply to, and access by, the population. The estimation of personal or household income decline, arising from the earlier estimated drop in production at sectorial levels, is used to determine the possible financial requirements for “cash-for-work” and other income-assistance programs for the affected population. Reconstruction requirements are estimated through the estimation of the value of destroyed physical, durable assets duly supplemented to incorporate an additional cost for improved, disaster-resilient standards.

As may be observed, the assessment of disaster effects and impact and the estimation of post-disaster recovery needs is unitary process: the identification and valuation of disaster effects is used for the estimation of disaster impacts at sector, macro and micro levels of analysis, and the results of the effects and impact analyses provide inputs for the quantification of recovery and reconstruction needs.

The value of total disaster effects is not equal to the value of recovery and reconstruction needs. Instead, it has been found that (i) recovery needs have a value that is normally equivalent to a fraction of the value of estimated losses in sectorial production and of higher costs of production combined, and that any possible insurance proceeds must be deducted from them, and (ii) that reconstruction needs are usually slightly higher than the estimated value of damage or destruction of assets since they are to be rebuilt with the introduction of disaster-resilient standards of design and construction, and that the value of any existing insurance proceeds are to be deducted.

In the specific sections of this document, mention is made of the procedures to estimate the values of recovery and reconstruction needs that the sectorial assessment teams are to follow. In the following sections, however, they are presented together to illustrate the overall procedure for needs assessment across all sectors.

- **Modalities for Recovery and Reconstruction**

There exists in the world a wide array of modalities for recovery and reconstruction and selection of modalities is context specific. For example, in the aftermath of 2004 Indian Ocean Tsunami, the five worst affected countries including India set up varied institutions for managing recovery and summary is at Table 6.2.

Table 7.2 Analysis of institutional arrangements for management of 2004 Indian Ocean Tsunami Recovery and Reconstruction

Key Key feature	Indonesia	India	Maldives	Sri Lanka	Thailand
New institution constituted for managing recovery	Yes	No	Yes	Yes	No
New Recovery institution was permanent in nature	No	-	Yes	No	-
Organizational structure went through major change	Yes	No	Yes	Yes	No
Legal status and political support	Yes	Yes	Yes	Yes	Yes
Lead agency for managing recovery	Central and Provincial government led recovery	Provincial government led recovery	Central government led recovery	Central government led recovery	Provincial government led recovery

Source: Springer Japan, 2015

In most cases, a combination of the following should be considered:

- Direct assistance from the central and State levels of government to the poorer strata of the population, using cash grants and in-kind donations for recapitalization and reconstruction purposes
- Provision of softer-term credit using lower interest rates and longer repayment periods as befits the nature of disasters in comparison to normal development financing – through the banking system to credit-worthy private individuals and businesses for both working capital replenishment and reconstruction purposes
- The introduction of incentives for disaster-risk reduction via expanding the role of private and public insurance and increasing its coverage until universal people participation is eventually reached.
- **Procedures for Estimation of Recovery and Reconstruction Needs**

The sector assessment section described the manner in which recovery and reconstruction requirements are to be estimated in each individual sector of economic and social activity. Further guidance is provided in order to reach the desired values of post-disaster recovery and reconstruction requirements in the case of the four types of recovery as identified previously.

o **Production recovery**

The value of production recovery requirements across the board all productive sectors (i.e. agriculture, manufacturing, trade, tourism, and mining) is to be estimated as a function of the estimated value of production losses arising from the disaster.

In each sectorial assessment for the productive sectors, the values of production of goods that will not be obtained due to the disruption of production induced by the disaster would have been estimated. While such production losses have in fact vanished from the economy and cannot be replaced, the production recovery needs refer to the amounts of working capital that producers would need in order to restore pre-disaster production levels.

While different in each productive sector, the need for working capital by the producers has been found to be a function of the value of annual losses sustained due to the disaster. That is, producers need a fraction of the value of their annual production as working capital¹⁵³. Thus, based on the characteristics of each productive process and sector, the value of recovery needs may be estimated.

In addition, mention has been made of the additional and parallel needs involving the possible requirement to re-finance or re-schedule (under softer term loan conditions) pre-disaster loans that producers may have had prior to the disaster, as well as in some cases to provide temporary tax relief to individual and business producers after the disaster, by reducing the rates of taxation related to production and sales.

o **Service supply and access recovery**

The value of recovery requirements for the supply and access to social and infrastructure services (housing, education, health, transport and communications, electricity and water supply) includes two possible types: (i) recovery needs by service providers, and (ii) recovery needs by individual households.

Service recovery requirements by provider enterprises (public or otherwise) refer to the amounts required to cover higher costs of service operation and provision, arising due to the disaster, which involve expenditures above the normal operations budget of the service providers, which are estimated as higher costs of operation in the sectorial assessments¹⁵⁴. It is essential that these needs be met as part of recovery to avoid the providers to utilize their normal budget resources to meet them since their use would entail a cost of opportunity for other normal activities that are otherwise left undone.

Service recovery requirements at the personal or household levels may arise after disasters when the enterprise service providers decide to transfer higher costs of operation in the systems to the consumers, which would cause an overall higher cost of living to the affected persons and households thereby leading to a lower quality of life arising from the disaster.

As may be foreseen, enterprise service providers that do not obtain recovery resources to reinforce their financial position may elect to increase tariffs or rates charged to clients, thereby transferring the higher costs to consumers. In some cases, an alternative solution to this, in order not to affect further personal or family finances, is the temporary introduction or increase of government subsidies for the services in question.

o **Personal income**

¹⁵³ As an example, farmers require about 18-25 per cent of the value of the crop to use as working capital, depending on the specific crop and varieties.

¹⁵⁴ Higher education fees, higher health care costs, costs of temporary housing, higher costs of transport, electricity and water supply, are typical examples of these increased costs of operation in service provision.

The value of personal income recovery represents the amounts of income losses sustained by the affected labor force across all affected sectors of economic activity, formal or informal, as a result of the disaster. These amounts may be used to define the scope and financial requirements of special, “cash-for-work” schemes that may be part of reconstruction.

Personal or household income losses are to be estimated across all sectors for the case of vulnerable population¹⁵⁵. Once all production losses in the productive sectors have been estimated as part of the assessment, an analysis is to be made that estimates income decline on the basis of the disaster impact on production. A comparison of post-disaster versus normal production levels, and the numbers of the labor force and vulnerable labor force, together with the usual wages they obtain, would yield an estimate of the employment and income losses at personal and household levels. Furthermore, using available data on poverty numbers and income thresholds in the affected areas, the above would enable to estimate possible increases in the poverty head count.

Once those estimations are completed, it is feasible to define a program to assist those persons and households that would otherwise face income decline, with special reference to those falling below the poverty-level threshold. The cost of such assistance program including cash for work programs and income-diversification assistance represents the needs for personal income recovery.

o **Physical recovery or reconstruction**

The value of reconstruction requirements (or physical recovery) is obtained by increasing the estimated value of damage, as obtained in all sectors across the board by the additional costs involved in introducing disaster risk reduction, through improved design and construction standards to increase disaster resiliency and, in selected cases where there are no other options, in relocating strategic activities in safer geographical areas where disaster risk is much lower.

It is essential that such increased costs of reconstruction are made available to affected persons and households to avoid reconstruction with the same or even lower construction standards that would cause an increased or higher disaster risk that what was present before the disaster.

For this, reconstruction needs may be channeled through alternative modalities to the affected population:

- i. Grants and in kind provision of construction materials for reconstruction to poor individuals and households, together with technical assistance for them to adopt and comply with improved design and construction standards; and
- ii. Soft-term credit provision (at lower-than-normal interest rates and for longer repayment periods, as befits a post-disaster situation) to credit-worthy individual persons and enterprises, through the development and private banking sector, who did not have insurance on assets or which only had partial insurance;

¹⁵⁵ This vulnerable population refers to persons whose income does not derive from permanent employment. Government and large private enterprise employees are usually free of such possibility; however, micro-, small to medium size enterprise labor force and the informal traders would normally face income decline after a disaster.

Identifying Recovery Needs for the Sectors

Agriculture

Estimating Recovery Needs: The total agricultural recovery needs in the agricultural sector are determined as follows:

*Agricultural Recovery Needs = A*Production Flow Losses*

Depending on the sub-sector or activity, the value of coefficient A varies between 0.2 and 0.5 or 20% and 50% of the production loss estimates. In other words, the financial needs for agricultural recovery are much lower than the estimated changes in production flows for crops, livestock, fisheries and forestry sub-sectors.

- o Agricultural Recovery Activities: The agricultural recovery activities can be broadly divided into four categories. These are
 - Agricultural production recovery
 - Recovery of critical agricultural services
 - Livelihood recovery
 - Recovery of food security.

All the recovery activities are important but there is a need to prioritize these categories and as well as activities within each of the categories. This is critical since budgetary resources are generally limited. Also there is a need to add time dimension, to each activity since some activities need to be completed immediately, others in the short-term and some may be in the medium term.

- o Agricultural Recovery Programs: First, the agricultural production recovery programs may consist of (i) provision of agricultural inputs; provision of animal feed and fodder; prevention and control of animal diseases; restocking of young animals; and restocking of aquaculture ponds with fries and fingerlings. Second, the critical agricultural service recovery programs consist of agricultural custom-hiring services; veterinary services; marketing services; transport services; nurseries; and service to supply fries and fingerlings. However, the list may vary depending on the nature and extent of the disaster.

Third, the livelihood recovery programs primarily, includes public works programs (both food for work and cash for work) and employment programs. In India, the National Rural Employment Guarantee Act (NREGA) program provides employment guarantee for a maximum of 100 days per year for the qualified rural unemployed. Finally, the food security recovery program deals with food balance in the disaster areas at the State and household levels. In case there is a deficit of food (or certain kind of food), there may be a need to either import food or transfer food from the food surplus areas to the food deficit areas. Again, the specific nature of the agricultural recovery programs depends of the extent of production losses and the intensity and nature of the disaster.

- o Financing Agricultural Recovery Programs: The likely manners of financing for agricultural recovery programs are in-kind or cash grants, targeted to small and marginal farmers, lines of credit at low interest rates, write-off or restructuring of agricultural loans, micro-credit, food safety net and temporary tax relief. The private farmers would also use their savings, borrowings and insurance receipts, in case they have an insurance policy. Since most of the farmers are small or marginal, their capacity to finance post-disaster agricultural recovery activities is limited. The public sector or public,

good programs can be financed by the government from its own budget either by diverting resources from the existing agricultural programs or through reallocation of additional budget by the Ministry of Finance.

- o Estimating Reconstruction Needs: The total agricultural reconstruction needs in the agricultural sector are determined as follows:

$$\text{Agricultural Reconstruction Needs} = B * \text{Destruction of Physical Durable Assets}$$

Depending on the activity, the value of coefficient B may vary between 1.2 and 1.5 or 120% and 150% of the damage estimates. In other words, the financial needs for reconstruction are higher than the damage estimates for crops, livestock and fisheries due to building back better.

- o Agricultural Reconstruction Activities: The agricultural reconstruction activities can be broadly divided into three categories. These are
 - Agricultural physical assets
 - Agricultural infrastructure
 - Agricultural perennial crops (plantations and trees).

Again, all the reconstruction activities are important but there is a need to prioritize these categories as well as activities within each of the categories. This is critical since financial resources are generally limited. Also, there is a need to add time dimension to each of the reconstruction activities since some activities need immediate attention where as others may be able to wait for certain amount of time in the short and medium-term.

- o Agricultural Reconstruction Programs: First, the replacement of agricultural physical assets mainly consists of acquisition and replacement of agricultural equipment and machinery, stock replacement of draft and milk animals, and replacement of boats, engines and fishing equipment. Second, reconstruction of agricultural infrastructure consists of irrigation systems, drainage systems, farm roads, storage facilities, animal sheds, fish-landing sites, aquaculture ponds and hatcheries. Finally, replacement of perennial crops includes fruit trees, coffee and tea plantations, date trees and oil palm trees. Again, the actual nature of the agricultural reconstruction and replacement program depends of the extent of damages and the intensity and nature of the natural event that caused the disaster.
- o Financing Agricultural Reconstruction programs: as indicated earlier, the government can finance all the public programs either by diverting resources from the existing agricultural programs or through new budgetary allocations by the Ministry of Finance. The private sources of funding for the private reconstruction or replacement programs are private savings, borrowings and insurance proceeds. However, the small and marginal farmers may not have the capacity to finance these programs on their own. Government can facilitate financing through write-off or restructuring of existing agricultural loans, provision of lines of credit at low rates of interest, temporary tax relief, and targeted government subsidies for small and marginal farmers. Government needs to carefully and passionately evaluate various options for financing the critical programs. Otherwise, a large number of affected farmers and landless laborers may fall below the poverty line.

Box : ***Agriculture sector: Damage and Needs, Uttarakhand Floods, 2013***

Seventy five per cent of Uttarakhand's population depends on Agriculture. Out of the total reported area of 5.67 million ha, 723,000 ha (13%) is under cultivation. The net irrigated area of the state is 340,000 ha, which is mostly confined to the plains while most of the cultivated area in the hills is rain fed. Land holdings in the hilly areas are small and scattered, and productivity of subsistence cereals is low (12- 14 quintal/ha in the hills, against 32-35 quintals/ha in the plains) and consequently the corresponding agriculture income is low. The incidence of poverty at about 40% is higher in Uttarakhand than the national average.

The State produces more cereals than its requirement but there is a deficiency of pulses and oil seeds. Wheat and Rice are the main crops of the State, and covers 30.8% and 23.9% of the total cropped area respectively. Rest of the arable area is covered by Millet (10.9%), Sugarcane (9.1%), Sowan (5.4%), Maize (2.7%), Pulses (2.5%), Oil seed (1.9%) and others (12.8%).

The impact of the disaster on the agricultural sector has been severe. Heavy rains have severely eroded the agricultural land in many villages, while in the plains, crops have been damaged due to inundation. Given that agriculture is the main livelihood for most of the population in the affected areas and most of the farmers in Uttarakhand come under the small and marginal category of land holdings, the disaster has severely impacted their livelihoods.

While detailed assessments are yet to be undertaken, as of July 29, 2013, the total crop area affected by the disaster in the State was estimated as 20,401 ha, out of which 14,800 ha accounts for the sugarcane crop in the district of Haridwar. The damage to the agriculture sector consists of one or more of the following, damage due to the total wash away of lands, damage to the agriculture infrastructure, losses due to the damaged crops and losses due to the siltation of lands that need to be cleared at a cost.

Reconstruction Needs: Based on the reported damages as of July 29, 2013, total damages and direct losses in the five districts were estimated at INR 255 million (US\$ 4.25 million). The Uttarakhand Agriculture Department is in the process of carrying out detailed assessments in the field and more precise data will be available once these assessments are completed. According to the estimates, the main damage is due to the wash away of lands and the worst affected district in terms of agriculture is Rudraprayag.

Source: GoU, 2013

Mining and Quarrying

In the mining and quarrying sector, recovery needs refer to the amounts of financing required to restore normal production of the affected mines and of the extraction facilities for oil and gas, until such time as normal levels of production are achieved and the destroyed sector assets are rebuilt or replaced, and to meet any higher costs of production which may have arisen after the disaster.

These would usually involve the following activities and associated costs:

- o The cost of pumping out flood waters from flooded mines (as happened in the Serbia floods in 2014) to enable restarting mining operations;
- o The costs of shoring up tunnels and other parts of mines that have sustained destruction or flooding and ensure safety of the workers;
- o The removal of destroyed equipment and materials from disaster affected areas in the oil and gas fields;
- o The cost of starting up of alternative, stand-by oil and gas production units to take up the interrupted supply from destroyed units;
- o Any higher costs of operation of undamaged oil and gas production units to supplement the interrupted supply of damaged units;
- o Cleanup costs of spilled mine tailings and spilled oil in adjacent areas arising from the disaster until they are fit to return to their normal utilization; and
- o Any cost of drilling emergency oil and gas wells to expedite recovery of supply, while the destroyed are repaired or rebuilt.

Note should be taken that in the temporary absence or insufficiency of coal, fuel and gas that may be used for industries and other consumer sectors, such consumers may incur in production losses or in higher costs to acquire such inputs from alternative sources. Such production losses and higher production costs of the consumer sectors, and the corresponding recovery needs, are to be accounted for under their own institutional sectors, and not under the mining and quarrying sector.¹⁵⁶

Should the mining and quarrying sector enterprises have insurance on losses in production and unearned revenues, the value of any due insurance proceeds (as reported by local insurance companies) should be deducted from the value of recovery needs.

The needs for reconstruction of sector assets and equipment are to be estimated by the mining and quarrying sector team by taking the estimated value of damage and increasing it by a certain percentage to include risk reduction features, as part of “build-back-better” strategy. Such an increase would arise from the combination of adopting better design standards to acquire resiliency against disasters (such as raising the base of oil and gas wells and storage facilities to avoid flooding), the possible relocation of certain sector activities such as the alignment of oil and gas pipelines to avoid seismic zones and flood areas), etcetera. There is no widespread experience in regard to the possible increase in unit costs to achieve such disaster risk reduction, and the sector assessment team would need to analyze each case as it comes to define such possible cost increases.

¹⁵⁶ An example of this situation was the acquisition of electricity from nearby countries that had to be undertaken last year by the electrical companies of Serbia, in view of the production losses of coal that occurred in the mining, sector which did not enable the electric utilities to have sufficient coal to generate electricity in their thermal power plants.

Again, the possible insurance proceeds for destroyed sector assets must be deducted from the estimated reconstruction needs to arrive at the net value of reconstruction requirements.

At the personal or family level, human recovery needs are the amounts of financing which may be necessary for disaster-affected households to meet any higher costs of living arising from resulting higher unit costs of goods produced in the sector, over and above their pre-disaster expenditure levels. These higher costs may be met through the setting up of temporary government subsidies or from special cash grants to affected households to cover the temporary price increases of fuel and other products arising from the disaster in the sector.

As pointed out before, the above human recovery needs are to be estimated by the assessment team and delivered to the separate team in charge of estimating human recovery needs. Care must be exercised to ensure these needs are not included in both places, to avoid double accounting in the overall assessment.

Manufacturing

Financial requirements or needs for recovery of the manufacturing or industry sector are defined as the amounts of funding that are required to ensure returning the sector to its normal or non-disaster level of production performance.

The value of such needs may include the availability of credit to provide the affected industrial establishments with sufficient working capital to re-start and conduct normal operations, which also may include financing to reschedule non-performing loans arising from the disaster. It is to be noted that such financing is not expected to come from the Central or State governments; rather, the government should make the necessary representations to the development and private banking system to ensure the availability of sufficient fresh funding for recovery purposes, under softer-term conditions to adjust to the post-disaster conditions¹⁵⁷. Recovery financial resources may be channeled to industrial entrepreneurs through a set of alternatives ways, depending on their size and credit worthiness, that may include:

- o Cash grants to micro-enterprises;
- o Soft-term credit with lower than normal interest rates and long repayment periods for small to medium sized enterprises (SMEs), channeled through the development and private banks; and
- o Possible temporary tax relief schemes for large industries that may be partially insured or non-insured.

The amounts required for such recovery financing may be estimated by industrial economists in the industry sector assessment team on the basis of the value of production decline caused by the disaster, for each type and kind of industrial establishment. Experience acquired in the application of disaster impact assessment over the past 40 years shows that industrial sector recovery needs may range between 25 to 40 per cent of the estimated value of production losses¹⁵⁸. Data arising from the sample survey of industrial establishments may assist the industry sector assessment team members to define the actual range of working capital needs as a function of production losses.

¹⁵⁷ Needless to say, this refers to lower interest rates and longer repayment periods, different from the normal credit conditions that govern normal banking operations.

¹⁵⁸ See Jovel, Roberto, *Damage, Loss and Needs Assessment Guidance Notes, Volume 3, Estimation of Post-Disaster Needs for Recovery and Reconstruction*, Global Facility for Disaster Reduction and Recovery, The World Bank, Washington, D.C., 2010.

The industry sector assessment team should next deduct from the above-estimated recovery needs any expected amounts of insurance-on-production proceeds that would be forthcoming to the industrial enterprises which may have had such type of insurance coverage, to arrive at the net value of economic recovery needs.

o **Needs for reconstruction**

Under a “building-back-better” strategy (that includes disaster-resilient features) are to be estimated by the industry assessment team taking the estimated value of replacement of destroyed assets (including buildings, equipment and machinery) and increasing it by a certain percentage whose magnitude will be a function of the degree of technological modernization and disaster-risk reduction defined in the adopted reconstruction strategy. This means that the value of reconstruction needs will be higher than the estimated value of damage.

In this connection, the industry sector assessment team should keep in mind the fact that replacement of destroyed equipment and machinery may not be possible using the same characteristics and capacities which the assets had prior to the disaster, because of technological obsolescence, and that the replacement equipment and machinery may have improved characteristics and performance as well as different unit costs. Such issue needs to be factored in when estimating post-disaster reconstruction requirements.

Experience reveals that the range to be used for estimating needs over damage in the industry sector may range from 15 to 30 per cent, depending on the type of equipment and machinery involved¹⁵⁹. The exact percentage to be adopted in each case of equipment and machinery to be replaced is to be defined by industrial engineers that compose the assessment team.

The estimated value of reconstruction needs is to be reduced whenever the industrial enterprises had insurance on destruction of assets, after data is obtained from insurance companies in regard to the likely value of insurance proceeds that the industrial enterprises may actually receive in due time.

o **Human recovery needs**

In this sector refer to the possible and temporary loss of employment and income of the labor force associated to the manufacturing sector, arising from the destruction and production disruption caused by the disaster, until full recovery and reconstruction is achieved. The industry assessment team does not estimate the employment losses and corresponding income decline. Rather, the data on production decline and its estimated time period of occurrence as estimated by the manufacturing sector assessment team is to be used by the human recovery needs assessment team as an input to estimate the personal or household income decline that will be sustained by the labor force of the industry and other sectors of economic activity.

¹⁵⁹ See note above.

Electricity and Gas

Post-disaster financial requirements or needs in the electrical sector normally include the amounts of financing to:

- o Ensure the return of the sector to the normal level of production and sales of electricity (recovery needs)
- o Achieve physical recovery or reconstruction of destroyed physical assets using disaster-reduction features
- o Recovery of the quality of life at the personal or household level (human development recovery).

Financial requirements for the electrical sector to achieve economic recovery are defined as the amounts of funding required for the progressive return to normal electricity supply to the consumers and to normal financial operation of the systems. In a sense, recovery needs involve a combination of some of the following activities:

- o The cost of urgent rehabilitation works to restore minimum electricity flows in the system;
- o Possible costs of inter-connection to other un-affected electrical systems to enable temporary imports of electricity if required;
- o Financing of temporary, higher-than-normal costs of generation, transmission and distribution of electricity costs during the time required to rebuild or replace destroyed system components.
- o Components for estimation
 - First component: The costs of the restoration of minimum electricity supply usually conducted during a few hours or days after the disaster, through special rehabilitation crews from the electrical enterprises.
 - Second component: It may apply whenever the damage to the existing electrical system components is such that electricity must be imported through inter-connection to other nearby, unaffected electrical systems, which may require building additional lines for the required interconnection.
 - Third component: It refers to the possible, temporary, additional costs involved in situations such as:
 - Operating higher-unit-cost power plants while lower-cost, damaged power plant is under repair or reconstruction
 - Importing electricity from other nearby, undamaged power systems while the affected system is under repair or reconstruction
 - Covering temporary financial deficits of the electrical companies through government subsidy or increasing government subsidies, during the time required to restore consumer demand. In the latter case, whenever private enterprises are involved, the possibility of providing temporary tax relief of holidays may also be considered.

The amounts of economic recovery needs arise from the estimation of changes in the sector's economic or production flows, and never should exceed such values as estimated previously by the electrical sector assessment team.

The estimation of financial requirements for reconstruction (or physical recovery) may involve increasing the estimated value of damage to include higher design standards or alternative standards to reduce disaster risk. As examples, the estimated value of damage to transmission lines may be increased to introduce a higher safety of power lines against wind in cases of cyclones or tropical storms, or to account for the cost of utilizing subterranean power lines in certain city areas for the same purpose. Therefore, reconstruction needs will always have a higher value than the value of damage as estimated by the electrical sector assessment team, the increase being a function of the desired degree of risk reduction that may be defined in the strategy for recovery and reconstruction, and bearing in mind the available financial resources for the purpose.

The estimation of post-disaster human development recovery requirements for affected individuals and households may be made whenever the latter are significantly affected by the lack or insufficiency of electricity and/or whenever electricity rates have to be increased. After a disaster, rural electricity households may resort to use of wood for cooking and heating purposes, thereby affecting the environment through the unproductive use of forests; urban households may be forced to utilize fuel or wood for cooking and heating purposes and incur into higher expenditures at least over the time required for the electricity sector to recover.

In some countries, as a way to assist affected households, governments may resort to introduce a temporary subsidy to the costs of electricity or to temporarily waive the payment of their electricity bills, and/or to the provision of gas stoves and fuel supplies to the affected families. Such costs are to be estimated by the electrical sector assessment team and deliver them to the macro-social assessment team that is entrusted with estimating human recovery needs. In no case are these human recovery needs be included simultaneously in both the economic recovery needs and in human recovery needs, to avoid double accounting.

Water supply, sewage and waste management

Recovery is achieved at the time when the sector returns to normalcy, which is defined as at least equal to pre-disaster conditions. This would involve the provision of water and sanitation services to the population with the same coverage as before the disaster as well as in the same quantity and quality, and at the pre-disaster tariffs or rates. Recovery is not achieved until all destroyed assets have been rebuilt and are fully operational, hopefully under a building-back-better strategy that includes adoption of disaster-resilient standards.

o Institutional recovery:

The financial requirements or needs for institutional recovery of the water supply and sanitation services sector are defined as the amounts of financing required to ensure the returning of the sector to normalcy of operation after the disaster. They refer to the value of higher operational costs of the enterprises that provide the collective water supply and sanitation services in the affected area¹⁶⁰, from the time when the disaster occurred until full recovery and reconstruction has been achieved. If the assessment of post-disaster effects has been conducted correctly, the value of these recovery needs would already

¹⁶⁰ This means that the post-disaster higher costs of collective-system operation whose value is over and above the non-disaster institutional operations budget for the systems.

have been included as part of the estimated changes in production flows for the sector. However, the estimated value of recovery needs should be equal to the higher costs of operation caused by the disaster, minus any possible revenue-loss insurance proceeds that the utility enterprises may have had. Putting it differently, recovery needs would have a value lower than that of production flow changes.

It is to be noted that if government subsidies were already part of the regular financing of the water and sanitation services, a temporary increase in such subsidy may be required to assist the sector enterprises in recovery and to avoid transferring the higher operational costs to consumers through an increase in water and sanitation service tariffs.

o **Reconstruction needs:**

The value of financing required for reconstruction of the destroyed components of the infrastructure or assets of the water supply and sanitation sector is to be estimated by taking the estimated value of damage and increasing it by a certain percentage, whose magnitude depends on the degree of modernization, technological improvement and disaster-risk reduction that is required in the recovery and reconstruction strategy. That is to say, the value of reconstruction needs will be slightly higher than the value of damage.

It should include – as was indicated for the estimation of the value of damage – both the reconstruction requirements of collective urban systems that may have sustained destruction and the requirements for individual household or community-based facilities that may have been destroyed in rural areas as well.

Experience acquired in the past forty years when post-disaster assessments have been conducted in many countries of the world reveals that the range of increase of the value of damage to obtain disaster-resilient reconstruction needs is between 10 to 25 per cent, depending on the possible risk reduction features that the infrastructure and assets had prior to the occurrence of the disaster. The exact figure to be adopted will have to be defined by civil or sanitary engineers that form part of the water supply and sanitation assessment team and who have had relevant experience in this type of work. Once the gross value of reconstruction needs has been estimated, the available amount of insurance-on-assets proceeds must be deducted to arrive at the net value of reconstruction requirements for the water and sanitation sector.

o **Human development recovery needs**

It refers to the higher-than-normal costs of obtaining drinking water and wastewater and solid waste disposal services by individual households, in urban and rural areas, since these persons will require assistance to enable their access to such services during the post-disaster recovery and reconstruction stages. As was indicated before, such higher personal or household expenditures are not to be added to the estimated changes in production flows for the institutional water and sanitation sector, and should be estimated separately by the assessment team.

Such higher access costs incurred by households may include:

- o Higher-than-normal household expenditures to purchase drinking water from private suppliers or to purchase of bottled water for urban household consumption, whenever households are unable to obtain it through the collective urban water-supply systems;

- o Higher-than-normal expenditures made by households to purify water to ensure adequate quality of drinking water in urban and rural areas;
- o Higher-than-normal expenditures made by mostly rural households that are unable to dispose of wastewater and solid waste through collective systems; and
- o Possible opportunity costs incurred by rural families that must utilize more time of its members (mainly women and children) in collecting drinking water and thus are not able to temporarily continue with their normal productive and reproductive work after disasters.

These post-disaster higher household expenditures negatively impact on the well-being or quality of life of affected families and represent a human development recovery need. It may be attended to through several alternatives, such as the setting up of special, temporary post-disaster State Government assistance programs aimed at providing the services of water supply and sanitation to affected households (in mostly rural but also in some urban cases) at no cost to the families¹⁶¹; the provision of temporary cash grants to such affected families, over the time required for recovery and reconstruction of the water supply and sanitation systems; and/or, the setting up of “cash-for-work” programs to rehabilitate other infrastructure works and provide the affected population with the means to finance such post-disaster higher expenditures.

It cannot be over-emphasized that these human development recovery needs are not to be mistaken with the institutional economic recovery and reconstruction needs described in the preceding section of this chapter, and that they would apply only if the urban water supply enterprises are not able to provide full services and in the case of isolated, family systems of the rural areas.

Trade, Hotels and Restaurants

Recovery: Financial requirements or needs to ensure the recovery of the sector are defined as the amounts of funding required to ensure returning the sector to its normal level of functioning and sales. In most cases, these needs would include the availability of financing to ensure the availability of sufficient working capital for the affected enterprises to re-start operations, including the possible need to refinance or reschedule non-performing loans arising from the disaster. Such financing may be channeled to the entrepreneurs through different ways, depending on their size and credit worthiness:

- o Cash grants for micro-sized entrepreneurs, to avoid their resorting to use informal credits from loan sharks;
- o Soft-term credit for small-to-medium sized enterprises (SMEs) channeled through the development or private bank systems, with lower-than-normal interest rates and longer repayment period.
- o Large enterprises, that are usually at least partly insured, may require in some cases to receive temporary tax relief during recovery.

The amounts of financing required for these recovery schemes may be estimated by trade economists on the basis of the estimated value of disaster-induced sales decline for each type and level of trading enterprise, since they normally have a typical value of stocks to sell in their premises that may have been destroyed. Experience acquired in the past 40 years of disaster assessments has revealed that the usual

¹⁶¹ An example of this is the cost of providing water purification kits to affected households.

range of such recovery needs ranges between 25 to 35 per cent of the value of losses in sales; the detailed results of the commerce sample survey, however, would provide information on which to more firmly define this range or working capital needs.

The above values are to be decreased by the amounts of possible insurance on sales proceeds that some of the commercial enterprises may actually have, in order to obtain the net amounts of financing that are to be channeled to disaster-affected enterprises.

Reconstruction: Financial requirements or needs for reconstruction under a “building-back-better” strategy are estimated by taking the estimated value of replacement of destroyed assets and increasing it by a certain percentage whose magnitude depends on the degree of quality and technological improvement as well as disaster-risk reduction defined in the strategy for reconstruction. Saying it differently, reconstruction requirements will always have a larger value than the estimated value of damage.

Experience shows that the range to increase the value of damage to obtain disaster-resilient reconstruction needs is between 10 to 25 per cent, depending on the degree of disaster resilient features that the destroyed infrastructure had prior to the disaster¹⁶². The exact increase to be adopted must be defined by civil and structural engineers that are part of the commerce sector assessment team, who have had relevant experience in this type of work.

The estimated gross value of reconstruction requirements must be reduced by the expected amount of insurance-on-assets proceeds that are to be received by the commercial enterprises that had such type of insurance.

For the estimation of human development recovery needs, estimated values of commerce sector sales losses are to be delivered to the separate team in charge of estimating personal or household impact analysis, for the subsequent estimation of employment and personal or household income losses. This will in turn enable the estimation of requirements for the funding of temporary “cash-for-work” employment schemes.

In addition to the above, results of the sample survey of informal traders which had been conducted in temporary shelter camps to estimate their income losses due to the disaster should be delivered as well to the assessment team in charge of estimating human development impact, and for defining additional financial requirements in terms of possible cash grants or other assistance for informal male and female traders.

Tourism

Recovery: The financial requirements to achieve recovery in the tourism sector are equal to the amounts of financing required to ensure the return of the services (in quantity and quality) to normal or non-disaster conditions.

They may include some of the following activities:

- Provision of soft-term credit to finance working capital to tourism entrepreneurs and restaurant owners – channelled through the private banking system or the development banks – and/or to facilitate the rescheduling of disaster-induced non-performing loans, when the tourism enterprises were not sufficiently or adequately covered by insurance on revenues or sales;

¹⁶² See Jovel, Roberto, *Damage, Loss and Needs Assessment Guidance Notes, Volume 3, Estimation of Post-Disaster Needs for Recovery and Reconstruction*, Global Facility for Disaster Reduction and Recovery (GFDRR), The World Bank, Washington, D.C., 2010.

- Provision of temporary tax relief for the above as an additional manner to alleviate financial difficulties arising from the disaster, when required; and
- Possible partial government financing in the cost of information campaigns to reach foreign visitors and convince them to return to the tourism facilities after the disaster effects have been overcome.

The amounts required for working capital or to re-schedule loans in the tourism sector enterprises may be estimated as a fraction of the annual unearned revenues caused by the disaster. Experiences indicate that a range of between 20 to 35 per cent of the value of annual tourism revenue losses may be adequate to meet such economic recovery needs¹⁶³.

However, their exact value in each individual case of disaster is to be defined by the tourism sector assessment team on the basis of a detailed analysis of financial data obtained during the assessment, and after informal discussions are held with representatives of the different tourism establishments that were affected.

The cost of an information campaign to attract or re-attract foreign visitors after the disaster must be estimated on the basis of experience acquired in previous disaster events. The tourism sector assessment team needs to bear in mind that the cost of such information campaign is to be borne in foreign currency since the target groups of the campaign reside abroad. In cases where special tourism packages are to be advertised for acceptance by domestic tourists, to increase their use of tourism facilities as a way to partially compensate for the loss of foreign visitors, the cost would of course be estimated on the basis of local currency requirements.

Reconstruction: The value of insurance proceeds to compensate for tourism revenue losses, when such insurance was available, must be deducted from the estimated value of needs. Financial requirements for reconstruction under disaster-resilient standards are normally estimated by taking the value of asset destruction or damage, and increasing it by a certain percentage to enable the introduction of quality improvement, technological modernization and adoption of disaster-risk reduction standards defined in a “building-back-better” reconstruction strategy. Experience acquired in conducting post-disaster needs assessments in many countries of the world in the past forty years indicates that the usual range to increase the value of estimated damage would be between 15 to 20 per cent¹⁶⁴. In some cases, reconstruction requirements may include the cost of relocating the destroyed premises in safer places, and the cost of land acquisition and of provision of basic services must be added to the value of damage.

After coming up with a value of reconstruction requirements, the tourism sector assessment team must deduct the value of insurance-on-assets proceeds that the tourism enterprises may have had in order to come up with a net value of reconstruction requirements.

The tourism sector assessment team must deliver the estimated values of tourism flow changes or decline to the separate assessment team in charge of estimating disaster impact on human development, for them to estimate the possible decline in employment and personal or household income. On that basis, the human development assessment team will be able to ascertain whether the labor force of the tourism sector will need to be included in a possible, temporary “cash-for-work” post-disaster program, or whether other types of assistance are required.

¹⁶³ See Jovel, Roberto, *Damage, Loss and Needs Assessment Guidance Notes, Volume 3, Estimation of Post-Disaster Needs for Recovery and Reconstruction*, Global facility for Disaster Reduction and Recovery (GFDRR), The World Bank, Washington, D.C., 2010.

¹⁶⁴ See again previous note.

Transport

o Recovery:

Recovery needs are the amounts required to restore normal levels of operation of all transport subsectors after a disaster. Essentially, this refers to the reduction of higher costs of transport that have resulted from the effects of the disaster, and usually involve:

- Urgent removal of blockages or opening of alternative road sections to enable minimum vehicular traffic flows right after the disaster;
- Erecting of temporary bridges or construction of fords to enable vehicular traffic over road sections where bridges and major drainage works have been destroyed or damaged to the point where vehicular traffic is deemed not safe;
- Establishing temporary alternative schemes of transport when regular transport means have been destroyed or deemed unsafe for operation after the disaster;
- Setting up temporary government subsidies – or temporarily increasing existing ones – to the operation of collective transport systems in urban areas facing significantly higher transport costs after the disaster, and thus avoid possible widespread increases in transport fees charged to individual users; and
- Possible temporary tax relief schemes for private and public transport companies over the recovery period.

It is to be noted that recovery needs would span since the time of the disaster until full reconstruction of destroyed physical infrastructure and vehicular stocks have been rebuilt and replaced, respectively. Needless to say, the value of recovery needs may not exceed the estimated value of higher transport costs. In cases where collective transport companies had insurance coverage on lost revenues, the amount of such proceeds is to be deducted from the value of recovery needs.

o Reconstruction

It is estimated by the transport assessment team by increasing the estimated value of damage to the sector assets to include disaster-risk reduction features, as required under a “build-back-better” post-disaster strategy. Very often, reconstruction of destroyed bridges and associated drainage works would require the adoption of different standards of design and construction to ensure adequate flood discharge capacities or earthquake resistance, as well as the introduction of landslide and flood-protection works for specific road sections. However, the nominal transport design capacity of roads and other transport infrastructure and vehicular stock is not to be increased from the pre-disaster level¹⁶⁵.

Experience reveals that an adequate increase in the value of damage to estimate reconstruction requirement ranges between 12 to 25 per cent¹⁶⁶. Nevertheless, in each specific case of disaster it will be up to the experts comprising the transport sector assessment team to define the value of such increase,

¹⁶⁵ Increasing the design traffic capacity of a road is a matter of normal socio-economic development and is not a matter arising as a result of the disaster.

bearing in mind both the degree of disaster resilience required and the design standards prevailing when the destroyed assets were originally built.

The amount of possible insurance proceeds on destroyed transport assets should be deducted to ascertain the net value of reconstruction needs.

o **Human development recovery needs**

At the personal or household level, needs are the amounts of financing which may be required by disaster-affected households to fulfil their transport-related needs over the recovery and reconstruction period for the sector without incurring into additional living expenditures.

As indicated before, such additional costs of living by families are not to be added to the value of disaster effects for the transport sector, as the institutional transport sector includes only collective transport functions. The higher costs of personal or family transport are to be kept separate from the transport sector disaster effects, and handed over by the transport sector team to the separate team in charge of estimating human development impact.

In any case, there are two possible types of higher transport costs to be faced at the personal or household level:

- Higher transport costs in collective systems
- Higher fuel consumption and payment of higher toll costs.

When using their own private vehicles. If these costs have been estimated, they may be met through temporary government subsidies of the collective system operation to avoid an increase in the tariff rates, and through a temporary scheme of providing subsidized fuel to the affected families. Should the decision be adopted for the central or State government to enter into such subsidy arrangements, their implementation would have a negative impact on the fiscal position of the government, and the transport sector team should inform the macro-economic assessment team accordingly.

In any case, the value of such human development recovery need should never be added to the estimated value of recovery and reconstruction needs, and kept separately to avoid double accounting of needs.

Communications

o **Recovery**

To restore the functionality of the communications sector may include the following activities, whose costs or financial requirements are to be estimated by the communications sector assessment team:

- Urgent repair and realignment of wireless antennas and equipment that may have been lightly affected, to restore the flow of minimum communications after the disaster;
- Setting up of portable or mobile alternative communications facilities and equipment to enable temporary communication flows while repairs and replacement are made of destroyed equipment and facilities;

¹⁶⁵ See Jovel, Roberto, *Damage, Loss and Needs Assessment Guidance Notes, Volume 3, Estimation of Post-Disaster Needs for Recovery and Reconstruction*, Global Facility for Disaster Reduction and Recovery (GFDRR), The World Bank, Washington, D.C., 2010.

- Provision of soft-term credit lines (under lower interest rates and longer repayment periods, in view of the special circumstance caused by the disaster) and facilities to communications enterprises, through the development and private banking system, to ensure adequate availability of working capital and the rescheduling of non-performing loans arising due to the disaster;
- Possible temporary increase of existing government subsidies to communication enterprises, or possible increase in communications service tariffs and rates charged to customers, to meet post-disaster higher costs of system operations;
- Possible temporary tax relief schemes to assist in the recovery of the financial governance of privately-owned communications enterprises.

Should any insurance coverage on revenue losses be available to the communications service enterprises, such amounts should be deducted from the value of recovery needs.

o **Reconstruction**

To achieve physical assets recovery after the disaster – are to be estimated by the communications assessment team by taking the estimated value of destroyed assets and increasing it to cover for any additional costs to ensure an increased resilience against future disasters, as a way to reduce disaster risk. Results of many assessments conducted in other countries in the past, indicate that an increase of between 15 to 25 per cent over the value of damage is typically required to ensure risk reduction¹⁶⁷. Despite the above, the communications sector assessment team should define, in each specific case of disaster, the value of such increase, on the basis of the desired degree of disaster resilience and of the prevailing design standards at the time when the assets were originally built.

Another consideration for the estimation of reconstruction requirements is the possibility that at the time of reconstruction, some equipment and materials may not be available with the same characteristics as in the destroyed units, and which require replacement using more advanced and costly models. Should that be the case, the reconstruction needs should adopt the cost of such improved versions of the equipment.

Furthermore, it is also possible that – at least in the case of fixed-line communication systems – the adopted reconstruction strategy may involve resorting to the use of subterranean cabling to substitute the more vulnerable aerial land-lines, or to the utilization of more-resistant poles and cables. Another possibility is that antennas or other vulnerable key equipment need to be relocated to safer sites, and require additional investments. Whenever those situations arise, reconstruction requirements would have to be increased accordingly.

After the communications team has estimated such total reconstruction requirements, a deduction should be made of the available insurance proceeds that were identified during the visit to local insurance companies, in order to arrive at the net value of reconstruction requirements.

¹⁶⁷ In that regard, see Jovel, Roberto, *Damage, Loss and Needs Assessment Guidance Notes, Volume 3, Estimation of Post-Disaster Needs for Recovery and Reconstruction*, Global Facility for Disaster Reduction and Recovery (GFDRR), The World Bank, Washington, D.C., 2010.

o Human development recovery needs

It refers to the higher costs that individual persons and households may have to pay to meet their communications requirements after a disaster. Such needs may occur, whenever the communications enterprises need to meet higher costs of operation in their systems and a decision is adopted to transfer such costs to the consumers, which in addition to sustaining lower income may also have to meet higher cost-of-living expenditures. This situation would result in a decline in the quality of life of the affected population.

In other countries, after significant disasters, governments have elected to assist the affected population by temporarily subsidizing the communications enterprises operations, and thus avoid increasing the population's post-disaster burden¹⁶⁸. Another alternative way of assisting the affected population would be to issue cash grants to the affected population.

In any case, the communications sector assessment team should deliver the information on the higher costs of communication services to the assessment team in charge of estimating disaster impact at the personal or household level, for their subsequent consideration. Nevertheless, care should be exercised to ensure that the higher costs of communications are not counted twice as a recovery requirement (i.e. both as a need for the institutional sector of communications and for human development recovery).

Financing, Insurance, Real Estate and Business Services

Arising from the impact analysis and in consultation with the affected population and key stakeholders, the sector team experts should develop recommendations for a recovery strategy. The Government may have its own goals for the sector so it is important to review recent development plans or budget statements.

What is an indicative cost of recovery in the sector and how long is recovery estimated to take is an important question? To arrive at the cost of recovery it is important to take into consideration the cost of reconstruction and to consider what is required to reduce future risk. In other words, how can the sector build back better.

It should be noted that recovery in the sector not only addresses the reconstruction of the physical assets damaged as a result of the event but the identification of the measures which hasten the recovery process or support households in meeting the financial and technical requirements for rebuilding.

If households have to be relocated for safety and to reduce risk, then this cost of relocation, such as the acquiring of land, its preparation for housing in addition to the construction of temporary shelters (discussed previously), will have to be identified and included. The cost of recovery therefore is equal to the cost of reconstruction plus the cost of building back with resilience to future events. In the case of repairs to existing structures, recovery costs should include the costs of retrofitting those structures to withstand further events of a similar nature. Some households may need temporary Government assistance to meet their shelter requirements during reconstruction, either through provision of temporary housing and/or rental subsidies, these costs should be included in the recovery costs. In addition, homeowners may need temporary tax relief during the same period of reconstruction, which would have a negative impact on fiscal budget.

¹⁶⁸ After the Mexico City earthquake in 1985, the Government of that country elected to provide free telecommunications services to the affected population.

State and central governments in India may wish to make the necessary representations to the private and development banks to establish special, soft-term credit lines for housing reconstruction of credit-worthy individuals, in order to avoid increased disaster risk and financial overburden to households. How long recovery may take, is a factor of not only the measures for financing for recovery but the capacity in the construction sector.

Issues to be considered regarding rebuilding of homes include:

- o Can private homeowners rebuild on their own through savings, insurance payments or with the assistance of family and friends, such as through the receipt of remittances? If not, how can financial resources be made available to private homeowners to rebuild.
- o How will the funding be met, through small grants, low interest loans?
- o Should institutions be created to facilitate such processes or are there adequate institutions already in existence, which may be persuaded to create special windows for the new measures?
- o Should special concessions be granted to importers of the building materials to meet the needs of the construction sector?
- o Can the available skills in the sector meet the demands or if they need strengthening?
- o If homeowners rebuild their homes themselves, serious consideration has to be given as to how to transfer new skills to such persons so that the result will be more resilient dwellings.

When all of these and other measures are taken into account then a realistic time frame can be provided to answer how soon recovery may take place in the sector.

Community, Social and Personal Services

Arising from the impact analysis and consultation with the affected population and key stakeholders, the sector experts should develop recommendations for a recovery strategy. The Government may have its own goals for the sector so it is important to review recent sector, national and sub national development plans or budget statements.

It should be noted that recovery in the sector not only addresses the reconstruction of the physical assets damaged as a result of the event but the identification of the measures which hasten the recovery process or support the sector in meeting the financial and technical requirements for recovery. 'Building back better' may speak not only to structural efforts but to non-structural measures to build better the processes for the delivery of education services and therefore the introduction of these processes may require additional costs.

The cost of recovery therefore is equal to the cost of reconstruction plus the cost of building back with resilience to future events. In the case of repairs to existing structures, recovery costs should include the costs of retrofitting those structures to withstand future events of a similar nature, when required. The cost of renting alternative premises when classrooms have been destroyed and over the time of reconstruction; possible additional costs of teachers (overtime, or training and on psycho social counseling, etc.)

How long recovery may take, is a factor of not only the measures for financing for recovery but the capacity in related sectors such as the construction sector and infrastructure as road or bridges may affect access.

When all of these and other measures are taken into account then a realistic time frame can be provided to answer how soon recovery may take place in the sector.

Health

Arising from the impact analysis and consultation with the affected population and key stakeholders, the sector experts should develop recommendations for a recovery strategy. The Government's own goals for the sector as stated in recent development plan, budget statements or sector plans should inform the health sector team's development of recommendations for recovery and reconstruction. To arrive at the cost of recovery it is important consider build back better principle.

It should be noted that recovery in the sector not only addresses the reconstruction of the physical assets damaged as a result of the event but the identification of the measures which hasten the recovery process or support the sector in meeting the financial and technical requirements for recovery. 'Building back better' may speak not only to structural efforts but to non-structural measures to build better the processes for the delivery of health services and therefore the introduction of these processes may require additional costs.

It is important to note that the costs of recovery (recovery needs) are those amounts of losses for which there is no provision in the regular budget for sector. Recovery costs should therefore be determined by the fact that any expenditures over and above the normal or non-disaster level in regard to provision of immediate to medium term health care should be included. As an example, recovery needs may include the cost of setting up and operation of alternative temporary health facilities until the destroyed ones have been rebuilt, any increased personnel costs (overtime or special assignments outside the normal residence, etc.), plus the cost of prevention (vaccination, increased monitoring of disease, information campaigns, etc.), plus any costs of controlling both the occurrence of outbreaks and of vectors (spraying, etc.)

Culture

Arising from the impact analysis and consultation with the affected population and key stakeholders, the sector experts should develop recommendations for a recovery strategy. The Government may have its own goals for the sector so it is important to review recent sector, national, State and sub national development plans or budget statements. There is growing recognition that culture, when engaged with positively, can strengthen social inclusion or reduce conflict, more emphasis is being placed on the positive outcomes which can be gained from taking cognizance of the cultural dimensions of development throughout recovery and reconstruction.

To arrive at the cost of recovery, it is important to take into consideration both the cost of reconstruction and Build Back Better aspects. It should be noted that recovery in the sector may not only address the reconstruction of the physical assets damaged as a result of the event but the identification of the measures which hasten the recovery process or supports the sector in meeting the financial and technical requirements for recovery. 'Building back better' may speak not only to structural efforts but to non-structural measures to build better the processes for the delivery of cultural services and therefore the introduction of these processes may require additional costs. It may necessitate acquiring land space for the convening of religious or cultural practices or removal of artifacts to alternative sites until the original sites can be restored.

The cost of recovery therefore is equal to the cost of reconstruction plus the cost of building back with resilience to future events. In the case of repairs to existing structures, recovery costs should include the costs of retrofitting those structures to withstand future events of a similar nature.

How long recovery may take, is a factor of not only the measures for financing for recovery but the capacity in related sectors such as the construction sector and infrastructure such as road or bridges which may affect access. When all of these and other measures are taken into account then a realistic time frame can be provided to answer how soon recovery may take place in the sector.

Environment

Recovery needs

It is defined as the expenditures required to assist nature in achieving the pre-disaster environmental services level provided by environmental assets that are capable of restoration (and which are not to be written off as totally destroyed). For that purpose, the environment assessment team should estimate the cost of the following activities:

- Removal of downed trees;
- Cost of control of invasive species in damaged areas to speed up recovery;
- Minus: any possible salvage revenue obtained from sale of downed trees

Reconstruction needs

It includes the financial amounts required to rebuild associated infrastructure and assets and to replant some tree species that may have been destroyed. These needs may include:

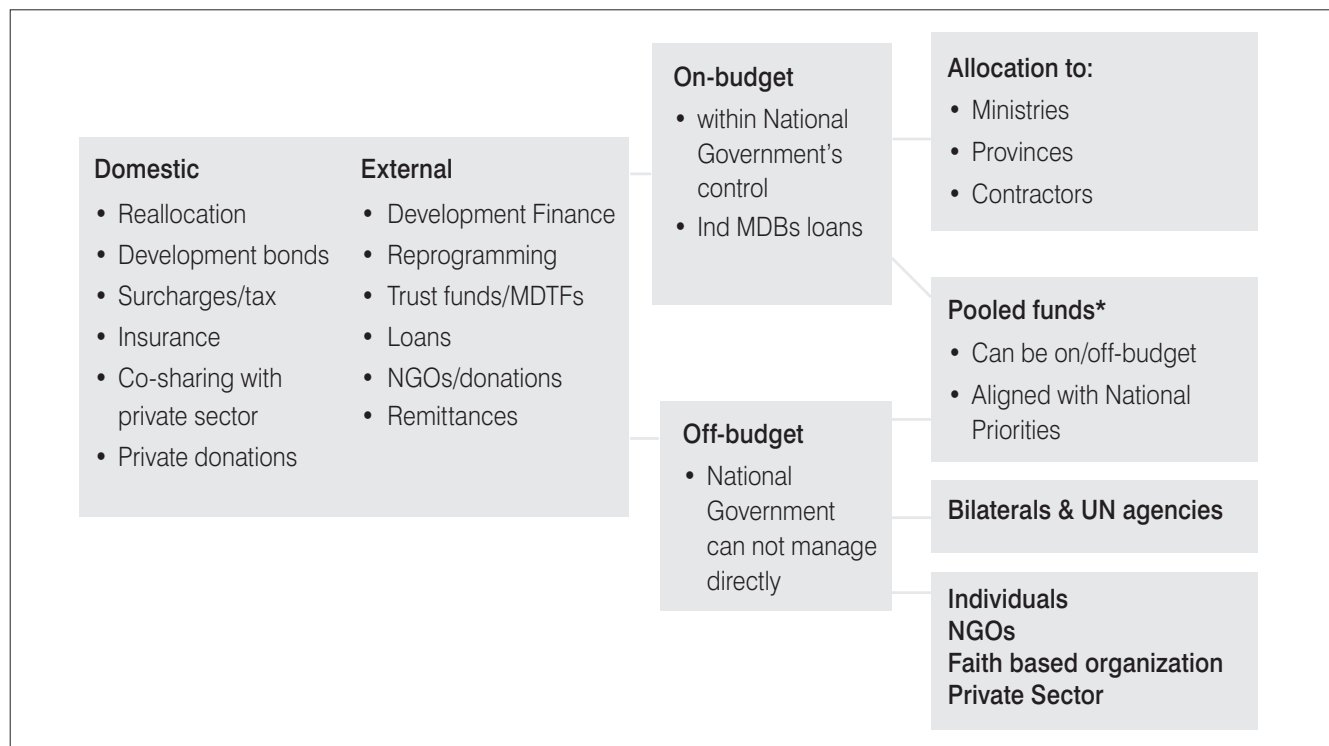
- Reconstruction of walking trails, internal roads, bridges, observation towers, research stations, nurseries, storage facilities, etc. located within forests and other ecosystems;
- Replanting or repopulating of trees in affected forests, with a view to restore the pre-disaster tree population and associated environmental services.

Similar estimations of recovery and reconstruction requirements are to be made for the case of other affected ecosystems.

Options for Financing recovery

The key elements of recovery financing, both national as well as international resources, are at Figure 7.2.

Figure 7.2 Options for financing recovery



Source: The World Bank & et al, 2014

Domestic Funding Sources: Additional domestic resources have been generated by disaster-affected governments through:

- Reallocation among the budget items from “less” to “more” disaster-hit sectors
- Issue of sovereign reconstruction or development bonds
- Levy of tax or surcharge for reconstruction
- Introduction of policy incentives for private sector to share reconstruction costs
- Voluntary civil society and private philanthropies' contributions
- Insurance

Box 7.1 Financing Recovery in Thailand in the aftermath of 2004 Indian Ocean Tsunami

For example, after the 2004 Indian Ocean tsunami, a major portion of R&R costs in Thailand were borne by the government. The overall budget for tsunami R&R was nearly USD 1.7 billion, out of which the government set aside USD 112 million for immediate relief, USD 73 million for rehabilitation measures, and initially USD 8.3 million for public infrastructure reconstruction. The country agreed to receive assistance from foreign governments only in the form of technical assistance, which amounted to around 10 percent of Thailand's recovery-related budget

(ADB, 2010)

External / International Sources of Funding: The external resources for recovery can be sourced from multilateral development banks, regional development banks, bilateral development partners, international NGOs, private philanthropies and charities, and remittances.

Depending on the scale and visibility of the disaster event, charity can account for a huge portion of total assistance. In some cases, funds mobilized by national and international NGOs form a large portion of the total recovery funds. Also, the private sector can play a crucial role in mobilizing resources for recovery.

Possible multilateral financing resources for post-disaster recovery are:

- Credits or loans from multilateral development banks
- Reallocation of existing portfolio of international development institutions
- Multi-donor Trust Funds
- Debt relief
- Ex-ante contingent component of standard investment operations
- Risk Insurance
- Standby financing
- Catastrophic DDOs
- Catastrophe Deferred Drawdown Option (Cat DDO) (The World Bank & et al, 2014)

For example, in the case of Sri Lanka, out of a total USD 2.15 billion for R&R, around 31 percent came from bilateral donors, 29 percent from multilateral agencies, and the remaining 40 percent from NGOs and INGOs (GoSL, 2005).

Monitoring and Evaluation (M&E) of recovery

The M&E is very important in any recovery as programs are often planned with limited data and new vital information emerges later. It is essential elements of good project/ program implementation, providing decision makers with critical information.

- It provides data to decision makers on program progress and effectiveness which includes physical progress and financial disbursement.

- It improves decision making by providing critical information that allows for program / project adjustments to be made. For example, In Indonesia during the 2004 Indian Ocean tsunami R&R, the BRR established the Recovery Aceh Nias Database, which became the central coordinating database for tsunami recovery data in Indonesia, tracking 1,700 projects and a total of USD 3.7 billion in commitments. It featured sector-specific Key Performance Indicators (KPIs) for measuring the progress of reconstruction at various levels, including at the project and sector levels. It also provided a tool to analyze trends of KPIs against baseline and target values, as well as financial and other project data. Similarly, in Gujarat Earthquake Rehabilitation and Reconstruction Programme, GSDMA established Benefit Monitoring System to track progress as well as impact of program implemented in the aftermath of 2001 earthquake.
- M&E systems support transparency and improve accountability to all stakeholders (the public, leaders, and donors).
- M&E systems allow lessons to be captured that improve future program / project implementation, which is valuable (TGLL, 2015).

Box. 7.2 M&E in 2004 Indian Ocean Tsunami Recovery Indonesia

Following the 2004 tsunami, Indonesia used its M&E system for performance based budgeting. Unlike the common government practice of basing budgets on the prior year's allocation, BRR allocated project funds on the basis of a sector's output and capacity to implement. The Recovery of Aceh and Nias (RAN) database was contracted by UNDP to support recovery monitoring. All project proposals were submitted through the database for review by BRR. Project concept notes (PCN) contained information on key performance indicators, funding source, sector, location, and budget allocation. The RAN database also recorded BRR approval. Prior to annual review meetings, project implementers reported on progress within the databases, so that BRR could provide consolidate reports to stakeholders

Source: The World Bank and et al, 2014

It is essential for any post-disaster program to have adequate quantitative as well as qualitative indicators to monitor progress implementation and the eventual achievement of recovery. For example, in Myanmar two complementary monitoring mechanisms namely Periodic Reviews (PRs) and Social Impact Monitoring (SIM) were established to track progress of the Cyclone Nargis Recovery program.

• Case study: M&E Mechanisms in Cyclone Nargis Recovery Program, Myanmar

Background:

Myanmar was struck by the category 3 Cyclone Nargis on 2 and 3 May 2008 and affected more than 50 townships (administrative unit), mainly in Yangon and Ayeyarwady Divisions, including Yangon, the country's largest city. With wind speeds of up to 200 km/h accompanied by heavy rain, the damage was most severe in the Delta region, where the effects of the extreme winds were compounded by a 12-foot storm surge. Nargis was the worst natural disaster in the history of Myanmar, and the most devastating cyclone to strike Asia, since 1991. It led to death of 84,537 people, 53,836 missing and 2.4 million severely affected.

In order to track the progress of recovery as well as seek feedback from ground, two key monitoring mechanisms namely Periodic Reviews (PRs) and Social Impact Monitoring (SIM) were established.

Periodic Reviews

Background: A series of periodic reviews (PRs) were conducted to assess the needs of people and communities, and progress towards recovery and the PR-I was conducted over October-November 2008 i.e. after 6 months of the disaster, while PR-III was conducted over October-November 2009. The goal was to generate data that can be used to target assistance, inform future assessments and thereby help alleviate suffering and accelerate the process of recovery.

Methodology: The methodology evolved with each periodic review. In the first review data was collected from 2,376 households in 108 communities spread across the area of the worst affected by Cyclone Nargis. The Period Review-III covered 1,400 household heads in 30 townships of affected areas.

The 1st review covered the following sectors: Health; Nutrition; Food; Water, supply, sanitation and hygiene (WASH); Shelter; Education; Livelihoods (Credit, Agriculture, Livestock and Fisheries) and Crosscutting issues (Vulnerability and protection, Wealth and Receipt of aid). The 3rd Review covered the following sectors: Health (health facilities and Child health); Water, sanitation and hygiene (Water and Sanitation); Food security; Livelihoods (Crops, Fishing, Boats and Livestock); Shelter; Education and Crosscutting issues (Women, Children, Resettlement, Documentation and Disaster preparedness).

Findings: The findings of the survey were analyzed sector-wise, which included impact of disaster on the sector, status of recovery, priority areas and micro cases studies capturing individual household.

For example, in Periodic Review III, the shelter sector status was captured the following:

- Impact of the Cyclone Nargis on shelter and vulnerable houses a key factor for high number of deaths
- Access to shelter-related relief items
- Status of shelter repair

Table 7.3 Status of shelter Repair

Township	Number of Household						
	Labutta (250)	Bogale (75)	Pyapon (100)	Maubin (75)	Yangon South (100)	Dedaye (50)	Myaungmya (50)
Percentage of households not living in the same dwelling	27	44	18	15	4	14	10
Percentage of household shelters sustaining no damage			1			2	10
Percentage of shelters damaged	73	56	81	85	96	84	80
Percentage of damaged shelters that have been fully repaired	35	60	47	25	54	14	28

Percentage of damaged shelters still in need of repair	66	40	53	75	47	86	73
Percentage of household heads perceiving their shelter as worse than before	94	93	87	87	88	92	90

- Main reasons for inability to repair shelter
- Adequacy of shelter captured type of roofing material used.
- Shelter preparedness, which considered whether risk reduction features have been considered in shelter recovery (TCG, 2008).

Social Impact Monitoring (SIM)

Background: Natural disasters impacts on the social fabric of affected communities and Cyclone Nargis were no exception. Understanding these is vital for effectively delivering post-disaster assistance. A series of Post-Nargis Social Impacts Monitoring were held to examine how key dimensions of village life appear to have changed (or stayed the same) six months after the cyclone hit Myanmar.

The objectives were:

- o Examined the recovery effort at the village level as experienced by affected villagers. This includes an assessment of how much and what types of aid people are getting, needs and shortfalls, and aid targeting and delivery.
- o Examined the socioeconomic impacts of Nargis, including the effects on farmers, fishermen and labors, how they are recovering, and other issues such as debt and migration.
- o Examined the impact on social relations and cohesion, within and between villages, and between leaders and their communities.

Methodology: In-depth qualitative interviews and focus group discussions. For SIM-I it was held with more than 1,500 people in 40 villages in eight townships across the Delta. The villages were selected to be representative of villages in the Delta.

Contents : It captured three areas as follows:

- o Aid effectiveness: The social impacts monitoring assesses the recovery effort at the village level as experienced by affected villagers. It examines issues such as how much and what type of aid people are getting, needs and shortfalls, how assistance is being targeted and delivered, and the process of aid delivery and decision-making.
- o Socioeconomic impacts: The report looks at the impact of Nargis on key occupational groups such as farmers, fishermen and labourers, and the degree to which they are recovering. It considers other key socioeconomic issues in village life such as debt and migration.
- o Social impacts: Finally, the report assesses the way Nargis (and the subsequent aid effort) is changing relations within and between villages and between villagers and their leaders, and how it is affecting local social capital and collective action capacity (TCG, 2009).



Key learning's

- Needs are the estimated financial requirements to bring about the recovery from the disaster. They are identified based on the potential adverse impacts to the people and the economy if nothing is done to counter such identified potential impacts. The identified needs become the main basis of a post-disaster recovery plan intended to:
 - o Regain the people's personal income, access and provision of basic services, and of normal production levels of activity; and
 - o Reconstruct destroyed assets including introduction of disaster risk reduction measures.
- Recovery and reconstruction should apply the 'build back better' principle.
- Since budget for recovery is normally limited, the identified needs in each sector must be prioritized to enable decision makers to consider the most urgent ones among the priorities of all the sectors.
- Aside from the impact assessment, consultations with the affected population and key stakeholders may be needed before the sector experts develop recommendations for a recovery strategy.



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The Training Agenda

Day Number	Number of Hours	Topic	Methodology
1		Opening ceremonies The present post-disaster assessment in India 1. Disaster Response Funds guidelines 2. The Relief memorandum 3. Other protocol The PDNA conceptual framework 1. Concepts and definitions. 2. The sectors for assessment. 3. Linkages among sectors 4. Crosscutting issues.	Lecture, video, Group work case study, Discussions, Exercises
2		Standard procedures in undertaking a PDNA 1. Baseline information 2. Field Assessment 3. Aggregation of data 4. Estimation of needs	
3		Sector Assessments 1. The productive sector 2. The social sector 3. The infrastructure sector 4. Cross-cutting issues 5. Other issues 6. Exercises	
3/4		Aggregation of disaster effects and impact assessment 1. Summary of damages and losses 2. Macroeconomic impact assessment 3. Social impact assessment 4. Exercises	
4/5		Aggregation of disaster effects and impact assessment 5. Gender impact assessment 6. Personal and household levels impacts	
5		Estimation of post-disaster recovery needs 1. Identification of needs 2. Prioritization of needs 3. Estimation of the amount of recovery needs 4. Developing the recovery framework	

Participants' Feedback

Instruction: Valculate the average participant feedback and write in the table.

Day	Learning Unit	AVERAGE SCORE		FACILITATORS NAME
		Content	Facilitation	
1	Learning Unit 1. The present post-disaster assessment in India - Disaster Response Funds guidelines - The Relief memorandum - Other protocols			
	Learning Unit 2. The PDNA conceptual framework - Concepts and definitions - The sectors for assessment - Inter-sectorial linkages - Cross-cutting issues			
2	Learning Unit 3. Standard procedures in undertaking a PDNA - Baseline information - Field Assessment - Aggregation of data - Estimation of needs			
	Learning Unit 4. Sector Assessments The productive sector			
3	Learning Unit 4. Sector Assessments (Cont.) - The social sector - The infrastructure sector - Cross-cutting issues - Other issues - Exercise			

4	Learning Unit 5. Aggregation of disaster effects and impact assessment • Summary of damages and losses • Macroeconomic impact assessment • Social impact assessment • Exercises • Gender impact assessment • Personal and household levels impacts			
5	Learning Unit 6. Estimation of post-disaster recovery needs • Identification of needs • Prioritization of needs • Estimation of the amount of recovery needs • Developing the recovery framework			

Instruction: write down the most common and interesting participant feedback.

Good comments and recommendation?	Improvement needed and recommendation?

SCENARIO-BASED TRAINING EXERCISES: POST-DISASTER NEEDS ASSESSMENT IN INDIA

Facilitator Instructions

General Introduction

- A. The following group exercises are an integral part of the regional and national training courses on Post-Disaster Needs Assessment (PDNA) in India.
- B. The exercises will make use of the “India PDNA Handbook”, which each participant must use during the exercise.
- C. The exercises will be based on a fictional (yet realistic) post-disaster scenario in a District in India.
- D. The exercises will be conducted to consolidate participant learning after the technical presentations, in the following order:

After Learning Unit 4. Sector Guidelines for Undertaking PDNA

Exercise 1: Estimating Sector Disaster Effects

After Learning Unit 5. Aggregation of Disaster Effects and Impact Assessment

Exercise 2: Assessing Disaster Impacts

After Learning Unit 6. Estimation of Post-Disaster Recovery and Reconstruction Needs

Estimating and Prioritizing Needs within the Sectors

*** EXERCISES STARTS ***

Starting the Exercise

Before the exercises start, the facilitator will group participants into the corresponding sectors indicated in the “India PDNA Handbook” as follows:

- **Productive Sectors**
 - o Agriculture, Livestock, Fisheries and Forestry
 - o Mining and Quarrying
 - o Manufacturing
 - o Trade and Services
 - o Tourism
 - o (The Environment)
 - o (Macro-Economic Impact Estimation)

- **Infrastructure Sectors**
 - o Transport
 - o Communications
 - o Electrical
 - o Water Supply and Sanitation
- **Social Sectors**
 - o Housing
 - o Education
 - o Health
 - o Culture
 - o (Social Impact Estimation)

Once in the groups, the facilitator will request participants to read “Background: Pre-Disaster Socio-Economic District Profile”.

Exercise 1: Estimating Sector Disaster Effects

The first part of the scenario will involve the estimation of damages and losses where the macro-economic impact estimation team and environment team will join the productive sectors, while the social impact assessment team will join the social sectors.

Working in respective sector groups, participants will review the pre- and post-disaster information provided, and complete the following tasks:

1. Estimate the damages and losses and put it in the summary table for District Y.
2. Show the basis for the calculation of the damages and losses for each of the item.
3. Present and explain your results to the group.

Note: Participants will use the assessment procedures and tables presented in the India PDNA Handbook, and may decide to present results verbally or using flipcharts.

Exercise 2: Assessing Disaster Impacts

Using the results of the first exercise, the second part of the scenario involves analyzing the damages and losses (disaster effects) in the sector in order to understand and explain the potential disaster impacts. For this exercise, the macro-economic impact estimation, social impact assessment, and environment assessment teams will have their own tasks.

Working in respective sector groups, participants will be requested to complete the following tasks:

1. Assess the potential impacts:

A. For the productive, infrastructure and social sectors:

- Based on the estimated damages and losses, assess potential impacts to the economy and the people.
- What baseline information was lacking to make a more in-depth impact assessment?

B. For the macro-economic impact estimation:

- What are the potential impacts on the macroeconomic indicators? Enumerate the indicators that will be affected.
- What baseline information was lacking to make a more in-depth impact assessment?

C. For the social impact assessment:

- What are the potential impacts on the people that were affected by the disaster? Enumerate the indicators that will be affected.
- What baseline information was lacking to make a more in-depth impact assessment?

D. For the environment assessment:

- What are the potential environmental impacts based on the information from the sectors?
- What baseline information was lacking to make a more in-depth impact assessment?

2. Present and explain your results to the group.

Note: Participants will use the assessment procedures and tables presented in the India PDNA Handbook, and may decide to present results verbally or using flipcharts.

Exercise 3: Estimating and Prioritizing Needs within the Sectors

The third part of the scenario involves reviewing the results of the disaster effects (Exercise 1) and the potential impacts (Exercise 2), in order to understand and explain the estimated and prioritized needs within each sector. For this exercise, the macro-economic impact estimation, social impact assessment, and environment assessment teams will have their own tasks.

Working in respective sector groups, participants will be requested to complete the following tasks:

1. Estimate and prioritize needs within the sector

A. For the productive, infrastructure and social sectors:

- Based on the impact assessment, identify qualitatively (the types of activities/projects) the needs of the sector. (It is not necessary to quantify the amounts).

- Given that the initial budget for entire recovery is limited, prioritize the needs identified for the sector by activities/projects.

B. For the macro-economic impact estimation:

- What are the priority sectors that must be rehabilitated? Why?

C. For the social impact assessment:

- What are the priority projects that must be implemented? Why?

D. For the environment assessment:

- What are the priority projects that must be implemented? Why?

2. *Present and explain your results to the group.*

Note: Participants will use the assessment procedures and tables presented in the India PDNA Handbook, and may decide to present results verbally or using flipcharts.

*** EXERCISES ENDS ***

Background: Pre-Disaster Socio-Economic District Profile

A. Background

The State of X was hit by a cyclone which had strong winds at 175 kph and caused extensive flooding resulting to damages and losses to infrastructure and other sectors in 10 Districts.

Ten (10) post-disaster needs assessment (PDNA) teams were created to conduct post-disaster assessments, one for each District.

Your team was assigned to assess the disaster impacts in District Y.

B. Profile of Panigarh

1. Demography

Table 1. Information about the District

Name of District:			
Poverty incidence (%)	40%		
Maternal mortality rate:	20/10,000		
Infant mortality rate:	30/10,000		
Demography	Male	Female	Total
• Total Population	70,000	80,000	150,000
• Total Number of Those Below 5 years old	15,000	10,000	25,000
• Total Number of Those Above 60 years old	30,000	35,000	65,000
• Total Number of Differently-Abled	1,000	2,000	3,000
Household Description	Male	Female	Total
• Average size	3	2	5
• Average Number of Children	2	1	3
• Average Number of Those Below 5 years old	1		1
• Average Number of Children in School	1	1	
• Average Number of Those Above 60 years old		1	1
Prevalence of malnutrition (%)			10%

Total Number of Families/Households	% of Total	Total Number
• Headed by Male	90%	27,000
• Headed by Female	10%	3,000
• With sanitary toilets		29,000
• Without sanitary toilets		1,000
• With electricity		25,000
• Without electricity		5,000
• Belonging to ethnic minority group		5,000

2. Social Services

Table 2. Social services in the District

Name of District:									
Public Basic Services	Quantity	Capacity	Power Source		Source of Potable Water Supply				
		Persons	Electricity	Others	Type 1	Type 2	Type 3	Type 4	Type 5
Primary School	5	5,000	x			x			
High School	3	5,000	x						x
University	1	2,000	x						x
Health centers	5	250	x						x
Hospitals	1	500	x						x
Other Bldgs.									
District Hall	1	200							x
Fire station	1	50	x						x
Police station	1	50	x						x

- Capacity of basic services refers to enrolment in schools and the number of patients per day at the medical facilities.
- For water supply source:
 - Type 1 is sourced from a spring;
 - Type 2 is individual well with hand pump;
 - Type 3 is shared community well;
 - Type 4 is community faucet;
 - Type 5 is piped-in faucet.

3. Sources of income

Table 3. Main Sources of Income of Households

Name of District:					
Main Sources of Income	Number of Households	Average Monthly Income (Rs)	Average Value of Assets per Household (Rs)	Number of People	
				Male	Female
Self-employed:					
1. Farming	15,000	6000	12,000	12,000	3,000
2. Fishing	5,000	6000	9000	3,000	2,000
3. Livestock Growing	1,000	5400	12,000	800	200
4. Poultry Growing	1,000	4800	12,000	800	200
5. Microenterprises	1,000	4200	12,000	300	700
6. Trading (shops and stores)	3,000	7200	18,000	200	800
7. Services	1,000	6000	12,000	600	400
8. Transport workers	2,000	7800	18,000	1,900	100
Employed					
1. Daily wage laborers	1,000	9000	24,000	600	400
2. Skilled workers (Mining)	300	15,000	36,000	300	0
3. Professionals	5,000	30,000	300,000	4,000	3,000
4. Others					
Other sources					
1. Pension	1,000	6000	36,000	800	200
2. Outside remittance	50	12,000	30,000	20	30



Agriculture, Livestock, Fisheries and Forestry

- Agricultural crops are mostly rice and vegetables.
- There is one commercial coffee plantation that employs 100 people as coffee pickers.
- Livestock and poultry are mostly backyard in nature.
- One irrigation facility is existing.
- District Y supplies 30% of the rice in State X.

Baseline information:

Name of District:								
Sub-sector	Area planted	Average yield for the year	Farm gate price	MSP	Production cost	Number of farmers or growers		
	(Hectares)	(Kg/ Hectare)	(Rs/ unit)	(Rs/ unit)	(Rs/ Hectare)	Families	M	F
Crops								
Rice	2 M	5,000	25/kg	15/Kg	30,000	15,000	12,000	3,000
Vegetables	500	500	20/kg		12,000	5,000	3,000	2,000
Permanent Crops								
Coffee	100	10,000	300/kg		900,000	100	10	80

Based on the field visit, the following were noted:

- 800 hectares of rice farm were affected. The rice was planted only 2 months before the cyclone occurred. It is estimated that production per hectare will be reduced by 30% because of the cyclone.
- Coffee production is expected to be reduced by 20% for the year.
- 500 kg of harvested vegetables were totally washed away by the floods.

- d) 10,000 kg of harvested rice were totally destroyed.
- e) 3 km of irrigation canal were partially damaged and need repair estimated at Rs. 6,00,00,000. While the irrigation is under repair and losses from irrigation fees is estimated to be Rs. 18,00,000.
- f) 50 full grown cattle (valued at Rs. 30,000 each); 100 pigs (valued at Rs. 6,000 each) and 70 goats (valued at Rs. 4,800 each) died from the floods.
- g) 300 chickens (valued at Rs. 60 each) and 100 ducks (valued at Rs. 90 each) were declared to be missing and presumed dead.
- h) Veterinary medicines worth Rs. 60,000 and pesticides worth Rs. 12,000 were destroyed.
- i) 20 tractors were damaged with a total estimated repair cost of Rs. 3,00,000.

Exercise 1:

- 1. Estimate the damages and losses and put it in the summary table for District Y.***
- 2. Show the basis for the calculation of the damages and losses for each of the item.***
- 3. Present and explain your results to the group.***



Mining and Quarrying

- There are 2 mining companies in the district, one for copper and one for gold.
- Copper output amounts to 160 Tons/year while gold output is 0.09 Tons/year, which are both exported.
- Chemicals used in mining operations leaked into the river during the flood.

Baseline information

District Name						
Company Name 1						
Ownership	Public () Private ()					
Employees	Male	95	Female	12		
Production	Average Output / Year (Tons)					
A. Fuel minerals	Coal	Lignite	Petroleum	Natural Gas	Others	
B. Metallic Minerals	Iron	Manganese	Bauxite	Copper	Gold	Others
				160		
C. Non-Metallic Minerals	Limestone	Mica Stone	Others			
Company Name 2						
Ownership	Public () Private ()					
Employees	Male	18	Female	3		
Production	Average Output / Year (Tons)					
A. Fuel minerals	Coal	Lignite	Petroleum	Natural Gas	Others	
B. Metallic Minerals	Iron	Manganese	Bauxite	Copper	Gold	Others
					0.09	
C. Non-Metallic Minerals	Limestone	Mica Stone	Others			

Base on the field visit, the following were noted:

1. The gold mine equipment was affected by the cyclone needing Rs 60,00,000 for repair.
2. Production in the gold mine will be reduced by 20% for 8 months.
3. The tunnel of the copper collapsed which will need Rs 6,00,00,000 to reconstruct.
4. The copper and gold mines operations will totally stop for 3 months.
5. Workers in the copper mines will be temporarily out of job while the production is stopped.

Exercise 1:

1. *Estimate the damages and losses and put it in the summary table for District Y.*
2. *Show the basis for the calculation of the damages and losses for each of the item.*
3. *Present and explain your results to the group.*



Manufacturing

- Aside from mining, the other main manufacturer in the district is the drinking water bottling company which earns total revenues of Rs 60,00,000 a month and employing 2,000 people with an average salary of Rs 12,000 a month.
- There are 20 small meat processing companies employing 1,000 people in total, earning a total of Rs 3,00,000 a month. Their source of raw materials are from the livestock in the District.
- There are 10 micro enterprises engaged in leather goods processing businesses (whose source of raw materials are from the livestock in the District) employing 1,500 people. Their total income per month is estimated at Rs 1,00,000.
- There are 50,000 informal rural people engaged in handicrafts in the district earning revenues at an average of Rs 4,000 per month.
- There are a 20,000 informal urban people in the district engaged in simple food processing which they sell at the markets, each earning Rs 300 per day.

Name of District:								
Type of firm in the Formal Sector	Number							
	Micro		Small		Medium		Large	
	Public	Private	Public	Private	Public	Private	Public	Private
A. Manufacturing								
Food (meat, fish, fruits, vegetables and oils)				20				
Dairy products								
Grain mills products								
Other food products								
Beverages (Water bottling)						1		1
Tobacco products								
Spinning, weaving and finishing of textiles								

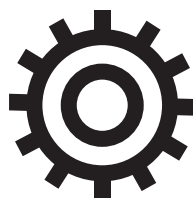
Wearing apparel								
Leather and fur products		10						
Wood and wood products								
Furniture								
Paper and printing								
Rubber, petroleum products								
Chemicals and chemical products								
Non-metallic products								
Basic metals								
Metal products and machinery								
Electrical machinery								
Other manufacturing								
Transport equipment manufacturing								
Others								
TOTAL								
	Micro			Small				
Type of firms in the Informal Sector	Number of Businesses		Number of People Employed		Number of Businesses		Number of People Employed	
Food processing			20000					
Handicrafts			30,000				20000	
Others (Enumerate)								
TOTAL								

Based on the field visit, the following were noted:

1. The water bottling company will be closed for 2 months since its equipment was damaged needing Rs 6,00,000 to repair. The workers will have no work for a month.
2. The food processors experienced damages in their plants requiring a total of Rs 4,00,000. The expected revenue is projected to decline by 60% for 3 months.
3. The leather processors lost their equipment valued at Rs 1,00,000. Their expected revenues will decline by 10% in 1 month.
4. All of the people earning a living from the informal sector are totally out of work for at least 1 month. 80% of them do not have capital to re-establish their micro-businesses.

Exercise 1:

1. *Estimate the damages and losses and put it in the summary table for District Y.*
2. *Show the basis for the calculation of the damages and losses for each of the item.*
3. *Present and explain your results to the group.*



Trade and Services

- There are 1,000 wholesalers in the district each earning an average of Rs. 3,00,000 revenues per month.
- There are 10,000 retailers in the district each earning Rs. 1,80,000 per month. These retailers in the district employ a total of 30,000 people with an average salary of Rs. 12,000 a month.
- There are 5 gasoline station in the district each earning revenues at an average of Rs. 9,00,000 per month.
- There are about 25,000 people in the informal sector working as vendors, carpenters, repairmen, etc., earning about Rs. 300 per day.

Name of District:								
Type of firm in the Formal Sector	Number							
	Micro		Small		Medium		Large	
	Public	Private	Public	Private	Public	Private	Public	Private
A. Wholesale Trade								
Agricultural products				200		800		
Food, beverages, tobacco								
Household goods								
Machinery, equipment, and supplies								
Others (e.g. fuels)								
B. Retail Trade								
Non-specialized shops		5000		3500		1500		
Food, beverages, tobacco								
Automotive fuels				5				
ICT equipment								
Household equipment								
Recreation, reading, games								
Others								

C. Trade and Repair of Motor Vehicles								
Motor vehicle sale								
Motor vehicle repair/ maintenance								
Others								
B. Other Services								
Financial services								
Construction								
Restaurants								
Others								
TOTAL								
Type of firms in the Informal Sector	Micro		Small					
	Number of businesses	Number of Employed	Number of businesses	Number of Employed				
Retail trade		8000		2000				
Repairs		5000						
Restaurants		3000		1000				
Others		1000						
TOTAL								

Base on the field visit, the following were noted:

- 1,000 wholesalers closed their shops for 1 week while 150 retailers closed their shops for 2 weeks.
- The 5 gasoline stations closed for 1 week to clean debris from its premises, which cost Rs 30,000 each of the gasoline stations.
- Except for the carpenters, all of the people earning a living from the informal sector are totally out of work for at least 1 month. 80% of them do not have capital to re-establish their micro-businesses.

Exercise 1:

- 1. Estimate the damages and losses and put it in the summary table for District Y.*
- 2. Show the basis for the calculation of the damages and losses for each of the item.*
- 3. Present and explain your results to the*



Tourism

- In District Y, 20,000 tourists arrive per month to worship in a famous temple.
- From these tourists, hotels earn on the average Rs. 600,000 per month and other guest houses earns Rs. 180,000 per month.
- On the average, a foreign tourist stays 3 days in the district and, aside from hotels, it is estimated that a foreign tourist spends Rs. 1,200 a day on food items.

Name of District:							
Establishment	Number of Establishments by Ownership		Type of Structure (in numbers)				
			1 to 4 Floors			5 and More Floors	
			All Concrete	Concrete and Wood	Wood and Bamboo	All Concrete	Concrete and Wood
	Private	Public					
Accommodation							
Hotels	13	2					
Heritage Hotels							
Apartment Hotels							
Guest Houses	22						
Homestay / Bed & Breakfast							
Spas							
Others							
TOTAL							
Tourist restaurants							
Restaurants	3						
Mobile food service							
Event catering							
Beverage serving service							
Others							
TOTAL							

Based on the field visit, the following were noted:

1. The temple was heavily damaged needing Rs. 2,00,000 to repair and will be closed for 6 months.
2. Only 5 hotels have minor damages needing repair amounting to Rs. 60,000 each.
3. Tourist arrival is expected to be reduced by 80% for six months, which is expected to reduce the income of hotels and guesthouses by 90% for six months.
4. There are about 300 people, mostly from the informal sector, who earn total Rs. 1,80,000 a month tourism services. They are expected to lose 90% of their income for 6 months.

Exercise 1:

1. *Estimate the damages and losses and put it in the summary table for District Y.*
2. *Show the basis for the calculation of the damages and losses for each of the item.*
3. *Present and explain your results to the group.*



Environment

- There are 1,00,000 hectares of protected forest area in the district where only 500 families of indigenous people are allowed to stay and cultivate the land.
- A large watershed area is vital for the district's water supply.

Baseline information

Name of District:				
Environmental Assets (name)	Number of Environmental Assets by Ownership		Area (hectare)	Pre-Disaster Description and Characteristics
	Private	Public		
Forests (primary, secondary, mixed, mangrove, others)				
Mangroves		x	10	
Protected Areas (wildlife sanctuaries, national parks, wetlands, coral reefs, others)				
Protected mixed forests		x	100000	
Other Environmental Assets (areas of importance: high biodiversity, breeding grounds, endangered species, landscape/ recreation)				
TOTAL				

Based on the field visit, the following were noted:

- a) 50,000 hectares of the protected forest area suffered from severe landslide, which will need Rs. 3,00,00,000 to reforest in a year.
- b) The watershed was partially covered by debris, which will need Rs. 60,00,000 to clean within 3 months.
- c) 10 hectares of mangroves were destroyed needing Rs. 60,00,000 to re-plant.

Exercise 1:

- 1. Estimate the damages and losses and put it in the summary table for District Y.*
- 2. Show the basis for the calculation of the damages and losses for each of the item.*
- 3. Present and explain your results to the group.*



Environment

- There are various types of roads and bridges in District Y.
- There are 2 bus companies based in District Y; one government company and one private company.
- The airport is also located in District Y which service the passengers going to other 5 provinces including foreign tourists.
- The concrete roads and steel and concrete bridges connect the Province to other provinces. They are also among the main connection of Laos to Vietnam and Thailand.
- The wooden bridges are important means of access of rural farmers from their farms to the town center.

Baseline information

Name of District:									
Type of Roads	Total Length by classification (Km)					Average Replacement Cost	Average Repair Cost	Average Number of Users per Month	
	Exp.	N.H.	S.H.	M.D.R	Rural	(Rs/Km)	(Rs/Km)	Persons	Vehicles
Water-Bound Macadam	70					30,00,000	6,00,000	3,00,000	1,00,000
Black Top		100				18,00,000	3,00,000	2,00,000	50,000
Cement Concrete			100			6,00,000	1,20,000	50,000	10,000
Motorable				50		3,00,000	60,000	20,000	1,000
Non-motorable									
Others									
Types of bridges	Number by classification					Replacement Cost	Average Repair Cost	Average Number of Users per Month	
	Exp.	N.H.	S.H.	M.D.R	Rural	(Rs/m)	(Rs/m)	Persons	Vehicles
Steel	5					3,00,00,000	18,00,000	3,00,000	1,00,000
Concrete	15					1,20,00,000	6,00,000	2,00,000	50,000
Wood		30				30,00,000	1,20,000	50,000	10,000
Others									

The following are the types of roads/bridges:

- o Exp. means Express road or bridge
- o N.H. means National Highway or bridge
- o S.H. means State Highway or bridge
- o M.D.R. means Major District Road or bridge
- o Rural means rural or other road or bridge

Based on the field visit, the following were noted:

1. The following roads and bridges were damaged and need repair:
 - o 10 km of water-bound macadam roads
 - o 20 km of black top roads
 - o 80 km of cement concrete roads
 - o 40 km of motorable roads
 - o 1 steel bridge
 - o 5 concrete bridges
 - o 20 wooden bridges
2. The roofs of 2 public bus terminals were blown off by strong winds needing Rs. 3,00,000 each for repair.
3. 10 buses from the government bus company were submerged in flood waters needing Rs. 18,00,000 to repair
4. 5 busses from the private bus company were submerged in flood waters needing Rs. 6,00,000 to repair
5. 200 private cars were damaged needing a total of Rs. 30,00,000 to repair them all.
6. Because of the damages to the busses and roads and bridges, the government bus company is expected to lose Rs. 12,00,000 income for 2 months while the private bus company is expected to lose Rs. 6,00,000 for 2 months.
7. The runaway of the airport was full of debris, which will cost Rs. 6,00,000 to clear.
8. Runway lights were submerged in floodwaters, which need Rs. 30,00,000 to repair.
9. The airport will be closed for 2 weeks, which is expected to reduce the airport's income amounting Rs. 60,00,000.
10. About 50 km of railroad tracks were damaged needing Rs. 60,00,00,000 worth of repair. It will take 1 month to repair the track, which will cause the loss of Rs. 60,00,000 revenue losses. The train carries food supply to the state capital.

Exercise 1:

- 1. Estimate the damages and losses and put it in the summary table for District Y.**
- 2. Show the basis for the calculation of the damages and losses for each of the item.**
- 3. Present and explain your results to the group.**



Communications

- There is only one company which provides both telephone and internet services in the district.

Baseline information

Name of District:						
Name of Company	Ownership		Services provided			
	Public	Private	Postal services	Land telecommunication	Wireless telecommunication	Other systems
Company A		x		x	x	
TOTAL						

Based on the field visit, the following were noted:

- 50 towers of the telephone and internet company fell down due to strong winds which will need a total of Rs. 6,00,000 to repair.
- The telephone and internet company earns revenues amounting to Rs. 1,80,00,000 a month.
- All telephone and internet services will be unavailable for 1 month due to repairs.
- For 3 months, the company will use electric generators, which will cost them an additional Rs. 60,00,000 in operating costs.

Exercise 1:

- Estimate the damages and losses and put it in the summary table for District Y.*
- Show the basis for the calculation of the damages and losses for each of the item.*
- Present and explain your results to the group.*



Electrical

- There is one coal power plant in the District which generates electricity supplied to other districts earning revenues of Rs. 60,000,000 a month while extra electricity is exported to Myanmar worth Rs. 18,00,00,000 per month in revenues. This power plant is a joint venture between the government and a foreign company. This company also distributes the electricity it generates.
- The electricity from this power plant provides the power needed by all government offices, private businesses including the schools and hospitals as well as the electricity needed by the water company.

Baseline information

Name of District:					
Name of Power Company	Power Demand Forecast (Kw-Hr)				Rate
	Current Year	Year 1	Year 2	Year 3	Rs/ KW-Hr
Company					
a. Residential	5,000 KW-Hr	5,100	5,200	5,300	6/KW-Hr
b. Commercial	3,000 KW-Hr	3,100	3,200	3,300	9/KW-Hr
c. Industrial	2,000 KW-Hr	2,100	2,200	2,300	12/KW-Hr

Based on the field visit, the following were noted:

1. 2 turbines were damaged which will need Rs. 60,00,000 to repair.
2. Repair to damaged structures will require Rs. 1,80,00,000.
3. Due to the destruction caused by the cyclone:
 - o The demand for residential electricity for the current year will be reduced by 20%.
 - o The industrial and commercial demand will be reduced by 10% in the current year.
 - o The expected demand for the following years after the disaster will be unchanged.
4. The company cannot provide electricity for 1 week and it cannot export electricity for 1 month.
5. Some of the coal in the stockyard were carried by the floods to the river.

Exercise 1:

1. *Estimate the damages and losses and put it in the summary table for District Y.*
2. *Show the basis for the calculation of the damages and losses for each of the item.*
3. *Present and explain your results to the group.*



Water Supply and Sanitation

- There is one commercial water supply company that provide water to 5 states with a monthly revenue of Rs. 6,000,000.
- In District Y, it provides water to 60% of the households, all government offices, private businesses, schools, hospitals and other institutions.
- The other 40% of the households in District Y rely on rural water supply systems which is provided free by the government.

Baseline information

Commercial water supply

Name of District:									
Name of water supply system:									
Population connected to system (%)	60%								
Ownership	Public () Private ()								
Water Users and Supply	Water Demand Forecast (Liters per year) and Rates (Rs per Liter)								
	Current year			Year 1			Year 2		
	Users	Volume (L/Yr.)	Rate (Rs/L)	Users	Volume (L/Yr.)	Rate (Rs/L)	Users	Liters (L/Yr.)	Rate (Rs/L)
a. Residential	18,000	10 crore	6						
b. Commercial	10,000	5 crore	9						
c. Industrial	1,000	3 crore	12						

Rural water supply

Name of District:					
Type of Water Supply	Number by Ownership		Number of Users	Average construction cost	Average repair cost
	Public	Private	Families	Rs	Rs
Type 1: Open well	100		2,000	30,000	18,000
Type 2: Closed well with hand pump	300		5,000	42,000	30,000
Type 3: Closed well with storage and electric water pump and tap stands	150		5,000	120,000	60,000

Based on the field visit, the following were noted:

For commercial water supply:

1. The water treatment facility was damaged which will need Rs. 60,00,000 to repair.
2. Repair to damaged structures will require Rs. 3,00,00,000.
3. Due to the destruction of houses, the demand for residential water supply for the current year will be reduced by 20%.

For rural water supply:

1. 10 open wells were contaminated which require Rs. 18,000 each to be restored. No physical repairs are needed.
2. 5 hand pumps were damaged needing repairs.
3. 2 Type 3 water systems valued at Rs. 30,000 each were totally destroyed which needs to be replaced.
4. The clearing of debris in the water sources will require Rs. 6,00,000.

Exercise 1:

1. *Estimate the damages and losses and put it in the summary table for District Y.*
2. *Show the basis for the calculation of the damages and losses for each of the item.*
3. *Present and explain your results to the group.*



Housing

- There are 40,000 households in the District Y.
- Most of the families living in the far rural areas are farmers with Type 1, Type 2, Type 3 and Type 4 housing.
- 2,000 families living in Type 1 houses are in flood-prone riverbanks.

Baseline information

Name of District:							
Housing typology		Number of houses	Ownership (%)		Number of houses for rent	Average number of occupants	
Types	Description		Male	Female		Female	Male
Type 1	Grass/thatch/bamboo etc.	10,000	99	1	0	3	3
Type 2	Plastic/ Polythene	7,000	99	1	0	3	3
Type 3	Mud/unburnt brick	5,000	99	1	100	2	3
Type 4	Wood	5,000	90	10	100	2	3
Type 5	Stone not packed with mortar	2,000	90	10	100	2	2
Type 6	Stone packed with mortar	1,000	90	10	200	2	2
Type 7	G.I./ metal/asbestos sheets	1,500	80	20	100	2	2
Type 8	Burnt brick	2,500	80	20	100	2	2
Type 9	Concrete	5,000	70	30	200	1	2
Type 10	Others	1,000	70	30	100	1	2
Total							

Name of District:										
Particulars	Values (in Rs) of Various Types of Housing									
	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Type 9	Type 10 (Others)
Average Value of Contents	500	750	1,000	3,000	5,000	7,000	10,000	12,000	15,000	20,000
Average rent per month			50	100	150	250	300	400	500	600
Average replacement cost	1,000	1,500	3,000	5,000	7,000	10,000	15,000	17,000	40,000	50,000
Average repair cost	200	200	300	500	700	800	1,000	2,000	5,000	7,000

Based on the field visit, the following were noted:

1. 7,000 Type 1 houses, 5,000 of Type 2 houses and 1,000 of Type 3 houses were totally destroyed. The contents of these houses were also totally destroyed.
2. 2,000 Type 4 houses, 500 Type 5 houses, 100 Type 6 houses and 50 Type 7 houses were partially damaged. No house contents were damaged.
 - 100 of the partially damaged Type 5 houses are for rent which will require 1 month to repair before they can be rented out again.
 - 30 of the Type 7 houses that were partially damaged are for rent which will require 2 months to repair before they can be rented out again.
3. There are no damages to Type 9 and Type 10 houses but the total cost of clearing the debris within their premises will amount to Rs. 30,00,000.

Exercise 1:

1. *Estimate the damages and losses and put it in the summary table for District Y.*
2. *Show the basis for the calculation of the damages and losses for each of the item.*
3. *Present and explain your results to the group.*



Education

Baseline information

- There are pre-primary, primary schools, secondary schools and a training institute in the District.
- 5 of the primary schools are located along the riverbank, which are flood-prone.

Name of District:										
Total number of enrolled students	Male		Female							
Type of facilities	Number			Total	Average number of students				Average number of teachers	
Educational facilities	Public	Private	Religious		Public		Private		Public	Private
					Male	Female	Male	Female		
Pre-Primary School	20	5			400	410	100	120	12	8
Primary School	20	2			500	510	300	320	30	28
Secondary School	20	2			550	500	320	300	35	32
University										
Training Institutes	1				300	200				
Voc./Training School										
Others										
TOTAL										

Based on the field visit, the following were noted:

1. The roofs of 5 public primary schools were blown off by the cyclone, which will need a total of Rs. 30,00,000 to repair.
2. 10,000 books were washed away by the floods, which will need Rs. 60,00,000 to replace.
3. 5, 000 school desks need repair amounting to Rs. 30,00,000.
4. 10 old computers valued Rs. 6,000 each were totally destroyed
5. The total estimated cost in the cleaning of debris within the primary school premises is Rs. 6,00,000.
6. The training institute's damaged equipment will need Rs. 30,00,000 for repair.
7. Overtime pay for teachers to catch up with lost number of school days is estimated to reach Rs. 12,00,000.

Exercise 1:

1. *Estimate the damages and losses and put it in the summary table for District Y.*
2. *Show the basis for the calculation of the damages and losses for each of the item.*
3. *Present and explain your results to the group.*



Health Center

- In District Y, there is high incidence of malnutrition among children below 5 years old.
- Maternal mortality and child mortality in rural areas is above the national average.
- Vaccination is carried out through the health centers spread across the district.
- Regular services are provided free at the health centers are pre-natal and neo natal check-ups.
- Common diseases treated at the health clinics are diarrhea, pneumonia, influenza, wound infections, snake bites, accidents and other similar medical conditions.
- For serious illnesses, people go to the hospitals in the town center which is about 50 km from the rural areas.
- 3 of the health centers are locate in landslide-prone areas.

Baseline Information

Name of District:									
Type of medical facilities	Number		Total	Average number of clients per day				Average number of medical staff	
	Public	Private		Public		Private		Public	Private
				Male	Female	Male	Female		
Health Center									
Primary health center	15			50	150			3	
Community health center									
Others									
Hospitals									
District/ General/ Taluk hospital	1	1		100	300	75	200	8	12
Ayurvedic hospital									
Others									
Other Facilities									
Anganwadi centers									
Medical laboratories									
Others									
Total									

Based on the field visit, the following were noted:

1. 10 government primary health centers were damaged needing a total of Rs. 3,00,00,000 for repair. Vaccines worth Rs. 60,00,000 was totally destroyed by the floods. Vaccination and pre-natal services will not be rendered for at least 2 months.
2. 1 private hospital has damages on its delivery room needing Rs. 60,00,000 for repair. The repair will take 1 month, which will cause Rs. 12,00,000 in lost revenues. An ambulance was damaged which will cost Rs. 60,000 to repair. One CT scan on the ground floor was damaged by the flood and needs Rs. 3,00,000 for repair.

Exercise 1:

1. *Estimate the damages and losses and put it in the summary table for District Y.*
2. *Show the basis for the calculation of the damages and losses for each of the item.*
3. *Present and explain your results to the group.*



Culture

- There are 10 temples which are the places of worships in the district.
- There is one museum which houses the districts antiques and historical artifacts earning Rs 120,000 per month from entrance fees.

Baseline information

Name of District:					
Cultural Assets	Number of Cultural Assets by Ownership		Description	Average visitors / month	Average fee/ spend per visitor
	Private	Public			(Rs)
Creative arts and entertainment					
Libraries, archives and other cultural activities					
Museum		1		2,000	60
Sports, entertainment and recreation					
Other cultural assets (specify)					
Religious temples	10			350	30
Natural Formations					
TOTAL					

Based on the field visit, the following were noted:

1. One temple was heavily damaged needing Rs. 1,20,00,000 to repair and will be closed for 6 months.
2. The roof of the museum was blown away needing Rs. 6,00,000 to repair. Since the museum was damaged, it is expected to remain close for 2 months.
3. The cleaning of the artifacts submerged in the floods will require Rs. 3,00,000.

Exercise 1:

1. *Estimate the damages and losses and put it in the summary table for District Y.*
2. *Show the basis for the calculation of the damages and losses for each of the item.*
3. *Present and explain your results to the group.*

ABOUT THE INSTITUTE

National Institute of Disaster Management (NIDM) constituted on 30.10.2006 under The Disaster Management Act 2005 has been entrusted with the responsibility for planning and promoting training and research in the area of disaster management, documentation and development of national level information base relating to disaster management policies, prevention mechanism and mitigation measures. Re-designated from the National Centre for Disaster Management of the Indian Institute of Public Administration on 16th October 2003, NIDM is steadily marching towards the mission of making a disaster resilient India by developing and promoting a culture of prevention and preparedness at all levels.

FUNCTIONS

Under The Disaster Management Act 2005, the Institute, has been entrusted with the following functions:

- Develop training modules, undertake research and documentation in disaster management and organize training programmes
- Formulate and implement a comprehensive human resource development plan covering all aspects of disaster management
- Provide assistance in national level policy formulation
- Provide required assistance to the training and research institutes for development of training and research programmes for various stakeholders
- Provide assistance to the State Government and State training institutes in the formulation of State level policies, strategies, disaster management framework and any other assistance as may be required for capacity building
- Develop educational materials for disaster management including academic and professional courses
- Promote awareness among stakeholders including college or school teachers and student, technical personnel and others associated with multi-hazard mitigation, preparedness and response measures
- Undertake, organize and facilitate study courses, conferences, lectures, seminars within and outside the country to promote the aforesaid objectives
- Undertake and provide support for publication of journals, research papers and books as well as establish and maintain libraries etc.



Resilient India - Disaster free India

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