राष्ट्रीय आपदा प्रबंधन प्राधिकरण
NATIONAL DISASTER MANAGEMENT AUTHORITY
गृह मंत्रालय, भारत सरकार
Ministry of Home Affairs, Government of India
राष्ट्रीय चक्रवात जोखिम प्रशमन परियोजना
NATIONAL CYCLONE RISK MITIGATION PROJECT (NCRMP)
विंग 14, प्रथम तल, रा.आ.प्र.प्रा.भवन, ए1, सफदरजंग एन्कलेव,
Wing 14, First Floor, NDMA Bhawan, A-1, Safdarjung Enclave,
नई दिल्ली/New Delhi-110 029
Tele : 011-26701744, FAX : 011-26714321

Advertisement No. 1-1/2014-PMU (Vol.III)

Government of India has launched National Cyclone Risk Mitigation Project (NCRMP) with World Bank assistance with a view to address cyclone risks in the country. The overall objective of the Project is to undertake suitable structural and non-structural measures to mitigate the effects of cyclones in the coastal States and UTs of India. The Project Management Unit (PMU), NCRMP, NDMA is entrusted with implementation of this Project in coordination with participating State Governments and the National Institute of Disaster Management (NIDM).

2. PMU, NCRMP, NDMA invites applications from eligible persons for the following positions to be filled up on contract for the period for employment. The contract will be for one year initially and may be extended with mutual consent based on need and performance by not more than three (03) months at a time up to closure of NCRMP Phase-II, whichever is earlier. Educational qualifications, experience required and remuneration offered are given in the table below. For details of NCRMP and duties/responsibilities of each position, please visit www.ncrmp.gov.in or www.ndma.gov.in.

Job Title (2)	Remuneration (3)	Educational Qualifications (4)	Post Qualification experience & Expectations (5)
Consultant (Technical Specialist) National Multi-Hazard Risk Assessment and Risk Profiles	Rs.1,00,000/- per month (Consolidated)	• M.Sc. (Geography/ GIS and Remote Sensing) or Masters of Engineering Degree (Compute science/ IT) • Basic Computer Skills in Word processing, spread sheet & Power Point.	• **Essential :-** (a) 10-12 years experience in managing Technical Disaster Risk management (DRM) projects or conducting multi-hazard risk assessments. (b) Essential coordination and communication skills, to facilitate interactions between multiple stakeholders and drive consensus is a must. • **Desirable :-** (a) Experience of working with Disaster Risk Management Agencies and departments of the Government of India or in any State governments. (b) Past experience of generating Vector Data and Raster Data (at proper scale and contour intervals) collected through satellite as well as airborne imageries, overlaying census/field data and various natural/ manmade hazard profiles on GIS platform to arrive at appropriate decisions will be an asset.

3. **AGE** : Not more than 62 years as on the date of advertisement.

4. Interested individuals may send their application in the prescribed proforma for the above posts alongwith self attested copies of certificates establishing educational qualification, experience etc addressed to the Project Accountant/ Administrative Officer, National Cyclone Risk Mitigation Project, National Disaster Management Authority, NDMA Bhawan, A-1, Safdarjung Enclave, New Delhi-110 029, within 45 days from the date of publication of the advertisement in Employment News. The detailed Advertisement, Terms of Reference and Proforma for application may be seen on the project web site www.ncrmp.gov.in and NDMA's website www.ndma.gov.in

Proforma for application

1. Advertisement No. and title of Post applied for.

2. Name (in Block letters)　　　:

3. Date of Birth (Christian Era)　:

4. Nationality　　　　　　　:

5. Father's/Spouse's name　　:

6. Address for correspondence (with Tel./Mob. No. and e-mail ID) :

7. Permanent Address　　　:

8. Qualifications　　　　　:

(a)　　Educational qualification.

S.No.	Course/Degree	Subject(s)	University/Institute.	Year of passing.	Division.

(b)　　Professional qualification.

S.No.	Course/Degree	Subject(s)	University/Institute.	Year of passing.	Division.

10. Total experience directly relevant to the post applied (in months) :

11. Total employment experience and details (in months) indicating the nature of duties and responsibilities :

S.No.	Organisation /Institute.	Period From	to	No. of Months.	Nature of work.	Remarks.

12. If selected, minimum time required to join the post　:

13. Any other information　　　:

Declaration

　　I affirm that information given in this application is true and correct. I also fully understand that if at any stage it is discovered that any attempt has been made by me to wilfully conceal or misrepresent the facts, my candidature may summarily be rejected or employment terminated.

(Signature of the applicant)

Place　:

Date　:

TERMS OF REFERENCE
CONSULTANT (TECHNICAL SPECIALIST)
NATIONAL MULTI-HAZARD RISK ASSESSMENT AND RISK PROFILES

1. BACKGROUND

Integrating natural hazard and climate risk into development planning is primary to sustainable and long-term development of the Indian economy and its people. Thus, accurate and accessible information quantifying historical and potential risks from natural hazards and climate change have become a planner's and policymaker's invaluable resource that India can ill afford to ignore.

In the present scenario, Government planners and policymakers find themselves surrounded by a multitude of hazard and climate risk information that lacks standard methodologies (e.g. quality assurance) or does not have uniform geo-spatial coverage at national level, or even that these datasets are often on heterogeneous and difficult to integrate IT platforms. In view of this, Government of India, with World Bank and GFDRR support have commissioned the collection and presentation of natural hazards risk information in India, as well as the development of an online platform for data hosting and sharing.

The development of "National Multi-Hazard Risk Assessment and Risk Profiles" has been commissioned to a consulting agency with the following expected outcomes:

1. *Stocktaking analysis.* This component includes: a) stock taking report of existing multi-peril risk assessments at State level with a set of recommendations on additional risk assessments to fill identified information gaps and advance effective government's DRM decision-making; b) a structured database containing all available datasets related to existing risk assessments for individual perils as well as from a multi-hazard perspective, including information on historical events and their impacts.

2. *Assessment of the current and future risks from seismic ground shaking, fluvial flood, flash flood, urban flood, drought, cyclones, tsunamis, forest fires and heatwave, landslide and avalanche in India.* This will be based on collection of existing risk assessments done at regional, state and municipal levels, including adjustments and development of new information using available global, regional or national models if gaps are found, and should result in hazard, exposure and risk layers for the entire country.

3. *Design and development of online risk information platform.* This component includes: a) development of the online risk information platform which serves as a fundamental base for the government decision making as well as risk communication to the public; and b) design of training and capacity building for online platform users and for officials in charge of uploading data and information and provide analytics to decision makers.

4. *Risk Profiles at National, State and District levels.* Summarizing Risk Profiles will be developed at National, State and District levels and where possible, sub-district (block) level. The Profiles should summarize and visualize the multi-hazard risk situation, and can be published on the online risk information platform as well as in PDF format.

5. *India Disaster Risk Report.* The report will provide: a) country wide risk update, through the multi-hazard risk assessment for each State and Union Territory; b) an analysis of progress made in each State and Union Territory on DRM and risk assessment, in particular; and c) recommendations to set up protocols for producing risk assessments at State level, data availability and management, and institutional responsibilities.

6. *Detailed case-studies:* Detailed risk assessments for a selection of hazards for 5 cities or districts, using available information and, where possible, the creation of new hazard, exposure and vulnerability information. The case-study cities will be agreed upon with NDMA and the Consulting firm during the project.

The National Disaster Management Authority (NDMA) is seeking a Consultant to provide technical and coordination support to this exercise.

[Attachment: Terms of Reference for the 'National Multi-Hazard Risk Assessment and Risk Profiles']

2. SCOPE OF WORK

The Consultant is expected to manage the technical aspects of this project, including:

- Provide technical inputs to the consulting firm on the study design, implementation and emerging outputs;
- Review the project progress on a weekly and monthly basis including organisation of regular review meetings, communication with various stakeholders in preparation for and follow-up after the meetings;
- Facilitate the communication and engagement of the respective consulting firms with other government departments or entities towards development of outputs;
- Facilitate the consulting firm in matters associated with data acquisition and organization of data collection / validation processes;
- Review all key study outputs (including intermediate submissions) and provide timely feedback to NDMA for further action and output delivery approvals;
- Monitor progress and ensure incorporation of feedback in the reports/deliverables;
- Coordinate communication and shared actions between NDMA, The World Bank and consulting agency, and attend key meetings;
- Facilitate coordination between the consulting firms and the finance and procurement teams for smooth contract management.
- Integration of the study outputs, risk database at NDMA GIS Lab or any other entity that is decided by NDMA (this could perhaps be NDEM, NEOC etc.).
- Any other related task assigned by the Additional Secretary, NDMA.

3. REPORTING

The Consultant will report to and be guided by Project Director, NDMA.

4. QUALIFICATIONS AND SKILLS

- 10-12 years experience in managing technical disaster risk management (DRM) projects or conducting multi-hazard risk assessments.

- Experience of working with disaster risk management agencies and departments of the Government of India or in any State governments.
- Past experience of generating vector data and raster data (at proper scale and contour intervals) collected through satellite as well as airborne imageries, overlaying census/field data and various natural/ manmade hazard profiles on GIS platform to arrive at appropriate decisions will be an asset.
- Essential coordination and communication skills, to facilitate interactions between multiple stakeholders and drive consensus is a must.
- M.Sc. (Geography; GIS and Remote Sensing) or Masters of Engineering Degree (Compute science, IT and related field) with minimum post qualification experience of 4 years in the requisite field. The candidates should have high competency and established peer reputation.

5. DURATION

The consultancy will be for a period of 15 months.

India

National Multi-Hazard Risk Assessment and Risk Profiles

Terms of Reference

Background

Increasing resilience to natural disasters in India will require investments to reduce existing risk, prevent the creation of new risk, and manage residual risk through better institutions, policies, physical and digital infrastructure systems, and financial mechanisms. At the State level, investments must be tailored to local contexts taking into account risk profiles and institutional capacity and setup. The project objective is to enhance the quality of existing and future information on risks and vulnerabilities and related capacities at National and State level to increase resilience.

Given its vast geographic and climatic diversity, India is prone to all major natural hazards and has experienced the highest number of disasters in South Asia, with an increasing trend in events and causalities over the past 40 years. It is particularly exposed to earthquakes (tsunamis), floods, droughts, cyclones and landslides. About 60 percent of the landmass is prone to earthquakes of varying intensities; over 8 percent is prone to floods; almost 5,700 kilometers of the 7,500 kilometer coastline is prone to cyclones and 68 percent of the area is susceptible to drought.

Still, there are existing gaps that may undermine the effectiveness of DRM investments, also as recognized by the GoI. The main challenges identified by the GoI are twofold: i) generating, refining, and interpreting reliable disaster risk information that can be integrated into policies and programs; and ii) enhancement of the DRM Institutional Systems to assure its capability in addressing natural hazard risks and develop preventive policies at National, State and District levels, including opportunities for Risk Financing Options.

The creation, understanding and accessibility of hazard, exposure, vulnerability and risk information is key for effective management of disaster and climate risk. At present, even though there is plenty of hazard and climate risk information produced in India, the information that does exist typically lacks a standard methodology (e.g. quality assurance) and does not have uniform geo-spatial coverage at national level. Thus, the GoI has not always reliable information regarding current and future hazard and climate risk at national and some States levels, therefore the effectiveness of policy options on which to base their risk reduction decisions lacks uniformity.

A key first step toward integrating natural hazard and climate risk into development planning involves improving the understanding of risks in India by quantifying and anticipating the potential impacts of natural hazards and climate change on Indian society and the economy, as well as assessing the capability of existing institutions at national and State levels in addressing those risks, implementing their mandate and fostering resilience in the country. This activity will build on past activities that were developed at State level, which were carried out to inform ongoing lending operations in several States.

To better understand natural hazard and disaster risk, the World Bank and Global Facility for Disaster Reduction and Recovery (GFDRR) are supporting the collection and presentation of **fluvial flood, flash flood, urban flood, drought, landslide, avalanche, storm surge, cyclone, tsunami, forest fire, heat wave and seismic risk information in India**, as well as the development of an online platform for data hosting and sharing.

Specific outcomes are:

1. *Stocktaking analysis.* This component includes: a) stock taking report of existing multi-peril risk assessments at State level with a set of recommendations on additional risk assessments to fill identified information gaps and advance effective government's DRM decision-making; b) a structured database containing all available datasets related to existing risk assessments for individual perils as well as from a multi-hazard perspective, including information on historical events and their impacts.

2. *Assessment of the current and future risks from seismic ground shaking, fluvial flood, flash flood, urban flood, drought, cyclones, tsunamis, forest fires and heatwave, landslide and avalanche in India.* This will be based on collection of existing risk assessments done at regional, state and municipal levels, including adjustments and development of new information using available global, regional or national models if gaps are found, and should result in hazard, exposure and risk layers for the entire country.

3. *Design and development of online risk information platform.* This component includes: a) development of the online risk information platform which serves as a fundamental base for the government decision making as well as risk communication to the public; and b) design of training and capacity building for online platform users and for officials in charge of uploading data and information and provide analytics to decision makers.

4. *Risk Profiles at National, State and District levels.* Summarizing Risk Profiles will be developed at National, State and District levels and where possible, sub-district (block) level. The Profiles should summarize and visualize the multi-hazard risk situation, and can be published on the online risk information platform as well as in PDF format.

5. *India Disaster Risk Report.* The report will provide: a) country wide risk update, through the multi-hazard risk assessment for each State and Union Territory; b) an analysis of progress made in each State and Union Territory on DRM and risk assessment, in particular; and c) recommendations to set up protocols for producing risk assessments at State level, data availability and management, and institutional responsibilities.

6. *Detailed case-studies:* Detailed risk assessments for a selection of hazards for 5 cities or districts, using available information and, where possible, the creation of new hazard, exposure and vulnerability information. The case-study cities will be agreed upon with NDMA and the Consulting firm during the project.

Overview of the Scope of Work

The objectives of the project are to conduct a stocktaking of national multi-hazard and climate risk information; to develop a National multi-hazard risk assessment and a risk information sharing platform for the government decision making; as well as the risk communication for the public.

The expected outputs under this project will be the stocktaking and classification of existing risk assessment results to-date; risk profiles and a risk report; and the integration of all information in a

dedicated online platform. Risk information dissemination and capacity building of government users are part of the expected outputs.

All components will benefit from guidance of an ad hoc advisory committee to be established at NDMA. The advisory committee will be chaired by NDMA and include all relevant academic and technical institutions at national and selected State levels. It will also include representatives from all States' DMAs. The advisory committee will be consulted at inception, mid-term and final stages of the risk-assessment development. Three specific workshops will be held at inception, mid-term and final stages of the process to facilitate consultation and obtain guidance.

The main outputs are the following:

STAGE I: National information creation and platform development

I. Stocktaking analysis

The stocktaking exercise will collect and assess all existing risk information data and reports available at State, sub-regional and municipal levels (including prior assessment funded by GFDRR and other donors, as well as scientific studies), and suggest the most effective design of the information platform for the purpose of risk-informed decision-making at National level as well as state level. This aims to build a consistent national multi-peril risk assessment and a risk information platform for timely and effective decision making, combining existing data in an effort to build uniformity and assure high quality standard. This stocktaking and consolidation exercise will also identify information gaps, and serve a foundation for the development of the National multi-peril risk assessment.

The stocktaking should focus on gathering all relevant information for risk assessment for the various relevant perils, including (1) hazard maps; (2) exposure information for various asset types, including population density, buildings, infrastructure, agriculture, energy, education and healthcare facilities; (3) vulnerability functions for different types of assets. In addition, the stocktaking should identify existing historical disaster impact information databases and gaps in the existing historical information. Based on the existing information, overviews should be prepared of historical disaster impact information, i.e. reported losses and fatalities classified by date and event type. The Consulting Firm is expected to make use of documents containing relevant records of historic events and risk background information. This includes available World Bank country notes and post-disaster needs assessments (PDNA).

The stock taking assessment should be undertaken at State, sub-regional and municipal levels. The results should be (1) a well-organized database of spatial and tabulated data; and 2) a report with a set of recommendations on additional risk assessments and/or historical disaster impact information to fill identified information gaps and advance effective government's DRM decision-making.

II. National Multi-peril Risk Assessment.

This component will finance a comprehensive multi-peril risk assessment at the national level, using existing global and national models and limited new modelling, where needed. This assessment will cover *seismic ground shaking, fluvial flood, flash flood, urban flood, drought, cyclone, tsunami, forest fires and heatwave, landslide and avalanche.* Where possible – and at least for seismic, fluvial flood,

drought, cyclone and tsunami – the assessments should be on a probabilistic (i.e. return period) basis; for some hazards, susceptibility information will be sufficient.

The Consulting Firm may use and combine all available sources of local, national, continental and global data in a consistent final product. The Consulting Firm should pay special attention to the applicability and reliability of the proposed methodology and data sources in data-scarce areas in India. Specific attention should be paid to the validation and sanity checking of all results, by comparing modelled hazard maps to observed (e.g. satellite or remote sensing) information, and by comparing modelled risk information to historical losses as well as expert judgment.

The risk assessment should as much as possible use existing hazard data with the exposure and vulnerability information collected in the stocktaking. The stocktaking described under component I. will guide this sub-component that will build on existing risk assessment at State, sub-regional and municipal levels, leveraging existing information and combining different models. The requirements vary across the perils – a detailed overview of the required output metrics is provided in Table 1, under Deliverables. These include, contingent on the peril type:

- Stochastic and historic event sets (at least 3 per peril, where applicable) – which will be used for identifying the distribution of loss in major events and determining the key locations on which reconstruction options should focus for each peril;
- Hazard layers for at least the return periods 10, 20, 50, 100, 250, 500 and 1000 years (longer return periods may be appropriate for earthquake hazard);
- Tabulated total hazard exposure (exposed population; government buildings; commercial and residential buildings; agricultural; infrastructure and GDP);
- Tabulated potential loss;
- Event Loss Table (ELT) or Year Loss Table;
- Loss exceedance curve and tabulated return period losses;
- Tabulated Annual Average Loss (AAL);
- Tabulated break-down of loss metrics for different sectors; and
- GIS-compatible spatial datasets comprising exposure data, hazard footprints and loss footprints.
- The exact formats for delivering these data must be agreed upon with NDMA and GFDRR.

The Consulting Firm analysis should produce the analysis for the current climate and socioeconomic situation, as well as for the year 2050 under scenarios of climate change and socioeconomic development for all perils. The future risk projections should be based on a combination of hazard projections (for fluvial flood; flash flood; drought; snow avalanche and landslides only; based on at least three Representative Concentration Pathway[1] projections), and a projection of exposure (for all perils) based on at least three Shared Socioeconomic Pathway[2] (SSP) projections.

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[1] Van Vuuren, Detlef P., et al. "The representative concentration pathways: an overview." *Climatic Change* 109 (2011): 5-31. Available at http://link.springer.com/article/10.1007%2Fs10584-011-0148-z#

[2] O'Neill, B. C. et al. Meeting Report of the Workshop on *The Nature and Use of New Socioeconomic Pathways for Climate Change Research*. (2012). https://www2.cgd.ucar.edu/sites/default/files/iconics/Boulder-Workshop-Report.pdf

III. Risk Profiles

Using the risk assessment results, the Consulting firm will develop generic risk profiles at State level, district and sub-district levels. These profiles should also be developed at major cities level. A list of most vulnerable and most exposed cities will be agreed upon with NDMA and the Consultant at inception report. Up to 10 cities will be selected for which risk profiles will be created. Examples of risk profiles can be found here: https://www.gfdrr.org/en/disaster-risk-profiles These risk profiles should provide insight into the spatial distribution of the various risks and highlight the key insights from the risk assessments.

Ultimately, the risk assessment results should inform specific investment opportunities at a national and State level – e.g. Safer Schools3, Risk Financing, Urban Resilience, etc. Effective risk information will convey risk information amongst government counterparts, development partners and the private sector, to promote DRM efforts in the country's development planning. The risk information is therefore also expected to be repackaged as targeted risk profiles for specific topics and/or asset groups (e.g. schools) to build awareness of risk amongst government counterparts and development partners and lead to discussion on effective resilient investments and pipelines with the Bank. In consultation with NDMA and other stakeholders, a set of 10 targeted risk profiles will be defined.

Both the generic risk profiles and the targeted risk profiles should be produced in PDF form for printing, and in a dynamic electronic way on the web platform.

IV. Design and development of online risk information platform.

Under this component, the Consulting Firm will produce a national geospatial platform to host the various results produced under component (I) and (II), as well as the risk profiles (component III). This online national platform will be designed for internal use by the various government counterparts, and should preferably (but not necessarily) rely on open-source coding such as the *GeoNode* tool. The specific platform will be selected in agreement with NDMA.

The outcomes at II. and III. will inform this sub-component, which is aiming at the a) development of the online risk information platform which serves as a fundamental base for the government decision making as well as risk communication to the public; and b) design of training and capacity building for online platform users and for officials in charge of uploading data and information and provide analytics to decision makers.

The platform development should come with a comprehensive hosting and maintenance plan, including various options with pricing for the GoI. In addition, the Consulting Firm should provide sufficient training on the usage of the platform to the NDMA and GoI officials and other priority stakeholders, to be identified together with counterparts.

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[3] The Indian government counterparts were recently invited to the International Workshop of the Global Safer Schools, held in January 2017 in London, where the counterparts had opportunities to learn global efforts and lessons learned, including the experience of Japan. This opportunity enhanced the commitment of the GoI on improving structural safety of schools in India.

V. India Disaster Risk Report.

The Consulting Firm will develop a report including the outcomes of the previous phase as well as: a) country wide risk update, through the multi-hazard risk assessment for each State and Union Territory; b) provide an analysis of progress made in each State and Union Territory on DRM and risk assessment, in particular. The report should include recommendations to set up protocols for producing risk assessments at State level, data availability and management, and institutional responsibilities.

Staffing Requirements

The Consulting Firm is free to propose a staffing plan and skill mix necessary to meet the objectives and scope of services. If all the required skills are not available within the Consulting firm, they are encouraged to make joint ventures with other firms. Appropriately curated consortiums are appreciated in order to fulfil the full gamete of requirements The Project Manager should have at least 15 years of experience in flood, tropical cyclone, and/or earthquake catastrophe risk modeling and in the development of exposure data.

Deliverables

This section describes the required deliverables. Consistent with World Bank / GFDRR best-practice and the broader activity objectives, all outputs (hard and soft) produced under this assignment will be provided to NDMA and the Indian government, as the principal owner of the data, as well as the World Bank and GFDRR. All the data should be licensed as open source. All technical reports will be written in English.

The Consulting Firm is required to define the proposed methodology in a project inception report. This report should articulate the limitations of the proposed methodology including gaps in available data, which can be a focus for future development. The report should review and compare the proposed methodology with other available modelled views of risk for the country.

The Consultancy is required to provide a final project report that defines the methodology used, describes the drivers of loss for each peril, and discusses how the risks may change in the future based on socio-economic change and environmental change. The final report should also compare and rationalize modelled losses to other views of modelled risk in the region.

Below, a more detailed list of requirements is provided for the various deliverables:

1. Inception report, detailing at least

    1.1. The proposed methodology for the stock taking of existing risk assessments and historical information including a list of reports/documents to be reviewed;

    1.2. The proposed methodology for the risk assessment for all hazards, and for combining these in a multi-hazard perspective;

1.3. A comparison of the chosen methodologies with other available modelled views of risk for the country;

1.4. An assessment of foreseen limitations in data availability and the chosen methodologies;

1.5. A text summary of drivers of loss for each peril, including discussion of how the risk may change in the future

2. Tabulated exposure and loss data, current estimates and projections for 2050 (see Table 1 for the full details on output metrics):

   2.1. Tabulated record of historical disaster events, with associated losses;

   2.2. Tabulated total hazard exposure (exposed population; government buildings; commercial and residential buildings; agricultural; infrastructure and GDP), provided at the national level and at the level of first and second administrative boundaries;

   2.3. Loss metrics, to be provided for each peril individually and for combined perils. Each loss metric should be provided for each individual sector (i.e., government buildings; infrastructure; agriculture; commercial and residential buildings) and all sectors combined, at the national level and at the level of first and second administrative level.

      2.3.1. Event Loss Table (ELT) or Year Loss Table (YLT);

      2.3.2. Loss exceedance curve;

      2.3.3. Tabulated return period losses for the selected return periods (see Table 1);

      2.3.4. Tabulated Annual Average Loss (AAL); and

      2.3.5. Tabulated potential loss.

3. GIS-compatible hazard, exposure and loss data layers:

   3.1. Hazard footprints showing hazard intensity on gridded basis, for the selected perils and return periods (see Table 1). Parameter to be selected as most appropriate for the peril

      3.1.1. For various return periods, including at least 10, 20, 50, 100, 250, 500 and 1000 years (longer return periods may be appropriate for earthquake hazard);

      3.1.2. For at least 3 selected stochastic events per peril;

      3.1.3. For at least 3 selected historic events per peril;

   3.2. Exposure data layer on gridded basis for each sector (exposed population; government buildings; commercial and residential buildings; agricultural; infrastructure and GDP);

   3.3. Hazard exposure footprints for selected perils and return periods (see Table 1);

   3.4. Loss footprints for selected perils and return periods (see Table 1); and

   3.5. AAL footprint at the level of first administration boundaries for the selected peril (see Table 1)

4. Final project report, written in English, detailing for the entire project:

   4.1. The disaster risk assessment methodology applied, including detailed description of the development of vulnerability functions;

   4.2. Data implemented in the analysis;

   4.3. Limitations in the methodology applied;

   4.4. Comparison of the methodology to other modelled views of risk in the region;

   4.5. Presentation of results;

   4.6. Comparison of the losses derived, to other modelled views of risk in the region, and rationalization of the losses with respect to drivers of loss; and

   4.7. Any other critical information regarding the outputs.

5. India Disaster Risk Info and Risk profiles, written in English, detailing:

   5.1. Context of the situation with overview of historical disasters

   5.2. Highlights of the existing and future hazard and risk results

   5.3. Key insights from the risk assessment

राष्ट्रीय आपदा प्रबंधन प्राधिकरण
NATIONAL DISASTER MANAGEMENT AUTHORITY
गृह मंत्रालय, भारत सरकार
Ministry of Home Affairs, Government of India
राष्ट्रीय चक्रवात जोखिम प्रशमन परियोजना
NATIONAL CYCLONE RISK MITIGATION PROJECT (NCRMP)
विंग 14, प्रथम तल, रा.आ.प्र.प्रा.भवन, ए1, सफदरजंग एन्क्लेव,
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Job Title (2)	Remuneration (3)	Educational Qualifications (4)	Post Qualification experience & Expectations (5)
Consultant (Technical Specialist) National Multi-Hazard Risk Assessment and Risk Profiles	Rs.1,00,000/- per month (Consolidated)	• M.Sc. (Geography/ GIS and Remote Sensing) or Masters of Engineering Degree (Compute science/ IT) • Basic Computer Skills in Word processing, spread sheet & Power Point.	• **Essential :-** (a) 10-12 years experience in managing Technical Disaster Risk management (DRM) projects or conducting multi-hazard risk assessments. (b) Essential coordination and communication skills, to facilitate interactions between multiple stakeholders and drive consensus is a must. • **Desirable :-** (a) Experience of working with Disaster Risk Management Agencies and departments of the Government of India or in any State governments. (b) Past experience of generating Vector Data and Raster Data (at proper scale and contour intervals) collected through satellite as well as airborne imageries, overlaying census/field data and various natural/ manmade hazard profiles on GIS platform to arrive at appropriate decisions will be an asset.

3.   **AGE**   :   Not more than 62 years as on the date of advertisement.

4.   Interested individuals may send their application in the prescribed proforma for the above posts alongwith self attested copies of certificates establishing educational qualification, experience etc addressed to the Project Accountant/ Administrative Officer, National Cyclone Risk Mitigation Project, National Disaster Management Authority, NDMA Bhawan, A-1, Safdarjung Enclave, New Delhi-110 029, within 45 days from the date of publication of the advertisement in Employment News. The detailed Advertisement, Terms of Reference and Proforma for application may be seen on the project web site www.ncrmp.gov.in and NDMA`s website www.ndma.gov.in

Cont.

Proforma for application

1. Advertisement No. and title of Post applied for.

2. Name (in Block letters)   :

3. Date of Birth (Christian Era)   :

4. Nationality   :

5. Father's/Spouse's name   :

6. Address for correspondence (with Tel./Mob. No. and e-mail ID) :

7. Permanent Address   :

8. Qualifications   :

(a)   Educational qualification.

S.No.	Course/Degree	Subject(s)	University/Institute.	Year of passing.	Division.

(b)   Professional qualification.

S.No.	Course/Degree	Subject(s)	University/Institute.	Year of passing.	Division.

10. Total experience directly relevant to the post applied (in months) :

11. Total employment experience and details (in months) indicating the nature of duties and responsibilities :

S.No.	Organisation /Institute.	Period From	to	No. of Months.	Nature of work.	Remarks.

12. If selected, minimum time required to join the post   :

13. Any other information   :

Declaration

I affirm that information given in this application is true and correct. I also fully understand that if at any stage it is discovered that any attempt has been made by me to wilfully conceal or misrepresent the facts, my candidature may summarily be rejected or employment terminated.

(Signature of the applicant)

Place :

Date   :

TERMS OF REFERENCE
CONSULTANT (TECHNICAL SPECIALIST)
NATIONAL MULTI-HAZARD RISK ASSESSMENT AND RISK PROFILES

1. BACKGROUND

Integrating natural hazard and climate risk into development planning is primary to sustainable and long-term development of the Indian economy and its people. Thus, accurate and accessible information quantifying historical and potential risks from natural hazards and climate change have become a planner's and policymaker's invaluable resource that India can ill afford to ignore.

In the present scenario, Government planners and policymakers find themselves surrounded by a multitude of hazard and climate risk information that lacks standard methodologies (e.g. quality assurance) or does not have uniform geo-spatial coverage at national level, or even that these datasets are often on heterogeneous and difficult to integrate IT platforms. In view of this, Government of India, with World Bank and GFDRR support have commissioned the collection and presentation of natural hazards risk information in India, as well as the development of an online platform for data hosting and sharing.

The development of "National Multi-Hazard Risk Assessment and Risk Profiles" has been commissioned to a consulting agency with the following expected outcomes:

1. *Stocktaking analysis.* This component includes: a) stock taking report of existing multi-peril risk assessments at State level with a set of recommendations on additional risk assessments to fill identified information gaps and advance effective government's DRM decision-making; b) a structured database containing all available datasets related to existing risk assessments for individual perils as well as from a multi-hazard perspective, including information on historical events and their impacts.

2. *Assessment of the current and future risks from seismic ground shaking, fluvial flood, flash flood, urban flood, drought, cyclones, tsunamis, forest fires and heatwave, landslide and avalanche in India.* This will be based on collection of existing risk assessments done at regional, state and municipal levels, including adjustments and development of new information using available global, regional or national models if gaps are found, and should result in hazard, exposure and risk layers for the entire country.

3. *Design and development of online risk information platform.* This component includes: a) development of the online risk information platform which serves as a fundamental base for the government decision making as well as risk communication to the public; and b) design of training and capacity building for online platform users and for officials in charge of uploading data and information and provide analytics to decision makers.

4. *Risk Profiles at National, State and District levels.* Summarizing Risk Profiles will be developed at National, State and District levels and where possible, sub-district (block) level. The Profiles should summarize and visualize the multi-hazard risk situation, and can be published on the online risk information platform as well as in PDF format.

5. *India Disaster Risk Report.* The report will provide: a) country wide risk update, through the multi-hazard risk assessment for each State and Union Territory; b) an analysis of progress made in each State and Union Territory on DRM and risk assessment, in particular; and c) recommendations to set up protocols for producing risk assessments at State level, data availability and management, and institutional responsibilities.

6. *Detailed case-studies:* Detailed risk assessments for a selection of hazards for 5 cities or districts, using available information and, where possible, the creation of new hazard, exposure and vulnerability information. The case-study cities will be agreed upon with NDMA and the Consulting firm during the project.

The National Disaster Management Authority (NDMA) is seeking a Consultant to provide technical and coordination support to this exercise.

[Attachment: Terms of Reference for the 'National Multi-Hazard Risk Assessment and Risk Profiles']

2. SCOPE OF WORK

The Consultant is expected to manage the technical aspects of this project, including:

- Provide technical inputs to the consulting firm on the study design, implementation and emerging outputs;
- Review the project progress on a weekly and monthly basis including organisation of regular review meetings, communication with various stakeholders in preparation for and follow-up after the meetings;
- Facilitate the communication and engagement of the respective consulting firms with other government departments or entities towards development of outputs;
- Facilitate the consulting firm in matters associated with data acquisition and organization of data collection / validation processes;
- Review all key study outputs (including intermediate submissions) and provide timely feedback to NDMA for further action and output delivery approvals;
- Monitor progress and ensure incorporation of feedback in the reports/deliverables;
- Coordinate communication and shared actions between NDMA, The World Bank and consulting agency, and attend key meetings;
- Facilitate coordination between the consulting firms and the finance and procurement teams for smooth contract management.
- Integration of the study outputs, risk database at NDMA GIS Lab or any other entity that is decided by NDMA (this could perhaps be NDEM, NEOC etc.).
- Any other related task assigned by the Additional Secretary, NDMA.

3. REPORTING

The Consultant will report to and be guided by Project Director, NDMA.

4. QUALIFICATIONS AND SKILLS

- 10-12 years experience in managing technical disaster risk management (DRM) projects or conducting multi-hazard risk assessments.

- Experience of working with disaster risk management agencies and departments of the Government of India or in any State governments.
- Past experience of generating vector data and raster data (at proper scale and contour intervals) collected through satellite as well as airborne imageries, overlaying census/field data and various natural/ manmade hazard profiles on GIS platform to arrive at appropriate decisions will be an asset.
- Essential coordination and communication skills, to facilitate interactions between multiple stakeholders and drive consensus is a must.
- M.Sc. (Geography; GIS and Remote Sensing) or Masters of Engineering Degree (Compute science, IT and related field) with minimum post qualification experience of 4 years in the requisite field. The candidates should have high competency and established peer reputation.

5. DURATION

The consultancy will be for a period of 15 months.

India

National Multi-Hazard Risk Assessment and Risk Profiles

Terms of Reference

Background

Increasing resilience to natural disasters in India will require investments to reduce existing risk, prevent the creation of new risk, and manage residual risk through better institutions, policies, physical and digital infrastructure systems, and financial mechanisms. At the State level, investments must be tailored to local contexts taking into account risk profiles and institutional capacity and setup. The project objective is to enhance the quality of existing and future information on risks and vulnerabilities and related capacities at National and State level to increase resilience.

Given its vast geographic and climatic diversity, India is prone to all major natural hazards and has experienced the highest number of disasters in South Asia, with an increasing trend in events and causalities over the past 40 years. It is particularly exposed to earthquakes (tsunamis), floods, droughts, cyclones and landslides. About 60 percent of the landmass is prone to earthquakes of varying intensities; over 8 percent is prone to floods; almost 5,700 kilometers of the 7,500 kilometer coastline is prone to cyclones and 68 percent of the area is susceptible to drought.

Still, there are existing gaps that may undermine the effectiveness of DRM investments, also as recognized by the GoI. The main challenges identified by the GoI are twofold: i) generating, refining, and interpreting reliable disaster risk information that can be integrated into policies and programs; and ii) enhancement of the DRM Institutional Systems to assure its capability in addressing natural hazard risks and develop preventive policies at National, State and District levels, including opportunities for Risk Financing Options.

The creation, understanding and accessibility of hazard, exposure, vulnerability and risk information is key for effective management of disaster and climate risk. At present, even though there is plenty of hazard and climate risk information produced in India, the information that does exist typically lacks a standard methodology (e.g. quality assurance) and does not have uniform geo-spatial coverage at national level. Thus, the GoI has not always reliable information regarding current and future hazard and climate risk at national and some States levels, therefore the effectiveness of policy options on which to base their risk reduction decisions lacks uniformity.

A key first step toward integrating natural hazard and climate risk into development planning involves improving the understanding of risks in India by quantifying and anticipating the potential impacts of natural hazards and climate change on Indian society and the economy, as well as assessing the capability of existing institutions at national and State levels in addressing those risks, implementing their mandate and fostering resilience in the country. This activity will build on past activities that were developed at State level, which were carried out to inform ongoing lending operations in several States.

To better understand natural hazard and disaster risk, the World Bank and Global Facility for Disaster Reduction and Recovery (GFDRR) are supporting the collection and presentation of **fluvial flood, flash flood, urban flood, drought, landslide, avalanche, storm surge, cyclone, tsunami, forest fire, heat wave and seismic risk information in India**, as well as **the development of an online platform for data hosting and sharing**.

Specific outcomes are:

1. *Stocktaking analysis.* This component includes: a) stock taking report of existing multi-peril risk assessments at State level with a set of recommendations on additional risk assessments to fill identified information gaps and advance effective government's DRM decision-making; b) a structured database containing all available datasets related to existing risk assessments for individual perils as well as from a multi-hazard perspective, including information on historical events and their impacts.
2. *Assessment of the current and future risks from seismic ground shaking, fluvial flood, flash flood, urban flood, drought, cyclones, tsunamis, forest fires and heatwave, landslide and avalanche in India.* This will be based on collection of existing risk assessments done at regional, state and municipal levels, including adjustments and development of new information using available global, regional or national models if gaps are found, and should result in hazard, exposure and risk layers for the entire country.
3. *Design and development of online risk information platform.* This component includes: a) development of the online risk information platform which serves as a fundamental base for the government decision making as well as risk communication to the public; and b) design of training and capacity building for online platform users and for officials in charge of uploading data and information and provide analytics to decision makers.
4. *Risk Profiles at National, State and District levels.* Summarizing Risk Profiles will be developed at National, State and District levels and where possible, sub-district (block) level. The Profiles should summarize and visualize the multi-hazard risk situation, and can be published on the online risk information platform as well as in PDF format.
5. *India Disaster Risk Report.* The report will provide: a) country wide risk update, through the multi-hazard risk assessment for each State and Union Territory; b) an analysis of progress made in each State and Union Territory on DRM and risk assessment, in particular; and c) recommendations to set up protocols for producing risk assessments at State level, data availability and management, and institutional responsibilities.
6. *Detailed case-studies:* Detailed risk assessments for a selection of hazards for 5 cities or districts, using available information and, where possible, the creation of new hazard, exposure and vulnerability information. The case-study cities will be agreed upon with NDMA and the Consulting firm during the project.

Overview of the Scope of Work

The objectives of the project are to conduct a stocktaking of national multi-hazard and climate risk information; to develop a National multi-hazard risk assessment and a risk information sharing platform for the government decision making; as well as the risk communication for the public.

The expected outputs under this project will be the stocktaking and classification of existing risk assessment results to-date; risk profiles and a risk report; and the integration of all information in a

dedicated online platform. Risk information dissemination and capacity building of government users are part of the expected outputs.

All components will benefit from guidance of an ad hoc advisory committee to be established at NDMA. The advisory committee will be chaired by NDMA and include all relevant academic and technical institutions at national and selected State levels. It will also include representatives from all States' DMAs. The advisory committee will be consulted at inception, mid-term and final stages of the risk-assessment development. Three specific workshops will be held at inception, mid-term and final stages of the process to facilitate consultation and obtain guidance.

The main outputs are the following:

STAGE I: National information creation and platform development

I. Stocktaking analysis

The stocktaking exercise will collect and assess all existing risk information data and reports available at State, sub-regional and municipal levels (including prior assessment funded by GFDRR and other donors, as well as scientific studies), and suggest the most effective design of the information platform for the purpose of risk-informed decision-making at National level as well as state level. This aims to build a consistent national multi-peril risk assessment and a risk information platform for timely and effective decision making, combining existing data in an effort to build uniformity and assure high quality standard. This stocktaking and consolidation exercise will also identify information gaps, and serve a foundation for the development of the National multi-peril risk assessment.

The stocktaking should focus on gathering all relevant information for risk assessment for the various relevant perils, including (1) hazard maps; (2) exposure information for various asset types, including population density, buildings, infrastructure, agriculture, energy, education and healthcare facilities; (3) vulnerability functions for different types of assets. In addition, the stocktaking should identify existing historical disaster impact information databases and gaps in the existing historical information. Based on the existing information, overviews should be prepared of historical disaster impact information, i.e. reported losses and fatalities classified by date and event type. The Consulting Firm is expected to make use of documents containing relevant records of historic events and risk background information. This includes available World Bank country notes and post-disaster needs assessments (PDNA).

The stock taking assessment should be undertaken at State, sub-regional and municipal levels. The results should be (1) a well-organized database of spatial and tabulated data; and 2) a report with a set of recommendations on additional risk assessments and/or historical disaster impact information to fill identified information gaps and advance effective government's DRM decision-making.

II. National Multi-peril Risk Assessment.

This component will finance a comprehensive multi-peril risk assessment at the national level, using existing global and national models and limited new modelling, where needed. This assessment will cover *seismic ground shaking, fluvial flood, flash flood, urban flood, drought, cyclone, tsunami, forest fires and heatwave, landslide and avalanche.* Where possible – and at least for seismic, fluvial flood,

drought, cyclone and tsunami – the assessments should be on a probabilistic (i.e. return period) basis; for some hazards, susceptibility information will be sufficient.

The Consulting Firm may use and combine all available sources of local, national, continental and global data in a consistent final product. The Consulting Firm should pay special attention to the applicability and reliability of the proposed methodology and data sources in data-scarce areas in India. Specific attention should be paid to the validation and sanity checking of all results, by comparing modelled hazard maps to observed (e.g. satellite or remote sensing) information, and by comparing modelled risk information to historical losses as well as expert judgment.

The risk assessment should as much as possible use existing hazard data with the exposure and vulnerability information collected in the stocktaking. The stocktaking described under component I. will guide this sub-component that will build on existing risk assessment at State, sub-regional and municipal levels, leveraging existing information and combining different models. The requirements vary across the perils – a detailed overview of the required output metrics is provided in Table 1, under Deliverables. These include, contingent on the peril type:

- Stochastic and historic event sets (at least 3 per peril, where applicable) – which will be used for identifying the distribution of loss in major events and determining the key locations on which reconstruction options should focus for each peril;
- Hazard layers for at least the return periods 10, 20, 50, 100, 250, 500 and 1000 years (longer return periods may be appropriate for earthquake hazard);
- Tabulated total hazard exposure (exposed population; government buildings; commercial and residential buildings; agricultural; infrastructure and GDP);
- Tabulated potential loss;
- Event Loss Table (ELT) or Year Loss Table;
- Loss exceedance curve and tabulated return period losses;
- Tabulated Annual Average Loss (AAL);
- Tabulated break-down of loss metrics for different sectors; and
- GIS-compatible spatial datasets comprising exposure data, hazard footprints and loss footprints.
- The exact formats for delivering these data must be agreed upon with NDMA and GFDRR.

The Consulting Firm analysis should produce the analysis for the current climate and socioeconomic situation, as well as for the year 2050 under scenarios of climate change and socioeconomic development for all perils. The future risk projections should be based on a combination of hazard projections (for fluvial flood; flash flood; drought; snow avalanche and landslides only; based on at least three Representative Concentration Pathway[1] projections), and a projection of exposure (for all perils) based on at least three Shared Socioeconomic Pathway[2] (SSP) projections.

[1] Van Vuuren, Detlef P., et al. "The representative concentration pathways: an overview." *Climatic Change* 109 (2011): 5-31. Available at http://link.springer.com/article/10.1007%2Fs10584-011-0148-z#
[2] O'Neill, B. C. et al. Meeting Report of the Workshop on *The Nature and Use of New Socioeconomic Pathways for Climate Change Research.* (2012). https://www2.cgd.ucar.edu/sites/default/files/iconics/Boulder-Workshop-Report.pdf

III. Risk Profiles

Using the risk assessment results, the Consulting firm will develop generic risk profiles at State level, district and sub-district levels. These profiles should also be developed at major cities level. A list of most vulnerable and most exposed cities will be agreed upon with NDMA and the Consultant at inception report. Up to 10 cities will be selected for which risk profiles will be created. Examples of risk profiles can be found here: https://www.gfdrr.org/en/disaster-risk-profiles These risk profiles should provide insight into the spatial distribution of the various risks and highlight the key insights from the risk assessments.

Ultimately, the risk assessment results should inform specific investment opportunities at a national and State level – e.g. Safer Schools[3], Risk Financing, Urban Resilience, etc. Effective risk information will convey risk information amongst government counterparts, development partners and the private sector, to promote DRM efforts in the country's development planning. The risk information is therefore also expected to be repackaged as targeted risk profiles for specific topics and/or asset groups (e.g. schools) to build awareness of risk amongst government counterparts and development partners and lead to discussion on effective resilient investments and pipelines with the Bank. In consultation with NDMA and other stakeholders, a set of 10 targeted risk profiles will be defined.

Both the generic risk profiles and the targeted risk profiles should be produced in PDF form for printing, and in a dynamic electronic way on the web platform.

IV. Design and development of online risk information platform.

Under this component, the Consulting Firm will produce a national geospatial platform to host the various results produced under component (I) and (II), as well as the risk profiles (component III). This online national platform will be designed for internal use by the various government counterparts, and should preferably (but not necessarily) rely on open-source coding such as the *GeoNode* tool. The specific platform will be selected in agreement with NDMA.

The outcomes at II. and III. will inform this sub-component, which is aiming at the a) development of the online risk information platform which serves as a fundamental base for the government decision making as well as risk communication to the public; and b) design of training and capacity building for online platform users and for officials in charge of uploading data and information and provide analytics to decision makers.

The platform development should come with a comprehensive hosting and maintenance plan, including various options with pricing for the GoI. In addition, the Consulting Firm should provide sufficient training on the usage of the platform to the NDMA and GoI officials and other priority stakeholders, to be identified together with counterparts.

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[3] The Indian government counterparts were recently invited to the International Workshop of the Global Safer Schools, held in January 2017 in London, where the counterparts had opportunities to learn global efforts and lessons learned, including the experience of Japan. This opportunity enhanced the commitment of the GoI on improving structural safety of schools in India.

V. India Disaster Risk Report.

The Consulting Firm will develop a report including the outcomes of the previous phase as well as: a) country wide risk update, through the multi-hazard risk assessment for each State and Union Territory; b) provide an analysis of progress made in each State and Union Territory on DRM and risk assessment, in particular. The report should include recommendations to set up protocols for producing risk assessments at State level, data availability and management, and institutional responsibilities.

Staffing Requirements

The Consulting Firm is free to propose a staffing plan and skill mix necessary to meet the objectives and scope of services. If all the required skills are not available within the Consulting firm, they are encouraged to make joint ventures with other firms. Appropriately curated consortiums are appreciated in order to fulfil the full gamete of requirements The Project Manager should have at least 15 years of experience in flood, tropical cyclone, and/or earthquake catastrophe risk modeling and in the development of exposure data.

Deliverables

This section describes the required deliverables. Consistent with World Bank / GFDRR best-practice and the broader activity objectives, all outputs (hard and soft) produced under this assignment will be provided to NDMA and the Indian government, as the principal owner of the data, as well as the World Bank and GFDRR. All the data should be licensed as open source. All technical reports will be written in English.

The Consulting Firm is required to define the proposed methodology in a project inception report. This report should articulate the limitations of the proposed methodology including gaps in available data, which can be a focus for future development. The report should review and compare the proposed methodology with other available modelled views of risk for the country.

The Consultancy is required to provide a final project report that defines the methodology used, describes the drivers of loss for each peril, and discusses how the risks may change in the future based on socio-economic change and environmental change. The final report should also compare and rationalize modelled losses to other views of modelled risk in the region.

Below, a more detailed list of requirements is provided for the various deliverables:

1. Inception report, detailing at least

   1.1. The proposed methodology for the stock taking of existing risk assessments and historical information including a list of reports/documents to be reviewed;

   1.2. The proposed methodology for the risk assessment for all hazards, and for combining these in a multi-hazard perspective;

1.3. A comparison of the chosen methodologies with other available modelled views of risk for the country;

1.4. An assessment of foreseen limitations in data availability and the chosen methodologies;

1.5. A text summary of drivers of loss for each peril, including discussion of how the risk may change in the future

2. Tabulated exposure and loss data, current estimates and projections for 2050 (see Table 1 for the full details on output metrics):

2.1. Tabulated record of historical disaster events, with associated losses;

2.2. Tabulated total hazard exposure (exposed population; government buildings; commercial and residential buildings; agricultural; infrastructure and GDP), provided at the national level and at the level of first and second administrative boundaries;

2.3. Loss metrics, to be provided for each peril individually and for combined perils. Each loss metric should be provided for each individual sector (i.e., government buildings; infrastructure; agriculture; commercial and residential buildings) and all sectors combined, at the national level and at the level of first and second administrative level.

2.3.1. Event Loss Table (ELT) or Year Loss Table (YLT);

2.3.2. Loss exceedance curve;

2.3.3. Tabulated return period losses for the selected return periods (see Table 1);

2.3.4. Tabulated Annual Average Loss (AAL); and

2.3.5. Tabulated potential loss.

3. GIS-compatible hazard, exposure and loss data layers:

3.1. Hazard footprints showing hazard intensity on gridded basis, for the selected perils and return periods (see Table 1). Parameter to be selected as most appropriate for the peril

3.1.1. For various return periods, including at least 10, 20, 50, 100, 250, 500 and 1000 years (longer return periods may be appropriate for earthquake hazard);
3.1.2. For at least 3 selected stochastic events per peril;

3.1.3. For at least 3 selected historic events per peril;

3.2. Exposure data layer on gridded basis for each sector (exposed population; government buildings; commercial and residential buildings; agricultural; infrastructure and GDP);

3.3. Hazard exposure footprints for selected perils and return periods (see Table 1);

3.4. Loss footprints for selected perils and return periods (see Table 1); and

3.5. AAL footprint at the level of first administration boundaries for the selected peril (see Table 1)

4. Final project report, written in English, detailing for the entire project:

   4.1. The disaster risk assessment methodology applied, including detailed description of the development of vulnerability functions;

   4.2. Data implemented in the analysis;

   4.3. Limitations in the methodology applied;

   4.4. Comparison of the methodology to other modelled views of risk in the region;

   4.5. Presentation of results;

   4.6. Comparison of the losses derived, to other modelled views of risk in the region, and rationalization of the losses with respect to drivers of loss; and

   4.7. Any other critical information regarding the outputs.

5. India Disaster Risk Info and Risk profiles, written in English, detailing:

   5.1. Context of the situation with overview of historical disasters

   5.2. Highlights of the existing and future hazard and risk results

   5.3. Key insights from the risk assessment