

Terms of Reference (ToR)

Consultancy Services for Design and Development of Early Warning and Response System for the State of Himachal Pradesh under World Bank Funded HPSRTP

1. Background & Challenges

Himachal Pradesh is one of the most multi-hazard prone States of India. The State faces various types of natural hazards like the geological hazards (earthquake, landslide), hydrological hazards (floods), meteorological hazards (droughts, hailstorms, cloudburst), and climatological hazards (cold wave, avalanches, frosts). Hydro-geological hazards risk will increase over the next few decades because of climate change, disrupting transport systems & services. The existing transport infrastructure is often blocked by landslides and washed-out debris, causing interruptions for a significant time and isolating the rural population from basic services, including access to health facilities for women in labor. Road and other civil infrastructure development aggravate the worsening situation of land degradation and climate change in the Himalayan ranges. Due to weakened, cracked, and destabilized slopes and surfaces, sensitive areas have now become even more susceptible to landslides that could be triggered by earthquake activity, heavy rainfall or snowfall, or inappropriate land uses or infrastructure development. In addition, the communities have comparatively higher vulnerabilities caused by their lack of preparedness. Economic risks are also important since assets are concentrated in the hazardous areas subject to floods, landslides, earthquakes etc. Therefore, it is important to enhance the state of readiness, on a long-term basis, as well as during disasters lead-time. An effective multi-hazard community based Early Warning System (EWS) & a Response System (RS) will support the state road agencies: to alert the road users prior to any event to prevent them from any danger; to provide necessary structural & non-structural measures to safeguard the transport infrastructure and communities during an event; and to be prepared with roles & responsibilities to handle emergencies during a disaster.

The World Bank funded HP State Road Transformation Project (HPSRTP) is a 5-year program being implemented by HPRIDCL with primary objective of –sustainable landscapes, climate change adaptation and biodiversity conservation–with livelihoods, gender, and social inclusion besides natural disasters. An early warning system (EWS) and a response system (RS) must be developed under the current project. This TOR is seeking to contract a suitable professional consultancy to work with HPRIDCL team to develop an EWS & RS tailored to HP State region. An effective EWS must alert the population/road users under threat of an imminent disaster to undertake proactive actions to save lives and a RS should enable the agencies to successfully manage road users/traffic during an event of disaster.

2. Objectives

The overall objective of the consultancy is to support the HPSRTP Project in its efforts to develop and implement a multi-hazard(hydro-geological hazards) EWS & a RS systems and protocol tailored for the region which will eventually strengthen the resilience of transportation infrastructure, systems & services.

3. Scope of the Study

In consultation with the Project Team, prepare and submit an **Inception Report** which, inter alia, details the methodology /approach to the assignment and a related work implementation plan.

The scope of the study is divided into five task activities as described below. The consultant is expected to undertake the following activities and deliver the corresponding outputs to HPRIDCL:

Task Activities-1Preliminary Investigation (Gap Analysis)

- a. Undertake a desk review of the project document and other relevant documents in the field of EWS& RS.
- b. Review the existing EWS & RS guidelines, framework, and protocols in HP State at all levels (National, State, and local) to identify gaps, challenges, and opportunities for improvement.
- c. Review, gather& analyze the information on past, current and planned projects related to the EWS and RS, including disaster risk management and risk reduction activities.
- d. Review policies, rules and regulations for mainstreaming early warning information to assess and identify gaps and challenges in mainstreaming early warning information into public and private decision-making.
- e. Engage with both public and private institutions to determine the current state of the EWS, including equipment, telecommunications, databases, forecasting and monitoring products, advisories, and communication of EWS information.
- f. Key stakeholder identification (general/area-specific) for both EWS & RS; Stakeholder role and responsibilities matrix. The role and function of each identified EWS and RS, what the general workflow is from start to finish (documented in diagram is useful); identify any existing Standard Operating Procedures (SOPs).
- g. Conduct consultations to determine how an EWS for multi-hazards shocks are impacting the region could be integrated and mainstreamed into existing National EWS protocol. Similarly, determine how a state level RS could be integrated and mainstreamed into existing National IRS (Incident Response System) protocols.
- h. Identifying the role and responsibilities of the State agencies as they relate to communication with EWS& RS owners in the face of an emergency or impending event, to communication of warnings to communities at risk, and to manage the risk through RS.
- i. Review the capacities available at various public and private institutions, and identify capacities needed to support the institutions for long term monitoring and data management.
- j. Undertake consultative meetings with Regional State Agencies, Transport Departments, State Disaster Management Agency Committees as well as project beneficiaries on the functionality and effectiveness of the existing EWS& RS (if any). In the absence of EWS& RS, identify new options for developing an EWS& a RS.
- k. In the absence of an EWS in the State of HP, identify the sources (IMD, Satellite Imagery etc.) that provide different hazard warning alerts to the HP State/SDMA and understand protocols how these warning alerts are disseminated to the public. Also, identify the need for developing a new EWS for the State.

- l. Collate the information on various existing installed rain gauge stations/sensor locations and evaluate how the data is generated (in which format), agencies who control the data and how data management functions.
- m. Undertake field visit to collect and document project interventions at targeted geographical area for community based early warning system and institutional mechanism formed at the local level such as: local volunteer gauge readers, rain gauge stations, flood gauge stations, early warning task forces.

Expected Outcomes: Deliverable-I

- i. Gap analysis Report for existing EWS & RS - A detailed report on roles and responsibilities of key stakeholders, national/state mandates for EWS & RS and what is existing, existing information on warning sensors, source of warning alerts, etc. It should also include challenges, opportunities, and improvements along with SWOT analysis of both the systems. The Gap Analysis in the report shall be done very comprehensively with all the stakeholders and EWS agencies of National Level/State Level as well Regional level.
- ii. Detailed needs assessment report –A report explaining the current need for EWS and RS in the HP State region.
- iii. Detailed technical analysis report – A report describing the technical aspects of EWS & RS and highlight the critical issues that may arise moving forward with developing a new EWS & RS.

Task Activities-2: Risk & Demographic Information

- a. Identify the agencies responsible for coordinating hazard identification, vulnerability, and risk assessment.
- b. Collating historic& current multi-hazard information, hazard maps produced from hazard modelling tools available under responsible agencies (NDMA/SDMA), Research Institutes etc. and identify hazard prone areas within current project locations.
- c. Increased capacity in hazard mapping and associated vulnerability assessments, to further be incorporated into spatial information systems to inform planning and development processes.
- d. Identifying locations prone to different disasters and map the critical features within the area – essential facilities, communities, environmental features, locations of sirens if present, essential infrastructure (e.g. bridges, hospitals etc.).
- e. Key demographics of identified communities/road users – e.g. Age, Sex, population, income, their means of transport etc.

- f. Collect and document the traditional indigenous knowledge that the community have for EWS.

Expected Outcomes: Deliverable-II

- i. Data Collection – hazard, vulnerability & risk data in the desired format requested by HPRIDCL and which is suitable for incorporating the relevant input into EWS.
- ii. Maps (GIS Shape files) – Hazard prone locations and critical infrastructures.
- iii. Demographic information in GIS shapefiles.

Task Activities-3: Develop an Early Warning System

The development of a Community Based Early Warning system, inclusive of a Training Manual for implementation of such, with a focus on emergency communication procedures; that is designed for replication and scale up to the national level; and is developed through consultations with stakeholders, taking into consideration gender, cultural diversity, the differently abled population and vulnerable populations (e.g. elderly, socio-economically disadvantaged etc.). An effective EWS must be built upon four components: (i) Risk Knowledge, (ii) Monitoring and warning services, (iii) Dissemination & Communication, and (iv) Community Planning & Preparedness.

- a. Provide case studies of 5 best practices across the globe adopted by infrastructure operators, national and local governments with a description of the functions/objectives of the innovative Real-time forecasting system. The consultancy is also expected to come up with different innovative model to develop EWS and present it to HPRIDCL. Upon mutual agreement on a specific model which is trailed to the needs of HP state, that model must be developed and must be implemented.
- b. Design of an enhanced hydro-meteorological, hydro-geological network and data management systems based on the results emerging from the gap analysis. Determine the costs associated with the climate and hydrological & geological observing network, including equipment purchases, operations and maintenance, and human resources at a state level. Discuss with the key stakeholders before implementation.
- c. *Monitoring & Warning Services:* Real-time forecasting system development with data and model integration.
 - Real-time data feeds from data acquisition and management system along with supplemental global data sets.
 - Forecasting hazard model integration.

- Warnings from sensors connected with early warnings in real-time.
- d. *Dissemination & Communication*: Identify innovative ways to Integrate ICT applications and data into early warning system - Data and information management system for improving access and assimilating data from hybrid sources; and Communication and dissemination for delivering warnings and emergency information. Provide ways to enhance HP state capacities for public warning following improved capacity for public warning.
- e. *Community Planning & Preparedness*: Based on the field visits, develop a draft Standard Operating Procedure (SOP) on Community Based Early Warning Systems (CBEWS) including a poster to depict the mechanism and information flow. Discuss with key stakeholders and find ways to spread awareness of the State's EWS to the communities and to the road users.
- f. Some of the elements to be considered while developing an EWS:
- Identify different approaches to build an EWS.
 - Technology/Equipment needed (Should suit local conditions and circumstances).
 - Provide estimated costs of any equipment proposed for use.
 - 'Last Mile' connectivity of EWS – communication tool (e.g. mobile app), method and processes need to be most effective in accomplishing better connectivity.
 - Effective dissemination of warning alert messages.
 - Identifying possible private-public partnerships and advice on how best to integrate such a system with the existing EWS system.
 - Identifying of types of/additional capacity required to improve existing EWS.
 - Governance and institutional arrangement required to sustain EWS.
 - Improving awareness to natural hazards and the associated preparation and response protocols.
 - Enhanced national capacities for public warning following improved capacity for public warning
 - Undertake consultative meetings with State/District Disaster Management Agency and project beneficiaries on the functionality.
 - Improving communication networks and communication capacity of EWS.
 - Emergency communication equipment and operating modalities.
 - Design protocols used by EWS owners and state agencies for issue and transmission of warnings to those at risk.
 - Build new technologies/mechanisms for EWS and providing a comparative evaluation of these technologies/mechanisms with those used in international best practice.
 - Connectivity and integration of EWS with critical facilities and installations, emergency services, and the disaster management system in HP State.
 - Service support for maintaining the EWS on a regular basis and ensuring 100 percent uptime

Expected Outcomes: Deliverable-III

- i. Presentation to HPRIDCL- 5 best practices of EWS adopted by infrastructure operators across the globe.

- ii. Feasibility Reports including cost analysis–Detailed feasibility reports which describes the design of hazard observing network, including equipment purchases, operations and maintenance, and human resources.
- iii. Develop a real-time forecasting system and innovative ICT tools.
- iv. Draft Standard Operating Procedure (SOP) on Community Based Early Warning Systems (CBEWS) including a poster to depict the mechanism and information flow.

Task Activities-4: Develop a Response System

- a. Provide case studies of 5 best practices across the globe adopted by infrastructure operators, national and local governments with a description of the functions/objectives of an Incident Response System mainly pertaining to Transportation Branch. The consultancy is also expected to come up with different innovative model to develop RS and present it to HPRIDCL. Upon mutual agreement on a specific model which is trailed to the needs of HP state, that model must be developed and must be implemented.
- b. This consultancy will design(innovative technology) & implement a response system for transportation that should be integrated with the national/state level Incident response system (IRS).Response system must include incident action plan and identifying response team and define set of actions to be taken in the event of a disaster. Seek guidance and approval from key stakeholders on the design and implementation.
 - Response system must obtain the list of actions, mobilize necessary resources, and identify roles & responsibilities of stakeholders based on the disaster management plan. Disaster management plan in the context of transport is known as Transport emergency/evacuation management plan (TEMP), which must be integrated with the national/state/district/sub-divisional level emergency operations center (EOC).Following items are to be included in the TEMP Plan:
 - i. Procedures for mobilizing transportation services and systems for before, during and after hazard impacts.
 - ii. Procedures for requisitioning private vehicles/vessels for the use of providing emergency relief in the event of a disaster or emergency inclusive of procedures for assessing and paying compensation.
 - iii. Procedures for the safe transport of persons and/or goods via Air/Land before, during and after hazard impacts (e.g. alternative routes-micro & macro itineraries)
 - iv. Procedures for the safe transport of hazard/disaster responders via Air/Land to affected site(s).
 - v. Procedures for the safe transport of hazard/disaster victims via Air/Land to medical facilities.
 - vi. Procedures for the safe transport of hazardous dangerous goods.
 - vii. Procedures to apply the use of local taxis, tour busses and ferry boats - in the event of evacuation of the residents of any area which is considered desirable in the event of a disaster and/or emergency.

- viii. Procedures for transporting and accounting for community evacuees before and after hazard impacts.
 - ix. Procedures for closing and reopening roads/traffic before and after hazard impacts.
 - x. Procedures for restoring transportation networks.
 - xi. Roles & Responsibilities of different transport/traffic agencies during a disaster.
 - xii. Any other areas as further defined and or approved by the NDMA/SDMA.
- c. Provide guidelines to lay down the roles and responsibilities of different functionaries and stakeholders, at National/State/District levels and how coordination with the multi-tiered institutional mechanisms at the National, State and District level will be done.
- d. Prepare proper documentation of various activities for better planning, accountability, and analysis. It will also help transport/traffic responders to immediately get a comprehensive picture of the situation and go in for immediate action.
- e. During implementation of response system, a sample community-based drill shall be organized to allow the community to participate and experience how the system works.
- f. The Consultant shall submit a Simulation Exercise Manual/Toolkit and coordinate a simulation exercise to test the procedures outlined in the Transport Emergency/Evacuation Management Plan (TEMP). The Toolkit provides a common, approach to testing the TEMP based on the National/State Disaster Management Agency standard training and exercise/capacity building programme. The Exercise Manual or Toolkit is design and development, to conduct testing of the procedures outlined in the TEMP. The Exercise Manual or Toolkit is to be a step by step guide written in laymen's terms for use by local authority and includes at least two scenarios for desktop exercises, functional or full-scale exercises with injects, master sequence of events and fillable templates.

Expected Outcomes: Deliverable-IV

- i. Traffic management plan (TMP) & Transport emergency/evacuation management plan (TEMP)
- ii. Final report on the Consultancy which documents methodology used, the activities undertaken, challenges, results (planned and unplanned), lessons identified and recommendations for the implementation of the response system.
- iii. Stakeholder consultation report –detailing the consultations took place with different stakeholder during design and implementation.
- iv. Web-based application/tool for Response System
- v. Situational Exercise Manual/Tool kit

Task Activities-5: Training & Capacity Building

This activity will include training and capacity building for the staff and engineers from agencies responsible for HP transport infrastructure and service delivery (HPRIDCL), including the key stakeholder. The consultant is expected to undertake the following activities.

- a. Impart virtual and/ or face-to-face training for mid/ senior level engineers and planners on:
 - Resilient infrastructure and services, risk management, planning for resilient recovery, early warning systems, response system etc.
 - Operations and maintenance of infrastructure, systems, and services during a disaster, including IT aspects and use of digital technologies and platforms for resilient transportation.
 - Resilience indicators & resilience investment.
 - Undertake virtual and/ or face-to-face workshops for cross learning on developing effective tools for addressing risk management measures, including resilience aspects in transport (Key experts from government agencies, academicians, technical institutions will be invited to attend the workshops and share best practices, including avenues for private sector participation).The Consultant shall organize at least one such training in each of the four zones of HPPWD i.e Shimla zone, Mandi zone, Hamirpur zone and Kangra zone. All the expenditure incurred on training material and Consultant's key personnel for providing such training shall be borne by consultant itself.
 - All sessions will be recorded and made available for online sharing afterwards with supporting documents.

<i>Expected Outcomes:</i> Deliverable-V - Training & Workshop Material

3 Proposed staffing and Qualification

The Consultant is expected to mobilize appropriate number and specialised key personnel along with supporting staff to undertake the envisaged activities. Several of the activities under the TOR should be undertaken simultaneously and the consultant is expected to mobilize required resources to meet the delivery schedule and complete the assignment within the contract duration. A list of key personnel and the desired qualification, experience, and credentials to be evaluated at the stage of technical proposals is provided below. Consultants are expected to depute other professionals and support staff to meet the study requirements. Firms may associate with other agencies to enhance their qualification and credentials, including local partners to facilitate presence on the ground. Quality cum cost basis selection (QCBS) method, with 80:20 weightage for technical and financial proposals will be adopted.

Position	Desired Experience
Disaster Risk Specialist cum Team Leader	<ul style="list-style-type: none">• Degree in Civil Engineering or equivalent, with Master's in Disaster risk management/ Environmental studies.• More than 15 years of relevant experience in the area of hazard analysis, hazard modelling and hazard impact assessment.• Minimum 5 years of experience working with public/ private disaster risk management agencies/ institutions and atleast 2 DRM projects as Team Leader/ Project Manager.• Experience of working in hilly terrain.

	<ul style="list-style-type: none"> • Experience in externally aided projects.
Transport Specialist	<ul style="list-style-type: none"> • Degree in Civil Engineering or equivalent, with master's degree in Traffic Engineering/ Transport Planning. • More than 15 years of relevant experience in the transport sector, involving transport infrastructure and services. • Minimum 5 years of experience working with multiple government/ public transport agencies on transport policy, regulatory, institutional and capacity building aspects is desirable. • Experience of working in hilly terrain. • Experience in externally aided projects.
Hydrology/ Geological Expert	<ul style="list-style-type: none"> • Degree in Civil Engineering with Masters in Hydrology/Geology. • More than 10 years of experience in the area of surface water hydrology including water assessment, flood hydrology, hydro-geology, sedimentation, design flood reviews of existing transport infrastructure, preparation of hydrological guidelines/manuals, integrated early flood warning system, development of operation rules, hydro-geological modelling using any advanced modelling tool etc. • Minimum 5 years of experience in flood modelling/ hydro-geological projects. • Experience of working in hilly terrain. • Experience in externally aided projects.
GIS Expert	<ul style="list-style-type: none"> • Degree in Computer Science, Geography, Surveying, Engineering or related field. • More than 10 years of experience in designing digital maps with geographic data and other data sources, producing maps showing the spatial distribution of various kinds of data, converting physical maps into a digital form for computer usage, performing data munging and cleaning to convert data into its desired form, produce reports on geographic data utilizing data visualizations, managing a digital library of geographic maps in various file types. Experience with mapping tools such as QGIS and Carto is desirable. • Minimum 5 years of experience in the data mapping for GIS based project. • Experience of working in hilly terrain. • Experience in externally aided projects.
IT Expert	<ul style="list-style-type: none"> • Graduate in Computer Science/IT. • More than 10 years' experience in design and development of web-based software with specific experience of developing digital. • Must have experience of carrying out similar assignments.
Social Expert	<ul style="list-style-type: none"> • Master's Degree in Social Sciences (sociology /social work) with at least 15years total professional experience. • Minimum 5 years of experience shall be in working as social/ resettlement expert for major Civil Engineering Projects including Highway Projects. • The knowledge of World Bank's prevailing guidelines and/or policies

	<p>related to R&R is essential.</p> <ul style="list-style-type: none"> • Experience in legal analysis of land records is desirable. Experience in qualitative & quantitative analysis of data, participatory consultation is essential. • He should have through knowledge of prevailing land acquisition Act, as well as current draft land Acquisition and Resettlement Act as well as state's R&R policy etc. • Experience of working in hilly terrain. • Experience in externally aided projects.
QA Engineer	<ul style="list-style-type: none"> • Graduate in Computer Science/IT. • More than 10 years of experience in QA of web-based software applications. • Must have experience of carrying out similar assignments.
Training and Capacity Building Specialist	<ul style="list-style-type: none"> • Bachelor's degree • More than 10 years of relevant experience in Training & Capacity Building. • Minimum 5 years of experience in the technical area relevant to this study.

4 Study Duration and Schedule

The duration of the consultancy will be 18 months and the services shall be delivered in Himachal Pradesh. The consultant will be required to make their own arrangements for an office and other logistics.

5 Deliverables & schedule of payments

The deliverables include:

1. Inception Report with detailed methodology and work plan shall be delivered within 30 days of commencement of the services
2. Interim Report including preliminary investigation & gap analysis, Risk & Demographic Information, and outline of EWS & RS with architecture of the modules shall be delivered within 6 months of commencement of the services
3. Draft Final Report, including detail EWS&RS, with the EWS & RS modules shall be delivered within 12 months of commencement of the services
4. Workshop on the EWS & RS, including the modules will be organized upon delivery of the Draft Final Report
5. Final Report, addressing all comments from the Client and World Bank shall be delivered within 18 months of commencement of the services
6. Training & Capacity Building on the EWS & RS and application of the modules will be organized upon delivery of the Final Report

Payment shall be released upon submission and acceptance of deliverables as detailed below:

Deliverables	Deliverable Due Date	% release of payment	% Cumulative
Inception Report	30 days	10%	10%
Interim report (Preliminary Investigation & Gap Analysis, Risk & Demographic Information, and outline of EWS & RS)	6 months	20%	30%
Draft final report (EWS&RS)	12 months	40%	70%
Final Report	18 months	25%	95%
Workshop (Training & Capacity Building)	Upon delivering final report	5%	100%

Note:- Fifty (50) percent payment of each deliverable shall be made on submission of report and balance fifty (50) percent on approval/ vetting of report by Advisory committee for Himachal Pradesh State Disaster Management Authority notified by Government of HP vide notification number Rev. (DMC)(F)11-29/2011 dated December 27, 2011 (Annexed A) or any such committee as modified from time to time by Government of HP.

6 Reporting Requirements

- The consultant will report to Director (Projects)-cum-Chief Engineer for this assignment and work closely with HPSRTP project team and State Disaster Management Agency (SDMA).
- The entire assignment shall be carried out under the overall guidance of the project team. At all steps, the consultant will be required to closely engage and seek inputs from the project team.
- The project team will facilitate and lead the discussions with the Govt. of HP or other Govt. agencies on the key aspects to seek their feedback and inputs.
- The consultant must organize meetings for data collection and stakeholder consultations on their own. The project team may join some of the consultation meetings.

7 Data, local services, and facilities to be provided by client

The following shall be made available to the consultants.

- Access to reports available with HPRIDCL.
- The Consultants shall verify the correctness of the data/information provided by the Client/SDMA and satisfy them about the accuracy of data/information /material before these are used. Data/information /material provided to the consultants shall remain the property of the originating agency and shall be provided solely for the purpose of the work to be done under this contract. All such borrowed material shall be returned to the Client upon completion of the assignment.
- The consultants shall arrange its own equipment (vehicles, survey equipment, office and computer equipment, telecommunication and document printing and reproduction systems)including office space and furniture required for operational purposes. The consultants shall make own arrangement for travel/stay for performing the assignment.

8 Logistic Support

The consultant will manage his/her own logistic support for the completion of this assignment and required cost will be paid as factored in the accepted financial proposal. The consultant must ensure safety of the team to the best of his/her ability at all times, and arrange for insurance of all personnel on the consultancy.

9 Supervision

The consultant will undertake the assignment under the coordination and supervision of HPRIDCL/HPPWD authorities. He/She will be required to give presentations before the World Bank team and attend/incorporate their feedback/observations in the draft/final report.