

Consultancy Services for Developing Hydro-meteorological Resilient Action Plans (HmRAP) in Selected Urban Areas in India

Terms of Reference

Introduction & Background

1. During 2011, Govt. of India, Ministry of Home Affairs, launched a National Cyclone Risk Mitigation Project – I (NCRMP-I) in Andhra Pradesh and Odisha with an objective to protect the vulnerable coastal communities from frequent cyclones and minimize loss of lives and assets through multiple mitigating measures. Subsequently, during 2015, NCRMP-II was launched in six other coastal States viz. Goa, Gujarat, Maharashtra, Karnataka, Kerala and West Bengal.
2. One of the agreed components under NCRMP-II is about Hydro-meteorological Resilient Action Plans (HmRAP) as a futuristic step and funds have been demarcated for this purpose. Accordingly, PMU, NDMA has now decided to hire a Consultant firm for developing HmRAP in select urban areas. The HmRAP would be a key document in guiding decision-makers to improve their city's resilience and reduce risks to hydromet related hazards, with a critical focus on incorporating hydromet information into planning and service delivery. The HmRAP would identify specific issues and priorities tailored to the context of the specific urban area and propose key actions to be implemented at short, medium and long term for strengthening the hydromet information base and improving the resilience of urban services delivery. The plans would also become the basis for developing investment frameworks for climate resilient cities.
3. Hydromet hazards such as flooding, thunderstorms, poor air quality and others have significant impact on urban areas in India, causing both low level chronic damages, for example during the monsoons, and also resulting in major havoc due to extreme events. They have received insufficient attention but NDMA and cities are increasingly aware of the risks and need to plan specific efforts to deal with such hazards, fueled by the frequency of such events.
4. Urban flooding is significantly different from rural flooding as urbanization leads to developed catchments which increases the flood peaks from 1.8 to 8 times and flood volumes by upto 6 times. Consequently, flooding occurs very quickly due to faster flow times, sometimes in a matter of minutes.
5. Urban areas are centres of economic activities with vital infrastructure which needs to be protected 24x7 and they may not have only local but global implications. They are also densely populated and people living in vulnerable areas suffer loss of life, damage to property and disruptions in transport and power, thus, bringing life to a grinding halt. Even the secondary effects of possible epidemics and exposure to infections takes further toll in terms of loss of livelihood and human suffering.
6. It is being observed that there has been an increasing trend of urban flood disasters in India over the past in several areas whereby major cities have been severely affected. Most notable among them are Hyderabad in 2000, Ahmedabad in 2001,

Delhi in 2002, 2003 & 2010, Chennai in 2004, 2015 & 2017, Bangalore in 2014 & 2017, Mumbai in 2005, Surat in 2006, Kolkata in 2007, Jamshedpur in 2008, Guwahati in 2010 and Srinagar in 2014.

7. The main reasons for urban flooding in India are heavy rainfall during monsoons, storm surges in coastal cities, sudden release or failure to release water from dams/reservoirs, urban heat island effect, global climate change affecting weather patterns causing episodes of high intensity rainfall events occurring in a shorter period of time and rise in sea level due to global warming. Of late, the rainfall in certain cities has been much above the average. The municipal and storm drainage systems are decades old and cannot take the load of extra water flow. These often do not work also because of improper disposal of solid waste- domestic and industrial and dumping of construction debris into drains combined with poor maintenance. Encroachments on the natural drains and river flood plains, catchments, illegal sand mining etc. are also major problems in the cities and towns.
8. Rapid unplanned growth, urban areas in many cases retain high socioeconomic vulnerability, such as urban poverty, informal settlements, lack of municipal services, land tenure issues, etc., which are exacerbated by the exposure to climate-related shocks and stresses. The inter-phase between uncertainties associated with climate change, urbanization and increasing vulnerability has given rise to growing interest to address urban resilience to extreme weather events and climate change.
9. Accelerating urbanization across the country demand urgent formulation and implementation of rational and local adaptation/mitigation strategies backed by climate risk baseline study, future growth and climate scenarios, sector impact assessment and implementation of actions through an agreed risk reduction/adaptation framework which includes identification and evaluation of opportunities (entry points) and benefits for formulating new climate resilient practices in the context of urban planning and management.
10. Cities and local authorities have the potential to influence both the causes and consequences of climate change. Cities are a major contributor to GHG emissions, the obligation therefore falls on cities to provide leadership and direction and implement practical initiatives for the communities and citizens they represent. Based on the growth story and the agro-climatic zones, cities need to develop local strategies (to address extreme weather events and climate change impacts) towards a sustainable and resilient future.

Objectives of the Consultancy

11. The overall goal of the Hydromet Resilience Action Plan (or HmRAP) will be to strengthen the capacity of National/ State and ULB entities to effectively plan for and respond to significant hydromet hazards/extreme events and climate change affecting urban areas.
12. The objectives of the consultancy is to support participating ULBs in preparing resilience actions plans that will assess hydro-meteorological exposure, risks and vulnerability of urban assets and communities, identify current and proposed adaptive and mitigative actions, and develop action plans that include recommendations for strengthening capacity and investment outline for investing in



resilient solutions. A key focus of the consultancy would be to assess the availability of weather, water and climate information available at the city level, assess gaps and the potential for developing urban oriented hydromet services using existing information, and develop a plan to strengthen the capacity for improving such service delivery to critical weather dependent sectors and users.

13. The consultancy will target six cities in the initial phase and will include a strong technical analysis and consultative process as a basis for the development of the proposed action plans.

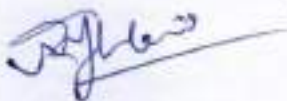
Scope of Work and Tasks

14. The assignment, which will result in a HmRAP for each selected urban area, will include the following activities and tasks. For each city, the consultants will:
 - a. Conduct an **overview** of the urbanization patterns, economic sectors' growth, hydromet hazards and risks, preliminary damage assessments from weather related events to characterize its vulnerability, existing institutional capacity and identification of key urban services delivery and user agencies and communities. This would also comprise of a desk review of research and other materials relevant to the key themes related to urban resilience and hydromet services.
 - b. Develop a **detailed methodology, work plan and baseline of information** on the basis of the overview and desk reviews of available research/other information. This will be included in an inception report along with plan for consultations during the consultancy across a spectrum of stakeholders.
 - c. Initiate a **technical and consultative process for prioritization of hydromet hazard/categorization** of cities by hazard. This initial scoping consultation will allow tailoring of the assessment and recommendations for each selected city based on the specifics of that particular urban area and the hydromet hazards that threaten its resilience. The overall TOR will be broader but an initial consultative scoping exercise would allow for scoping that can adapt the overall assessment to the specific city context.
 - d. Conduct a **detailed assessment of the hydromet hazard and risk identification/scoping for potential impact** across urban infrastructure and key services, available hydromet data and information, climate forecasts and capacity assessment for urban hydromet services and resilient actions. This will include a detailed assessment of historical data on chronic and extreme events, description of main climate hazards and their impacts currently experienced in urban areas (e.g. heavy rainfall and flooding, thunderstorms/cyclones, drought, heat waves, SLR, UHI effect, landslides, interruption to urban services and impact on urban infrastructure, cascade impact on infrastructure services, mortality/displacement /destruction of property and infrastructure, etc.) including damage assessments, etc. This will include a comprehensive assessment of available hydromet and climate data (historical and projections) for the city level. Data and information on hydro-meteorological parameters that allow for a systematic assessment of weather, water and climate related hazards and risks for population and assets exposed will be assessed, including collection of data on disaster history and trends. This can be achieved through a number of



sources, including close collaboration with IMD and hydrological agencies, downscaling from global and regional centers, etc. The assessment would define potential future evolution of climate variability and climate change related natural hazard risk (both sudden-onset and slow-onset) and possible intensification and intensification trends including extreme rainfall, flooding, drought, heat wave conditions/urban heat islands over the next 25 to 50 years. Collection of existing climate forecasts and scenario building at the national and state levels would have to be downscaled/ adapted to the specific urban area to get the best projections of potential local impacts based on different climate and disaster scenarios. A key part of this exercise would be to examine the potential for developing improved hydromet products and services targeting urban users based on existing data and identifying gaps where further investments would make the most impact in terms of improving the quality of such products. The Consultant is expected to envisage requirement of data for the assignment which is available with various Govt. agencies. The requirement of data will be examined by NDMA and will facilitate acquisition of data from relevant authorities. Any charges for acquisition of data from Govt. agencies will be borne by NDMA.

- e. Conduct **vulnerability and risk assessment** at urban level and for critical weather dependent sectors, develop hazard and vulnerability maps as well as impact scenarios based on hydromet risks. This will include identifying critical infrastructure and assets, identifying most vulnerable areas, communities and assets, formulating approach/methodology to create DEM/DTM of the study area through GIS, survey methods (Total station DGPS) including building height, road elevation, drainage (invert) level (state covered or uncovered), developing impact modeling, etc. Both, vulnerability and risk assessment will be based on current socio-economic context in which hazards are translated into impacts on urban environment, i.e. which populations/areas are vulnerable to various hazards, exposure of sectors (public and private) /urban systems to various climate hazards, and key drivers of vulnerability (e.g., social, economic, policy, regulatory, urban planning and management) and hazard scenarios, as well as future trends. It will both describe the current situation and simulate future impacts based on scenarios of future growth paths in weather dependent economic sectors, built environment, population segments, etc. under different climate projections. The assessment of future trends will be derived from master plans, sectoral growth plans and from specific interviews with officials and experts. More specifically, this activity will include the
- inventory and mapping of socioeconomic and infrastructure assets (current and future);
 - assessment of building codes to ensure they reflect risk profiles;
 - vulnerability mapping of exposed locations and populations in selected urban areas (current and future);
 - identification of target areas such as most at risk at present or projected, fastest growing neighborhoods, most vulnerable areas/communities/slums and in-depth analysis conducted.



- f. **Review and assess ongoing activities** undertaken by the local, state and National entities related to urban planning and resilience; and conduct a review of urban development strategies/area plans, policies and regulations - local but also at national and state levels related to DRM, urban planning, and any specific sectoral plans (e.g., transport, water, energy). This would include a description of current levels of adaptive capacity in the relevant population groups, urban systems, sectors and institutions; existing options available for response to manage and reduce existing risks, and constraints that prevent action to reduce risk. Assess the availability of weather, water and climate information available at the city level, assess gaps and the potential for developing urban oriented hydromet services using existing information, and develop a plan to strengthen the capacity for improving such service delivery to critical weather dependent sectors and users (assess entry points for generating and using urban hydromet products and services that can enhance the quality of planning or the resilience of ongoing investments through data informed decision making).
- g. Conduct a **detailed institutional assessment** to assess available capacity and gaps at city agencies (municipalities), hydromet agencies, early warning systems and relevant entities for undertaking resilient planning, incorporating weather and climate information into planning and actions and for facilitating delivery of hydromet urban services to key users and sectoral entities (particularly related to sectors such as DRM, water supply and drainage, urban planning, urban transport, energy etc.). This will include:
- stakeholder and institutional mapping (with identification of mandates for action) and capacity assessment of various organizations (public and private) involved in hydromet and early warning services, disaster response and recovery
 - inventory and mapping of actions/measures adopted on adaptation and DRM preparedness at the city level, including sector specific activities and expected results;
 - review of urban development patterns/master plan review and gaps analysis;
 - gaps assessment to evaluate the need for augmenting existing measures or defining additional ones (at technical, institutional, policy/ regulatory, and financial levels) – in light of previous vulnerability and risk assessment.
- h. Make **structural and non-structural recommendations** based on the analytical base of this activity and conduct a consultative process to define the priority actions and develop an investment framework by city to reduce vulnerability and enhance resilience. This would include identification of entry points for climate resilient practices and urban planning, as well as actionable recommendations to strengthen the urban infrastructure and services related to disaster risk management, public health, urban transport, water supply, drainage, sewage and sanitation, urban housing and building codes, energy, peri-urban agriculture, land use, etc. This would also include possible adaptation measures, including prevention, preparedness, mitigation of impacts,

response, awareness and sensitization as well as the identification of investments needs for infrastructure to support sustainable urban services, including developing reliable early warning systems that are widely accessible, and for improving the hydromet knowledge base in the cities (such as expanded/upgraded observation networks, capacity for improved forecasting and early warning services communication). It would further explore designs for decision support systems by urban users and sectors for incorporating hydromet data into their planning and propose ways of evaluating alternative measures based on criteria such as economic valuation or stakeholder prioritization.

- i. Develop a **summary report and detail report** that draws from individual city HmRAP to develop a strategic framework for city resilience to hydro-met events and climate change, identify city and sector specific investments for resilience actions and action plan for implementation (including capacity building of key institutions and communities/citizens, urban hydromet services delivery, promotion of adaptive and mitigative actions to enhance resilience). Individual city HmRAPs will have a matrix of recommended actions, proposed investments and an implementation strategy. The latter will describe the responsibilities of key stakeholder partners (ULB, state and national agencies) and include a capacity building plan that would be essential in the implementation of the HmRAP.

Geographical Coverage

15. The Action Plans will be made for six cities prone to heavy rain fall, one city each in the States covered under NCRMP Phase II. The Consultant is expected to cover area under latest Master Plan/ Development Plan of City / Municipal Area available as on July 2019 of the following six cities for mapping:-

- I) Panjim (Goa)
- II) Kochi (Kerala)
- III) Porbandar (Gujarat)
- IV) Mangaluru (Karnataka)
- V) Ratnagiri (Maharashtra)
- VI) Bidhannagar (West Bengal)

Type of Contract & Period of Assignment

16. It will be a lump-sum contract for 18 months. Payments will be linked with acceptance of deliverables. The time period of acceptance will be 40 days from the date of submission of the deliverable.

Expected Outputs and Deliverables

17. The primary output from this exercise is the City level HmRAPs for selected cities and an overall framework document. To complete these deliverables, interim outputs are also required, which are noted in the table below:-

