TERMS OF REFERENCE FOR CONSULTANTS
INDIA: ENHANCING CLIMATE RESILIENCE IN UTTARAKHAND URBAN DEVELOPMENT

A. Objective:

1. The state of Uttarakhand is part of the central Himalayas. It comprises numerous glaciers that are the source of perennial rivers, providing water to large parts of the country. Yet, water scarcity is an issue as water runs off in the hilly terrains instead of getting accumulated. Along with urbanization, degrading ecosystem, and inadequate, and insufficient wastewater management, and infrastructure, the Government of Uttarakhand raised serious concern on water pollution particularly in the watershed near major urban areas. The 2021 snow burst and flood in Chamoli district, the upstream of Dehradun watershed led to serious infrastructure damage and casualties, which alarmed people in the state of Uttarakhand as well as many other states with similar conditions.

2. The project aims to address complexity of climate and human induced problems, particularly on floods, water scarcity from insufficient retention and detention and storage capacities, floods, and water pollutions; to find solutions to effectively mitigate adverse impacts and enhance resilience. Responding to this request, the project will support situation analysis and modeling works for scenario buildings, the development of climate-resilient decision supporting tools and the selection and design of climate resilience measures with a special focus on nature-based solutions at upstream and downstream urban cities – Dehradun, Nainital, based on participatory modeling of climate change, surface, groundwater, topography and land-use; and the completion of concept design and pre-feasibility assessment of selected measures for future investment. Activities include: (i) thorough and integrated hydrology, geohydrology, environmental and climate modeling in key watersheds and urban areas in Dehradun and Nainital; (ii) development of interactive map-based 'climate adaptation decision supporting tools' that contains indications of flood-prone zones and other hazards prone zones; various climate-resilient solutions; information on potential water retention; detention, and storage capacities; and information on likely costs of selected measures, (iii) development of action plans on climate-resilient improvement with selection and prioritization of resilient measures at upstream and downstream urban areas in Dehradun and Nainital; and (iv) capacity building training and capacity building activities on climate-resilient planning and development, which can support and facilitate the development of regional climate-resilient and sustainable watershed management plan on the Uttarakhand critical watersheds.

B. Project Outputs

3. **Output 1: Comprehensive situation assessment and analyses in Dehradun and Nainital Watersheds carried out.** Detailed situation assessment and analyses are prerequisite to the planning. Activities of this output include: (i) socioeconomic and infrastructure assessment in consideration of climate change risks and vulnerability assessment; (ii) baseline assessment on natural resources system, including water resources and water quality systems, (iii) institutional and governance system. Each of the three systems is embedded within its environment. The natural resources system is bounded by climate and (geo)physical conditions. The socioeconomic system is formed by the demographic, social, and economic conditions of the surrounding economies. The institutional and governance system is formed and bounded by constitutional, legal, and political systems. Three systems are closely interlinked and create their vulnerabilities in Uttarakhand. The assessment would be further accompanied by integrated modeling works that can analyze and interpret results of various aspects like surface water and ground water discharging, snow melting, land sliding, emissions dispersion. This can further

provide science-based information and knowledge to translate complex systems and associated problems into convincing evidence.

4. **Output 2: Interactive map-based 'climate adaptation supporting tools (CAST)' developed and operational**. The CAST is a touch-table based platform that would contain the results of comprehensive situation assessment and analyses (output 1), have built-in (i) climate resilience measures with short explanation and engineering features, including ecosystem-based adaptation measures, (ii) likely associated costs of adaptation measures; and (iii) quantifiable information on likely improvement of relevant resilient parameters, such as water retention, detention, and storage capacity improvement. By using the CAST, planning participants can play around by selecting and comparing various adaptation options as they can pose specific interventions, situate them in their determined project areas, and immediately see an estimated resilience capacity improvement as well of associated costs for implementation. The CAST would provide quantitative, evidence-based performance information on cost effectiveness of adaptation measures regarding climate resilience and co-benefits. Another benefit of using smart technology-based CAST is to enable adaptative resilience planning as the platform can be updated with newer data and information.

5. **Output 3: Strategy framework on Uttarakhand integrated climate resilience development and catchment-level water resources management developed**. Through activities under outputs 1 and 2, a strategic framework on Uttarakhand integrated climate resilience will be developed, which will set out strategic direction, approaches, and methods to enhance climate resilience development and water resources management in Uttarakhand, addressing unique climate change risks and vulnerability challenges that Himalayan region have, at the same time balancing growth demand.

6. **Output 4: Knowledge and capacity for climate resilience planning enhanced.** Through participatory approach, a series of capacity building activities including training and workshops on climate-resilient planning and development, including watershed-level climate-resilient water resources management and infrastructure development in Uttarakhand.

C. Firm Selection: 'Climate resilience modeling, planning and designing consultant'

7. A total number of 62 person-months (20 for international experts and 42 for national experts) would be required for the assignment.

8. Deliverables under the Consultancy Assignment are:
   (i) Situation assessment and analyses report
   (ii) The customized for Dehradun and Nainital
   (iii) Concept designs and pre-feasibility assessment of priority adaptation measures in Dehradun and Nainital
   (iv) Strategy framework on climate resilience
   (v) Training program plan and training materials on smart urban planning, integrated urban design, heritage-sensitive urban design, sustainable financing for urban development, and others
   (vi) Training program evaluations

9. **Integrated Water Resources Expert/Team Leader** (International, 5.5 person-months, intermittent). The expert should (i) have a postgraduate degree in hydrology, water resource management, science, environmental science, hydrology engineering, or any relevant field; (ii) have at least 15 years of working experience; and (iii) be fluent in English. The consultant shall

lead the team, plan tasks in details, supervise, and carry out quality control of all the deliverables. The consultant shall input on all the works, particularly on water resource management assessment and solutions to enhance integrated water resource management in the state of Uttarakhand, particularly on selected watersheds. The consultant will be main focal communication with the other consultants, the government and Asian Development Bank (ADB).

10. **Climate Change Adaptation Expert** (International, 1 person-month, intermittent). The expert should (i) have a postgraduate degree in environmental science, environmental engineering, science, atmospheric science, meteorology, engineering, or any relevant field; (ii) have at least 10 years of working experience; and (iii) be fluent in English. The consultant shalll lead climate adaptation solutions design and assess project potential development impacts on resilience improvement. The consultant will be in close communication and collaboration with other consultants, the government, and ADB staff.

11. **Geohydrologist** (International, 3 person-months, intermittent). The expert should (i) have a postgraduate degree in hydrology, geohydrology, hydrogeology, water resource management, science, environmental science, hydrology engineering, or any relevant field; (ii) have at least 10 years of working experience; and (iii) be fluent in English. The consultant shall lead the works on ground water and its dynamic assessment and finding solutions to improve groundwater recharge, retention, and detention solutions in close communication with other consultants, the government, and ADB staff.

12. **Water allocation modeling and water resource management engineering expert** (International, 2.5 person-months, intermittent). The expert should (i) have a postgraduate degree in science, environmental science, environmental engineering, hydrology, or any relevant field; (ii) have at least 7 years of working experience; and (iii) be fluent in English. The consultant shall lead hydraulic modeling to assess water resource management and managing various engineering solutions findings in close communication and collaboration with other consultants, the government, and ADB staff.

13. **Urban resilience planning expert** (International, 2.5 person-months, intermittent). The expert should (i) have a postgraduate degree in hydrology, geohydrology, environmental science, environmental engineering, hydroengineering, engineering, urban planning, or any relevant field; (ii) have at least 10 years of working experience; and (iii) be fluent in English. The consultant shall lead the urban resilience planning and facilitate the development of strategy directions of urban resilience planning and the selection of priority provide inputs on resilience measures and their conceptual design and pre-feasibility assessment in close communication and collaboration with other consultants, the government, and ADB staff is required.

14. **Ecosystem-based adaptation and climate adaptation supporting tool engineering expert** (International, 4 person-months, intermittent). The expert should (i) have a postgraduate degree in environmental science, environmental engineering, hydroengineering, engineering, urban planning, or any relevant field; (ii) have at least 7 years of working experience; and (iii) be fluent in English. The consultant shall lead the ecosystem-based adaptation planning and facilitate the development the selection of priority provides inputs on ecosystem-based adaptation measures and their conceptual design and pre-feasibility assessment in close communication and collaboration with other consultants, the government, and ADB staff is required.

15. **Emission and water quality modeling expert** (International, 1.5 person-months, intermittent). The expert should (i) have a postgraduate degree in environmental science, environmental engineering, hydroengineering, engineering, hydrology, or any relevant field; (ii) have at least 7 years of working experience; and (iii) be fluent in English. The consultant shalll lead the water pollution investigation and assessment and finding solutions to improve water quality for both surface and groundwater for sustainable water resource use and management.

16. **Integrated water resource management specialist/Deputy Team leader** (National, 8 person-months, intermittent). The expert should (i) have a postgraduate degree in environmental science, environmental engineering, or any relevant field; (ii) have at least 10 years of working experience; and (iii) be fluent in English. The consultant shalll provide inputs on water resource management assessment in the state of Uttarakhand, particularly on selected watersheds, and finding approaches, measures, and solutions to enhance integrated water resource management.

17. **Climate change specialist** (National, 2 person-months, intermittent). The expert should (i) have a degree in environmental science, environmental engineering, science, atmospheric science, meteorology, engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shalll provide inputs on climate change projections and future scenarios of climate impacts in selected catchment areas and the state of Uttarakhand and provide inputs on climate resilience solutions seeking that can effectively address future climate induced risks.

18. **Climate adaptation specialist** (National, 3.5 person-months, intermittent). The expert should (i) have a degree in environmental science, environmental engineering, science, atmospheric science, meteorology, engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shalll provide inputs on costing related information on resilience solutions that would be discussed and selected for pre-feasibility assessment of priority resilience measures for investment, in close communication, and collaboration with other consultants, the government, and ADB staff, project potential development impacts on resilient development.

19. **Infrastructure and cost engineering specialist** (National, 4.5 person-months, intermittent). The expert should (i) have a degree in engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shalll provide inputs on costing related information on resilience solutions that would be discussed and selected for pre-feasibility assessment of priority resilience measures for investment, in close communication, and collaboration with other consultants, the government, and ADB staff, project potential development impacts on resilient development.

20. **Economist** (National, 2.5 person-months, intermittent). The expert should (i) have a degree in economy, finance, and or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shalll provide inputs relevant on economic growth, economic impacts of current development and vulnerability patterns as a part of socio and economic assessment. In close communication and collaboration with other consultants, the government, and ADB staff, project potential development impacts on resilient development.

21. **Geohydrologist** (National, 4 person-months, intermittent). The expert should (i) have a degree in hydrology, geohydrology, hydrogeology, water resource management, science, environmental science, hydrology engineering, or any relevant field; (ii) have at least 5 years of

working experience; and (iii) be fluent in English. The consultant shalll provide inputs relevant on ground water and its dynamic assessment and finding solutions to improve groundwater recharge, retention, and detention solutions in close communication with other consultants, the government, and ADB staff.

22. **Geology and landslide specialist** (National, 2person-months, intermittent). The expert should (i) have a degree in geology, soil science, environmental science, environmental engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shalll provide inputs on landslide related situation analysis in the upstream and downstream of two catchment areas and finding solutions to improve resilience in close communication with other consultants, the government, and ADB staff.

23. **Seismologist** (National, 2 person-months, intermittent). The expert should (i) have a degree in seismology, geology, soil science, environmental science, environmental engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shalll provide inputs relevant on seismic risks and vulnerabilities assessment be responsible to GIS-base data and information presentation and develop smart climate adaptation supporting tool in pilot cities and their catchment areas in close communication with other consultants, the government, and ADB staff.

24. **GIS specialist** (National, 3 person-months, intermittent). The expert should (i) have a degree in environmental science, environmental engineering, commuter science, engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shall be responsible to GIS-base data and information presentation and develop smart climate adaptation supporting tool in pilot cities and their catchment areas in close communication with other consultants, the government, and ADB staff.

25. **Environmental specialist** (National, 1 person-month, intermittent). The expert should (i) have a degree in environmental science, environmental engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shall provide inputs on environmental assessment, particularly on surface, and ground water pollution root cause assessment and finding solutions in close communication with other consultants, the government, and ADB staff.

26. **Urban planner** (National, 4 person-months, intermittent). The expert should (i) have a degree in urban planning, engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shall provide inputs on better urban control and planning along with resilient city development. Close and collaboration with other consultants, the government, and ADB staff is required.

27. **Nature-based adaptation design engineer** (National, 4 person-months, intermittent). The expert should (i) have a degree in climate science, environmental science, environmental engineering, science, engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shall provide inputs on carrying out conceptual design of nature-based adaptation solutions in close communication with other consultants, the government, and ADB staff.

28. **Ecologist (plant scientist)** (National, 2person-months, intermittent). The expert should (i) have a postgraduate degree in environmental science, ecology, biology, environmental engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shall provide inputs on finding climate-resilient ecological

solutions suitable to local conditions and situations in close communication with other consultants, the government, and ADB staff.

29. **Institutional and governance specialist** (National, 2 person-months, intermittent). The expert should (i) have a degree in policy, public administration, governance, social science, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shall provide inputs on governance assessment and institutional strengthening solutions and measures to enhance integrated and coherent resilience planning and development. Close communication with other consultants, the government, and ADB staff is essential.

30. **Stakeholder participation specialist** (National, 2.5 person-months, intermittent). The expert should (i) have a degree in environmental science, environmental engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shall be leading on stakeholder participation processes, in close communication with other consultants, the government, and ADB staff. The consultant is also responsible to prepare evaluation reports on stakeholder engagement and participation.

31. **Water supply specialist** (National, 1 person-month, intermittent). The expert should (i) have a degree in science, water engineering, hydrology, environmental engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shall provide inputs on water supply infrastructure and service assessment and sustainable integrated solutions finding for high quality water supply systems development in close communication with other consultants, the government, and ADB staff.

32. **Sanitation specialist** (National, 1 person-month, intermittent). The expert should (i) have a degree in science, environmental science, environmental engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shall provide inputs on sanitation, both centralized, and decentralized infrastructure and service assessment and integrated solutions finding in close communication with other consultants, the government, and ADB staff.

33. **Solid waste specialist** (National, 1person-month, intermittent). The expert should (i) have a degree in environmental science, environmental engineering, or any relevant field; (ii) have at least 5 years of working experience; and (iii) be fluent in English. The consultant shall provide inputs on waste management situation assessment and integrated solutions finding in close communication with other consultants, the government, and ADB staff.