

## CLIMATE RESILIENCE MEASURES

### A. Introduction

1. The project will contribute to increased economic activities and environmental protection in towns in the Tonle Sap Basin. It responds to the need of the municipal governments for integrated urban environmental management in urban areas around the Tonle Sap Lake. The project will improve urban services and enhance climate change resilience in Kampong Chhnang and Pursat municipalities through five strategic and integrated outputs: (i) Kampong Chhnang urban environmental improvements (river embankment reinforcement and construction, and solid waste management); (ii) Pursat urban environmental improvements (river embankment protection, drainage improvements, and solid waste management); (iii) community mobilization and environmental improvements (household latrines for the urban poor, climate change and hygiene promotion and community-driven infrastructure grants); (iv) strengthened sector coordination and operations; and (v) strengthened capacity for project implementation, operation and maintenance (O&M). The project is aligned and consistent with the Tonle Sap Urban Areas Development Framework (TSUADF) and Kampong Chhnang and Pursat urban development strategies to 2030.<sup>1</sup> The project also is in line with the government's development strategies, including the Cambodia Climate Change Strategic Plan 2014–2023, and the National Adaptation Programme of Action for Climate Change. This linked document illustrates the climate resilience measures integrated into the Project.

### B. Pilot Program for Climate Resilience

2. The Government of Cambodia (the Government) is one of the pilot countries participating in the Pilot Program for Climate Resilience (PPCR). In June 2011, the PPCR sub-committee endorsed the Government's Strategic Program for Climate Resilience (SPCR) and in August 2011 reconfirmed its commitment for funding envelope of up to \$86 million (\$50 million in grants and up to \$36 million in concessional credit). Of this, an allocation of \$10 million (\$5 million concessional credit and \$5 million grant) was agreed for the *Integrated Urban Environmental Management in the Tonle Sap Basin Project* (the Project or IUENTSP). The Government did not avail of the approved \$600,000 of the \$5 million grant for project preparations and preferred that it be included in the grant funding envelope of the project.

3. In November 2013, the Government and the Asian Development Bank (ADB) submitted a revised SPCR for endorsement, which reflected the evolving situation and project design of the proposed project. The revision was endorsed by the sub-committee on 28 January 2014.

4. The base investment for the proposed Project is \$37 million loan from ADB's Special Funds resources. The loan will have a 32-year term, including a grace period of 8 years, an interest rate of 1.0% per annum during the grace period and 1.5% per annum thereafter, and such other terms and conditions set forth in the draft loan and project agreements. While the base design already incorporates climate resilient measures for urban environmental improvement infrastructure in Kampong Chhnang and Pursat municipalities.

5. The original scope of Component III — Climate Proofing of Infrastructure, Project 3: Flood-resilient infrastructure development in Sisopohon, Siem Riep, Kampong Thom, Battambang, Pursat and Kampong Chhnang was envisioned as part of the project on

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<sup>1</sup> The TSUADF is for approval. Urban strategies approved on 31 July 2014 (MPWT Letter No. 009 PMU/MPWT/IEUMTB/14/30 July 2014 for Kampong Chhnang and No. 008 PMU/MPWT/IEUMTB/14/30 July 2014 for Pursat).

*Sustainable Urban Development in the Tonle Sap Basin Project*. Since then, the proposed project has been renamed to the current name and the project area has been focused to provide infrastructure financing for the two provinces of Kampong Chhnang and Pursat.

6. The project includes: (i) mainstream adaptation concerns into urban infrastructure planning in selected provinces, and (ii) enhance climate resilience of urban areas by strengthening river banks, solid waste disposal and other sanitation systems, to minimize the impacts of floods. It aims to improve urban services and enhance enhanced climate change resilience of urban infrastructure to floods in Kampong Chhnang and Pursat municipalities.

7. The preparation of the TSUADF has assisted the Government in prioritizing two municipalities Kampong Chhnang and Pursat for infrastructure investments under the project aimed at strengthening the climate resilience of urban areas. The TSUADF provides the rationale for the project and identifies Kampong Chhnang and Pursat municipalities as first priority for investments due to its strategic importance (location and economic importance), climate change and environment protection, synergies with ADB projects on agriculture and rural development, and complementarities with other ADB SCF projects. The preparation of the TSUADF and subsequent town urban development strategies in Kampong Chhnang and Pursat has led to an increased awareness about the importance of incorporating climate resilience features into future urban development projects. The Government has already requested ADB and the Cities Development Initiative for Asia (CDIA) for a Phase II of this project for two additional towns in 2016; the CDIA has responded favorably to this request to support the pre-feasibility of two additional municipalities around the Tonle Sap—Sisopohon and Serei Saophoan (also the new name for Kampong Thom).

8. It is important to coordinate closely with the PPCR financing for the climate resilience measures in the GMS Flood and Drought Risk Management and Mitigation Project, GMS Southern Economic Corridor Towns Development Project, the Cambodia Provincial Roads Improvement Project.<sup>2</sup> The GMS Flood and Drought Risk Management and Mitigation Project focusses on flood control to divert water during flood periods to reduce flooding in Pursat township; and the Cambodia Provincial Roads Improvement Project aims to improve the road embankments and roadside ditches which are susceptible to erosion in Kampong Chhnang township, specifically west and east of National Road 5, on 150B and 151B, and in the western-most section of the road, where water flows off the Phnom Aoral Mountains towards the road across large plains.<sup>3</sup> The proposed Project complements these projects in both Pursat and Kampong Chhnang by providing complementary climate resilient infrastructure to further protect these towns from flooding and environmental pollution.

9. PPCR loan (\$5.0 million) will finance 82% of the incremental costs associated with ensuring the Kampong Chhnang river embankment reinforcement and construction (output 1.1)

<sup>2</sup> These include: ADB. 2012. *GMS Flood and Drought Risk Management and Mitigation Project (L2970/G0330/L8262-REG)*. Manila (SPCR endorsement June 2011 for \$9.96 million; PPCR SC approval October 2012); ADB. 2012. *GMS Southern Economic Corridor Towns Development Project (L2983/L8265/G0335/G0334-CAM)*. Manila (SPCR endorsement \$10 million; PPCR SC approval October 2012); ADB. 2011. *Cambodia Provincial Roads Improvement Project (G0278/L2839/TA8005/L8254-CAM)*. Manila (SPCR endorsement \$17 million; PPCR SC approval November 2011).

<sup>3</sup> Increased climate resilience outputs of all projects are found online. GMS Flood and Drought Risk Management and Mitigation Project (<http://www.adb.org/sites/default/files/40190-013-cam-oth-02.pdf>); the GMS Southern Economic Corridor Towns Development Project (<http://www.adb.org/sites/default/files/43319-033-cam-oth-01.pdf>); the Cambodia Provincial Roads Improvement Project (<http://www.adb.org/sites/default/files/linked-docs/43309-013-cam-oth-02.pdf>); and the technical assistance for Mainstreaming Climate Resilience into Development Planning (<http://www.adb.org/sites/default/files/projdocs/2013/45283-001-cam-tar.pdf>).

is climate resilient or about 23.4% of the estimated cost for the river embankment sub-output. Additional cost of climate change measures is about \$6.1 million. Measures include: (i) concrete revetment on the slopes on the Tonle Sap side rather than gabions (\$2.2 million); (ii) concrete road instead of bitumen (estimated at \$1.5 million); and (iii) raising the embankment level by 0.9 meters to 13.00 meters (estimated at \$2.4 million). These measures and the increase in cost is justified in two ways: (i) the overtopping of the embankment would be disastrous and with the uncertain climate change consequences a return period of 50 years and a freeboard of 500 mm is justifiable; and (ii) the use of concrete for the road and slopes will increase the longevity of the embankment, enhance resilience to climate change and reduce maintenance costs.<sup>4</sup>

10. The PPCR grant (\$5.0 million) will finance 100% of the incremental costs associated with ensuring that the Pursat drainage improvements (output 2.2) is climate resilient or about 33.3% of the estimated cost for the drainage sub-output. The incremental cost of climate change adaptation for the drainage system is estimated at \$2.47 million. The PPCR grant also will be partially applied towards output 3 on community mobilization and environmental improvements (about \$2.03 million or 47% of the total amount allocated for this output, estimated at \$4.34 million). It also will be used to support sector coordination and operations through output 4 (about \$0.3 million or 70% of the total amount allocated for this output, estimated at \$0.43 million). This excludes \$0.2 million reserved as contingency.

11. Overall, the proposed PPCR financing will contribute to strengthening the capacity of the government and affected communities to reduce the risks associated with climate extremes, namely flood and drought events. It has been applied for investments that are in accordance with the environmental and urban development needs (including climate change assessment) completed during project preparation for the Tonle Sap area (i.e., TSUADF) and individual municipality urban development strategies for Kampong Chhnang and Pursat. The PPCR grant and loan will be used to help mainstream adaptation concerns into urban infrastructure planning in the Tonle Sap and in the two municipalities of Kampong Chhnang and Pursat.

12. On 23 October 2014, the PPCR Sub-Committee approved \$10.0 million in PPCR funding (\$5.0 million in credits and \$5.0 million in grant funding) for the proposal entitled, Cambodia: Flood-resilient Infrastructure Development in Pursat and Kampong Chhnang Towns as part of the Integrated Urban Environmental Management in the Tonle Sap Basin Project, submitted by the Government of Cambodia and the ADB.

### C. Key Features of the Project and Application of PPCR Financing

13. **Regional nature:** The Project is a national project that has links with the Greater Mekong Subregion (GMS) and Association of Southeast Asian Nations (ASEAN) regions. Urban areas around the Tonle Sap Lake are focal points of economic growth and crucial to Cambodia's own development and its position within the GMS and greater ASEAN region; unregulated growth can, however, adversely impact the environment through untreated water pollution in overall natural water resource management.

14. **Knowledge development and sharing:** The Project will generate knowledge that will assist the Government plan and develop future climate resilient infrastructure for urban environmental improvements. Experience from mainstreaming adaptation concerns into urban infrastructure planning in Kampong Chhnang and Pursat will provide opportunities for knowledge sharing and management. The Government has already requested ADB and the

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<sup>4</sup> The remaining \$0.02 million of the PPCR loan will finance the service charge of the loan.

Cities Development Initiative for Asia (CDIA) for a Phase II of this project for two additional towns; the CDIA has responded favorably to this request to support the pre-feasibility of two additional municipalities around the Tonle Sap.

15. The PPCR grant financing will help to further generate knowledge and will provide a forum (or platform) for knowledge sharing. The TA on Mainstreaming Climate Resilience into Development Planning will lead the coordination efforts amongst all the PPCR subprojects.<sup>5</sup> The Project will use this TA as a coordination mechanism to share experiences and lessons that emerge from the Project with the Ministry of Environment, Ministry of Economy and Finance, Ministry of Public Works and Transport (MPWT) and other partner agencies that have been recipients of PPCR financing. The ADB project team and MPWT will also provide project progress updates to the Southeast Asia Department focal, and ADB-Climate Investment Fund (CIF) and SPCR coordinators.

16. The Project's Output 4 on Sector Coordination and Operations includes support for knowledge development and sharing. While the ADB loan proceeds will be used to help support the implementation of the TSUADF and a national task force on urban development, the PPCR grant financing will support a group of consultants to carry-out consultations with provincial and municipal governments around the Tonle Sap Lake, and develop a Plan for Climate Change Adaptation in Urban Areas around the Tonle Sap, including revised building codes for household sanitation improvements in flood-prone areas. The consultants supported by the PPCR grant will coordinate regularly with the TA on Mainstreaming Climate Resilience into Development Planning and support subnational capacity development during preparation of the draft Plan. It will be prepared in line with agencies (e.g., Mekong River Commission and the GMS Environment Operations Center) and existing policy documents on the environment, climate change, climate resilience and infrastructure development (e.g., Cambodia's *National Adaptation Programme of Action to Climate Change*).<sup>6</sup>

17. **Gender dimensions:** The Project is classified as effective gender mainstreaming (EGM).<sup>7</sup> A project gender action plan (GAP) has been developed based on a gender analysis and consultations with the Ministry of Public Works and Transport and Ministry of Women's Affairs in Phnom Penh and in the provinces. The GAP has been prepared in accordance with ADB's Policy on Gender and Development (1998), ADB Operations Manual Section C2/BP (2010) Gender and Development in ADB Operations, and the Government's goal to strengthen the role and social status of women through capacity building for women in all sectors, changing discriminatory social attitudes, and safeguarding women's rights to actively and equally participate in nation building.<sup>8</sup>

18. The GAP includes specific gender actions to help ensure men and women actively participate in project activities, receive project information, and have access to opportunities during project implementation. It reflects current situations and needs of men and women in

<sup>5</sup> ADB. 2012. *Mainstreaming Climate Resilience into Development Planning* (TA8179-CAM). Manila.

<sup>6</sup> Government of Cambodia. Ministry of Environment. 2006. *National Adaptation Programme of Action for Climate Change* (NAPA). Phnom Penh, Cambodia; H. Moinuddin, et al.. 2011. *Climate Change Vulnerability, Adaptation and Mitigation in the Greater Mekong Subregion*. GMS Core Environment Program, Bangkok, Thailand.

<sup>7</sup> A project is assigned EGM if the project outcome is not gender equality or women's empowerment, but project outputs are designed to directly improve women's access to social services, and/or economic and financial resources and opportunities, and/or basic rural and urban infrastructure, and/or enhancing voices and rights, which contribute to gender equality and women's empowerment (Source: <http://www.adb.org/sites/default/files/40190-013-cam-oth-02.pdf>, footnote 1).

<sup>8</sup> Government of Cambodia. Ministry of Planning. National Institute of Statistics. 2011. *Women and Men in Cambodia*. Phnom Penh.

Kampong Chhnang and Pursat. A number of key gender challenges in urban environmental improvements were identified during project preparation in Kampong Chhnang and Pursat. Flood events and inefficient waste management often disproportionately impact women, as they are usually the ones who remain at home to care for family members during prolonged periods of flood and are given the primary responsibility for maintaining the home environment. Project gender actions are strategic and practical. Some actions aim at increasing women's roles in project planning and development, and others at increasing women's participation in project management and implementation units. The Project will explore new areas of gender research and action (Outputs 3 and 4), which have received limited attention in previous urban environmental improvement projects (e.g., menstrual hygiene management in flood-prone areas). A national gender and development specialist will be recruited to help monitor the gender action plan. The nongovernmental organization (NGO) that will be recruited to work with the communities in Output 3 is required to demonstrate that at least 30% of their NGO outreach staff includes women employees.

19. Details are available in RRP and PAM. A gender action plan is provided in the RRP, Appendix 2, linked document 12 and poverty and social analysis is in RRP, Appendix 2, linked document 22.

20. **Monitoring and evaluation.** Output 5 includes project implementation support services for the project management and implementation units in design and supervision, safeguards implementation, project and climate resilience monitoring, gender and community development, accounting and financial management, procurement, and disbursement. It will include skills enhancement and on-the-job training for project staff in urban planning and development, solid waste collection and landfill management, and operation and maintenance. Project implementation support services will review and expand existing stormwater drainage and flood mitigation strategies, SWM strategies, and disaster risk management strategies. The project implementation support services also will include assistance in preparing project progress reports, semi-annual safeguards monitoring reports, and monitoring reports in accordance with PPCR results framework and the guidance provided in the PPCR monitoring and reporting toolkit, semi-annual gender action plan monitoring reports, and annual project performance monitoring and evaluation reports to show cumulative progress against project implementation and the indicators in the project's design and monitoring framework (RRP, Appendix 1). Additional monitoring and evaluation requirements are outlined in the PAM.

21. **Synergy with ADB portfolio:** The Project is listed as a firm project in ADB's *Country Operations Business Plan (COBP) for Cambodia 2014–2016* and more recently in ADB's *COBP 2015–2017*.<sup>9</sup> It has synergies with other ADB operations that are located the same provinces and are receiving PPCR financing. These include the GMS Flood and Drought Risk Management and Mitigation Project; the GMS Southern Economic Corridor Towns Development Project; the Cambodia Provincial Roads Improvement Project; and the technical assistance for Mainstreaming Climate Resilience into Development Planning. Output 4 includes sector coordination activities that will provide an opportunity to strengthen these synergies with ADB and other development partner operations.

22. **Coordination with other Government agencies in Cambodia:** The Project actively coordinated with national and subnational government agencies in Kampong Chhnang, Pursat, Kampong Thom, Battambang, Banteay Meanchey and Siem Reap. These also include

<sup>9</sup> Asian Development Bank. 2014. *Country Operations Business Plan: Cambodia 2014–2016*. Manila; and ADB. 2015. *Country Operations Business Plan 2015–2017*. Manila.

municipalities of Kampong Chhnang, Pursat, Pursat, Siem Reap, Sisopohon and Serei Saophoan. There has been close coordination with the Ministry of Economy and Finance, Tonle Sap Authority (TSA), the Ministry of Water Resources and Meteorology (MOWRAM), Ministry of Environment, Ministry of Land Management, Urban Planning and Construction (MLMUPC), Ministry of Interior (MOI), Ministry of Women's Affairs, Ministry of Health, etc. The TSA in MOWRAM provided its approval to MPWT on the feasibility study report for the project, including the TSUADF on 16 January 2014.<sup>10</sup> The ADB project team and the Project Director in MPWT shared its initial thoughts on the PPCR allocation with the Climate Change Department in MOE on 28 January 2014 and have provided regular updates on the progress of project preparation. The MPWT Project Director, with support from the project preparatory consultants, held a meeting with the Environmental Impact Assessment Department on the environmental safeguards for the project on 7 March 2014. The MPWT Project Director is coordinating closely with the MLMUPC on the approval of the Tonle Sap Urban Areas Development Framework.

**23. Local communities and civil society organization participation:** The Project was prepared in consultation with local communities and civil society organizations, including water user committees and NGOs. During project preparation, the consultant team worked with the local government and local community organizations in identifying the optimal alignment for the river embankment / flood protection component in Kampong Chhnang. The ADB project processing team consulted with NGOs and sought feedback on the design of Output 3 (Community Mobilization and Environmental Improvements) and the terms of reference for the implementing NGO. The Project will rely on the continued participation by local communities in Kampong Chhnang and Pursat for their active participation and partnership during project implementation. Output 3 also reflects the specific needs of the local communities, especially the urban poor and vulnerable. The output is a community-driven component that will be implemented through an international NGO. The project area is focused on flood-prone areas in Kampong Chhnang and Pursat. It includes support for improved household sanitation in flood-prone areas, community-driven small-scale infrastructure improvements, and climate change and hygiene promotion. PPCR's support for a portion of this output will enable the Government of Cambodia to address the needs of urban poor and vulnerable, especially the Cham and floating communities in Kampong Chhnang. It supports small-scale community-driven activities, including household toilets, for which the Government may be unwilling to borrow. Details are available in RRP and PAM. A stakeholder consultation and participation plan is also provided in the RRP, Appendix 2, linked document 23.

**24. Private sector participation:** The Project will explore the role of private sector participation during project implementation. The MPWT (also the executing agency) has indicated its preference for public urban service units USUs to lead in the development, O&M of urban infrastructure and in the delivery of sustainable urban services. This would require a different approach to private sector participation, where a portion of O&M or service delivery may be contracted out. A specialist on private sector participation will be recruited during project implementation to explore these options further. Details are available in RRP and PAM. An urban institutional analysis describing the role of USUs is provided in the RRP, Appendix 2, linked document 32.

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<sup>10</sup> Letter from H.E. Minister of MOWRAM and Chairman of TSA to H.E. Minister of Public Works and Transport, No. 019/14 TSA, 16 January 2014, Phnom Penh.

## D. Overview of Projected Impacts of Climate Change

25. Climate change has an impact on the flood levels of the Tonle Sap. An overview of the expected consequences of climate change between 2020 and 2050 was carried out by the Mekong River Commission (MRC) in 2009.<sup>11</sup> The main predictions relating to flood levels and river flows in Cambodia are the following:

- (i) Climate change is expected to result in modifications to weather patterns in terms of temperature, rainfall and wind, not only in terms of intensity but also in terms of duration and frequency of extreme events.
  - a. Mean annual temperatures could increase between 0.3 and 0.6°C by 2025 and between 1.6 and 2.0°C by 2100.
  - b. The mean annual rainfall in Cambodia will be unchanged or even decrease by up to 8%. The largest increase is expected in the wet season, but will also occur in the dry season in Upper Mekong
  - c. Precipitation increases are projected predominantly in the central agricultural plains stretching from the southeast to the northwest, where rainfall has historically been below the national average; these areas are already vulnerable to floods and drought.
- (ii) The Mekong's flow is expected to increase by 4% to 13% in the wet season and by 10% to 30% in the dry season. The largest increases will appear from the Chinese border to Kratie in Cambodia.
- (iii) The snow melt contribution from the Upper Mekong is expected to increase and to start earlier due to increased temperatures.

26. The increased flow in the Mekong River will improve water availability in the dry season, but also increase the risk of flooding in the wet season. The low-lying areas downstream of Kratie including the Tonle Sap area are expected to be particularly at risk. The areas affected by flooding due to rainfall and upstream flow from Mekong are estimated to increase by 9%, not including effects of a possible sea level rise. Areas with flooding depths higher than two meters are estimated to increase by almost 40%.<sup>12</sup>

27. The storage capacity of hydropower installations may potentially reduce impacts of flooding in some areas. The Lower Mekong Basin 20-year development plan alone estimates a decrease of the wet season river flow by 7% to 17%, while the climate change scenarios for this season estimate a flow increase of between 2% to 11%. The combined effect is expected to vary between a decrease of 13% to an increase of 3%.<sup>13</sup> Importantly, the MRC report states that there is a high degree of uncertainty related to both the climate change scenarios and the different development plans in the basin.

28. Another 2010 study "Modeling climate change impacts on the flood pulse in the Lower Mekong floodplains" indicates that by 2050 the average water levels in the Tonle Sap may increase by 0.2m and peak water levels may increase by up to 0.3m.<sup>14</sup> The study estimated flood durations to be 9% longer under anticipated climate change conditions and therefore the probability of coincidence with river floods is likely to increase. However, the 2010 study also

<sup>11</sup> C. T. Hoanh, et al.. 2010. "Impacts of Climate Change and Development on Mekong Flow Regime. First assessment–2009." *MRC (Mekong River Commission) Technical Paper No. 29 (June)*. Mekong River Commission, Vientiane, Lao Peoples Democratic Republic.

<sup>12</sup> See footnote 11.

<sup>13</sup> See footnote 11.

<sup>14</sup> K. Västilä, et al.. 2010. Modeling Climate Change Impacts on the Flood Pulse in the Lower Mekong Floodplains. *Journal of Water and Climate Change*. Vol.1, No.1: pp. 67-86. .

considers the development of water infrastructure along the Mekong River and its impact on reducing downstream flood impact under climate change conditions. It concludes that while the two phenomena may balance each other, further detailed studies are required.

29. The following criteria have been used in conceptualizing the climate resilience measures for other infrastructure investments in Cambodia:

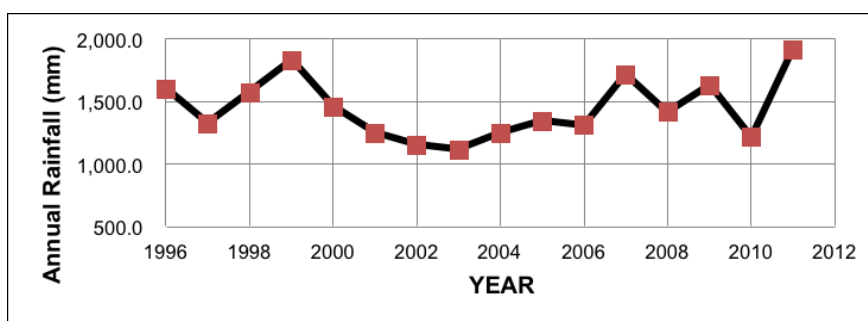
- (i) An average precipitation increase of 5% up to 2020 (this is a low estimate based on MRC projections and the Government's *National Adaptation Programme of Action to Climate Change [NAPA]*<sup>15</sup>);
- (ii) An increase of annual peak flows in Mekong between Phnom Penh and Neak Loeung of at least 5% up to 2050 (no change during the wet season and 20% to 40% increase during the dry season); and
- (iii) Changes to the water level at individual locations have to be estimated based on local conditions.

## E. Climate Change and Design Issues in Kampong Chhnang

### 1. Climate change vulnerability and impacts

30. A review of rainfall data in Kampong Chhnang (Figure 1) shows that rainfall over the last 15 years has been variable, but does seem to be increasing since 2006. The heaviest rainfall was seen in 2011 and this coincided with the flooding in the town when the existing embankment was overtopped. However, long term change could cause the Mekong River levels to rise with more intensive precipitation. There are also quite a few river control structures being built or planned in People's Republic of China (PRC) and Lao PDR, but only around 25% of the Mekong's wet weather and less than 50% of its dry weather flow originates from PRC.<sup>16</sup> These structures could have a substantial impact on both the Mekong's hydraulic regime. Irrigation schemes will increase infiltration or possibly even drain to other catchments, while dams will also alter the total and seasonal sediment loads of the river that can have an impact on aquatic life and erosion as well as water levels.

**Figure 1: Annual Rainfall in Kampong Chhnang**



Source: TA 7986-CAM Consultants based on discussion with PDMOWRAM.

31. Figures from the Ministry of Water Resources and Meteorology (MOWRAM) show that over the last 30 years, the maximum Tonle Sap water level at Kampong Chhnang first reached

<sup>15</sup> Government of Cambodia. Ministry of Environment. 2006. *National Adaptation Programme of Action for Climate Change (NAPA)*. Phnom Penh, Cambodia.

<sup>16</sup> Mekong River Commission Statistics. 2008. *Annual Flood Report and Yearbook* Vientiane.



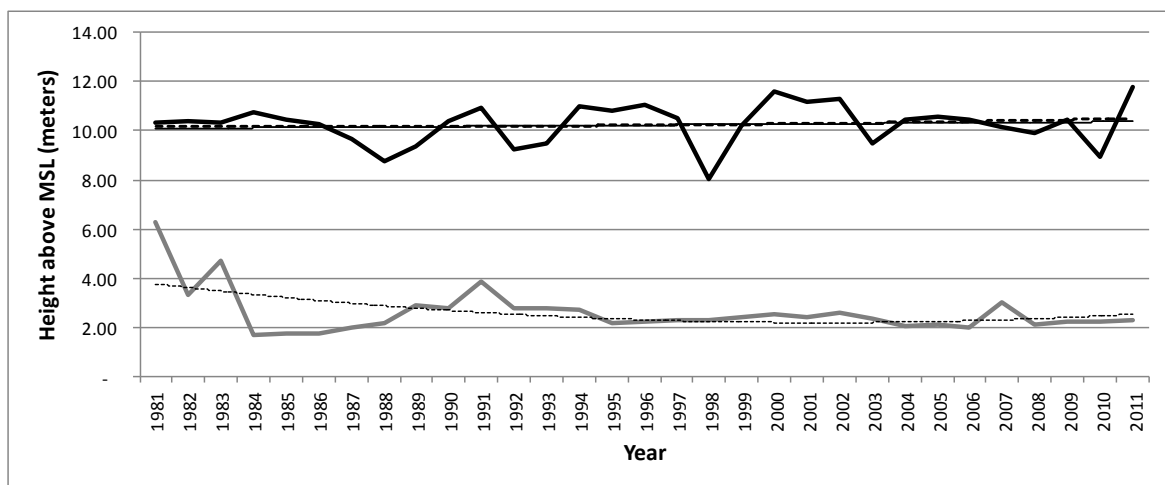
over 11.00 meters in 1996 and since then it has passed this level four more times. This is shown with actual flood levels listed in Table 1 below and shown in Figure 2.

**Table 1: Annual High Water Levels of Tonle Sap at Kampong Chhnang**

1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
10.320	10.370	10.330	10.780	10.430	10.250	9.670	8.770	9.350	10.380	10.940	9.240	9.510	11.000	10.840	11.050
1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
10.540	8.030	10.200	11.600	11.160	11.280	9.480	10.450	10.550	10.450	10.150	9.890	10.460	8.940	11.780	

Source: MoWRaM. Gauge station at Phsar Krom in Kampong Chhnang (12°16' 05.84" N, 104°40' 53.09" E)

**Figure 2: Annual Highest and Lowest Water Levels in the Tonle Sap at Kampong Chhnang**



MSL= mean sea level  
Source MORWRAM

32. The design of flood protection infrastructure is based on estimates of flood return periods. Return periods are usually based on historic data so there is also a need to consider climate change which, through more intensive rainfall, could cause the Mekong and the Tonle Sap to rise more over the design life of the embankment. Climate change could possibly be the reason that, over the recording period, between 1981 and 1995 the Tonle Sap did not rise to more than 11.00 meters above sea level, but since then has passed this level five times.

33. Table 2 shows typical design return periods for various land use types.

**Table 2: Typical Annual Return Period Design Values for Flooding**

Land Use	Range - (Years)
Town Center and Commercial Area	20 – 100
Industrial Areas	10 - 50
Urban Residential High Density >20 dwellings/ha	20 - 50
Urban Residential Low Density >5<20 dwellings/ha	10 - 20

Land Use	Range - (Years)
Rural Villages	2 – 10
Agricultural Land	1 – 10
Recreation areas	1 – 5

> = greater than, < = less than, ha = hectare.

Source: TA 7986-CAM consultant estimates. Based on Andhra Pradesh Urban Services for the Poor, Infrastructure Planning and Design Guidelines for Municipal Engineers, GHK International Consortium, March 2003.

34. The reinforcement and construction of a large river embankment that aims to protect a medium sized town and substantial agricultural land from inundation requires a commensurate return period. Thus a 50 year return period has been taken.<sup>17</sup>

35. A 50-year return period gives a flood level of 12.434 meters above mean sea level. This is around 600mm above the highest level of the existing embankment and about eight meters above areas where there is no existing embankment.

36. For climate change, it is difficult to predict an exact level for the Tonle Sap in the future. However, in Kampong Chhnang, the overtopping of the embankment could have a disastrous impact. Consideration of the findings of the climate change reports, plus the relative paucity of river level data, indicates the need to build in a factor of safety for the height of the embankment crest level. This can be included within the freeboard. Freeboard is the area above the designed highest water level and the top of the embankment. Where flood events can be reasonably accurately predicted, freeboard can be taken as 300 mm. However, to accommodate the unknown factors of climate change and the limited river flow data, 500 mm has been taken. This will take the design crest level to 12.934 meters. For ease of construction, this level will be 13.000 meters above mean sea level. This level provides a 120 year return period based on historical data in Table 3.

**Table 3: Determination of Return Periods for Flood Protection in Kampong Chhnang**

Year	Lowest (m)		Highest (m)		Return Period (Years)	Flood Level (m)
	Date	Level (x)	Date	Level (y)		
1981	07/07/1981	6.30	23/09/1981	10.32	2	10.127
1982	20/06/1982	3.31	14/10/1982	10.37	5	10.866
1983	08/08/1983	4.72	23/10/1983	10.33	10	11.356
1984	24/05/1984	1.70	23/09/1984	10.78	15	11.632
1985	26/04/1985	1.75	03/10/1985	10.43	20	11.826
1986	01/04/1986	1.73	06/10/1986	10.25	25	11.975
1987	30/04/1987	2.00	06/10/1987	9.67	30	12.096
1988	01/06/1988	2.16	27/10/1988	8.77	40	12.286
1989	14/06/1989	2.91	09/10/1989	9.35	<b>50</b>	<b>12.434</b>
1990	01/06/1990	2.77	08/10/1990	10.38	60	12.554
1991	01/07/1991	3.85	14/10/1991	10.94	70	12.655
1992	25/06/1992	2.75	04/10/1992	9.24	80	12.743
1993	20/06/1993	2.77	10/10/1993	9.51	90	12.820
1994	09/05/1994	2.68	05/10/1994	11.00	<b>100</b>	<b>12.889</b>
1995	29/04/1994	2.19	17/10/1995	10.84	<b>120</b>	<b>13.009</b>
1996	28/04/1996	2.22	14/10/1996	11.05	<b>150</b>	<b>13.155</b>
1997	15/05/1997	2.26	09/10/1997	10.54	170	13.237

<sup>17</sup> K. Västilä, M. Kummu, C. Sangmanee and S. Chinvanno. 2010. Modeling Climate Change Impacts on the Flood Pulse in the Lower Mekong Floodplains. *Journal of Water and Climate Change*. Vol.1, No.1: pp. 67-86. .

Year	Lowest (m)		Highest (m)		Return Period (Years)	Flood Level (m)
	Date	Level (x)	Date	Level (y)		
1998	10/05/1998	2.30	03/10/1998	8.03	200	13.343
1999	18/04/1999	2.40	08/10/1999	10.20	250	13.489
2000	18/04/2000	2.54	27/09/2000	11.60	300	13.608
2001	15/05/2001	2.38	30/09/2001	11.16	350	13.709
2002	09/04/2002	2.60	05/10/2002	11.28	400	13.796
2003	13/05/2003	2.37	06/10/2003	9.48	450	13.873
2004	11/04/2004	2.05	04/10/2004	10.45	500	13.942
2005	17/05/2005	2.10	08/10/2005	10.55		
2006	24/05/2006	2.00	21/10/2006	10.45		
2007	12/05/2007	3.00	22/10/2007	10.15		
2008	08/04/2008	2.08	08/10/2008	9.89		
2009	02/04/2009	2.20	15/10/2009	10.46		
2010	24/03/2010	2.20	25/10/2010	8.94		
2011	16/04/2011	2.30	22/10/2011	11.78		

Source: TA 7986-CAM Consultants based on discussions with PDMOWRAM.

37. The embankment height can also be raised by up to half a meter in the future by constructing a wall on the Tonle Sap side where there are existing settlements and by constructing a higher, but narrower, road on the embankment elsewhere. The wall would be disruptive to those living or working on the Tonle Sap side of these settlements, so should only be constructed if river levels are seen to rise significantly and hydrologists predict the possibility of flood levels over 13.000 mean sea level. This would then cover a current return period of 200 years.

## 2. Climate resilience design measures

38. **Output 1.1: Flood protection in Kampong Chhnang.** Various climate resilience measures have been developed for the embankment in Kampong Chhnang based on anticipated climate change impact. The Cambodian Government's *National Adaptation Programme of Action for Climate Change*<sup>18</sup> has prioritized 'Development and Rehabilitation of Flood Protection Dikes' as a project type aimed at reducing salinity and regaining rice growing land. While these measures increase the cost of investment, they also have another major benefit—they help to reduce maintenance costs and prolong the overall life of the embankment.

39. The main measures incorporated into the project design are:

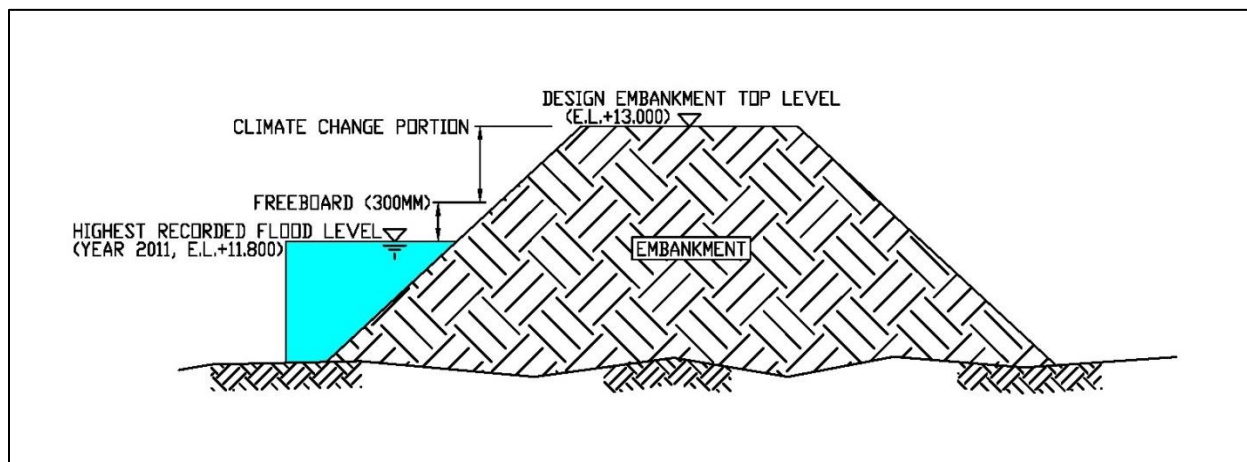
- (i) Take a return period of 50 years, rather than 20 years and building in a factor of safety for the embankment's crest level – this means the embankment design height is 13.00 meters above mean sea level rather than 12.10 meters; Note that 12.10 meters is 300 mm above the highest flood level of 11.78 meters.
- (ii) Use concrete revetment for the slopes on the embankment's Tonle Sap side in areas where there is settlement and will be used by boats, rather than gabions.
- (iii) Construct the crest road of concrete rather than bitumen. Concrete roads are much more expensive to construct than bitumen roads, but they are more robust and require much less maintenance.

40. Consideration of the findings of the climate change reports, plus the relative paucity of river level data, indicates the need to build in a factor of safety for the height of the embankment crest level. This can be included within the freeboard. Where flood events can be reasonably

<sup>18</sup> Government of Cambodia. Ministry of Environment. 2006. *National Adaptation Programme of Action for Climate Change (NAPA)*. Phnom Penh, Cambodia

accurately predicted, freeboard can be taken as 300 mm. However, to accommodate the unknown factors of climate change and the limited river flow data, 500 mm has been taken. This will take the design crest level to 12.934 m. For ease of construction, this level will be 13.000 m above mean sea level (Figure 3). This level provides a 120-year return period based on historical data.

**Figure 3: Determination of Design Flood Level and Embankment Top Level**



Source: TA 7986-CAM Consultant Team

41. The total base cost of the embankment is \$21.25 million. The costs presented are base costs and include materials, labor, plant and equipment plus contractors overheads. This excludes physical or price contingencies.

42. The additional capital cost of the climate change measures is \$6.10 million (cost of sluice gates will not change). Most of this increase is attributable to using a concrete road instead of bitumen (\$1.5 million) and concrete revetment on the slopes on the Tonle Sap side rather than gabions (\$2.2 million). Raising the level by 0.9 meters to 13.10 meters accounts for the balance \$2.4 million. The PPCR loan will finance about 82% of this incremental cost.

43. These measures and the increase in cost is justified in two ways: (i) the overtopping of the embankment would be disastrous and with the uncertain climate change consequences a return period of 50 years and a freeboard of 500 mm is justifiable; and (ii) the use of concrete for the road and slopes will increase the longevity of the embankment, enhance resilience to climate change and reduce maintenance costs.<sup>19</sup>

## **F. Climate Change and Design Issues in Pursat**

### **1. Climate change vulnerability and impacts**

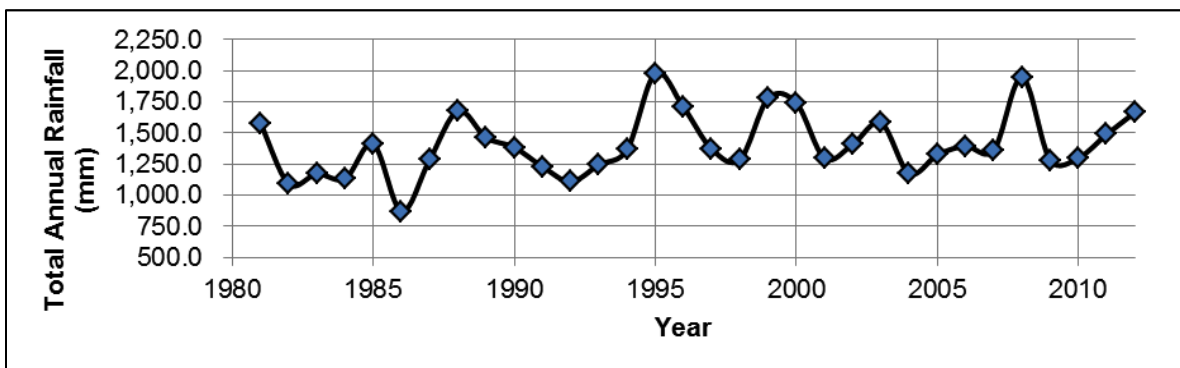
44. Detailed rainfall data for Pursat is available from 1981 and Figure 4 shows the variation in total annual rainfall over this period. However, this data is insufficient to prepare the intensity-frequency-duration (IFD) curves that would allow an accurate estimation of the time of concentration and thus the intensity. The MPWT uses IFD curves as contained in the Cambodia Road Design Manual for the design of storm water canals, pipes and culverts. These are

<sup>19</sup> The remaining \$0.02 million of the PPCR loan will finance the service charge of the loan.

available for Battambang which, at only 100 kilometers Northwest of Pursat with a very similar climate and rainfall pattern, can be used as an indicative guideline for Pursat. These are shown in Figure 5.

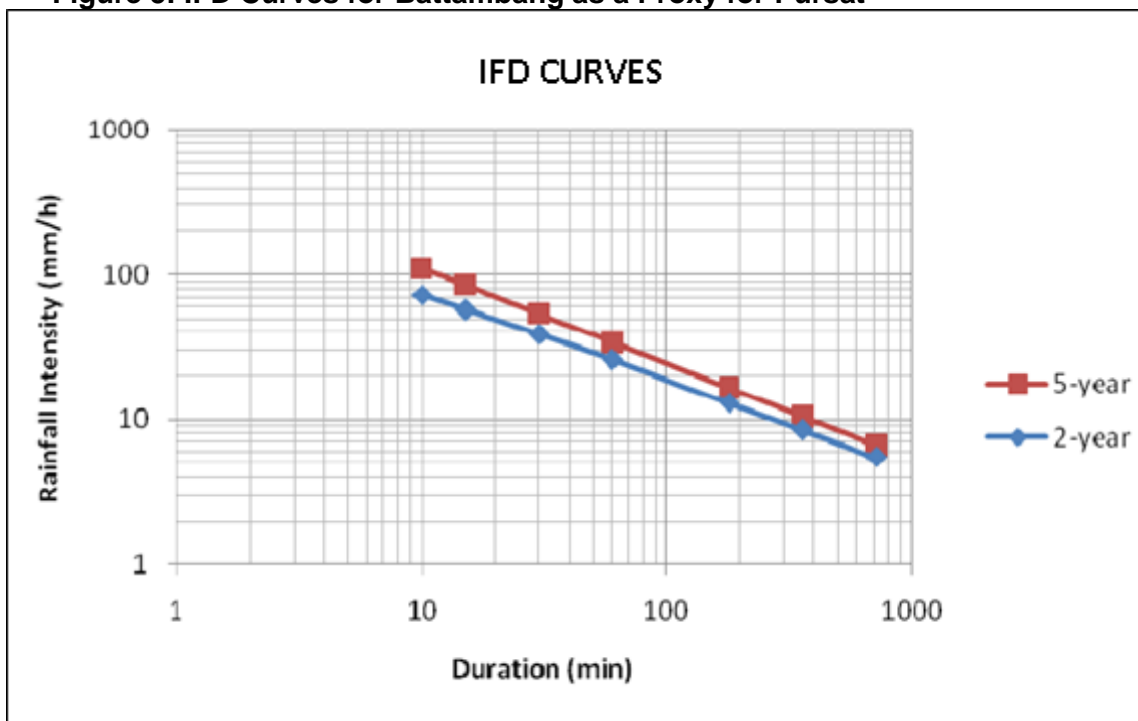
45. The rain intensity was taken as 30 mm per hour which is similar that used elsewhere in the region. However, this has been increased to 40mm per hour to accommodate the more intense rainfall expected from climate change and used for the drain design. While a more accurate assessment of the runoff coefficient will be made during detailed engineering design, given the somewhat conflicting and intangible information on climate change, it is still difficult to estimate future rainfall intensities. However, using 40 mm per hour provides a factor of safety to cover greater changes in rainfall intensity.

**Figure 4: Annual Rainfall in Pursat**



Source: Provincial Department of Water Resources and Meteorology in Pursat.

**Figure 5: IFD Curves for Battambang as a Proxy for Pursat**



Source: Government of Cambodia, 2010 Road Design Manual

46. As with flood protection infrastructure, the design of drainage is based on the estimate of return periods of major rainfall and flood events, and the design principles for the protection of urban and other areas are the same as in Table 2. In Pursat the town center catchment area includes the town center and existing medium density residential areas as well as lower density institutional areas. However it is expected that these areas will rapidly develop over the design period of the project. Therefore, a return period of 20 years has been adopted for the drainage design.

## 2. Climate resilience design measures

47. **Output 2.2 Pursat Drainage.** In Pursat, an ADB/PPCR-financed GMS project includes support for the Dhamnak Chheukrom Irrigation Scheme (DCIS). It includes climate change and climate resilience measures in its design.<sup>20</sup> Support to this project is one key factor in not currently proposing any works to raise the embankment levels of the Pursat River in the town. However, climate change still needs to be considered for the stormwater drainage system. Increased and more intensive rainfall will create larger storm flows which in turn will require larger sewers. Table 4 shows a summary of drain lengths proposed by the project.

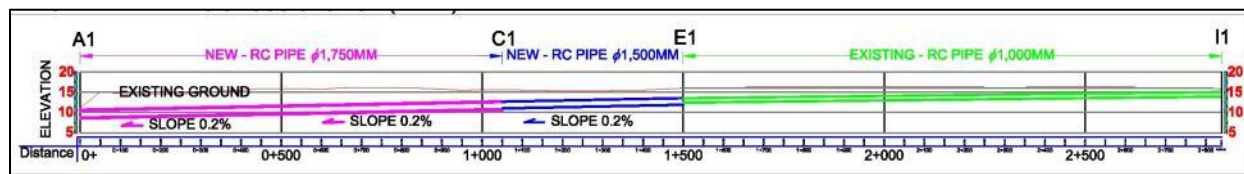
Table 4: Summary of Drain Lengths

Drain Dia.(mm)	Total Length (meters)	
	Existing	Proposed
1,750	-	2,710
1,500	-	2,220
1,000	2,025	1,880
600	2,670	3,080
<b>TOTAL</b>	<b>5,635</b>	<b>9,890</b>

Source: TA 7986-CAM Consultants

48. For the design of drains in tropical climates it is common to use a concentration time of 35 mm/hr. However, as described elsewhere, the intensity of rain events is expected to increase due to climate change. The drains in Pursat have therefore been sized to accommodate more intensive rainfall—up to 40 mm/hr. Concrete road surfacing has also been used as it is more robust and less liable to damage through storms, rather than the more usual double bituminous surface treatment (DBST) which is more common in Cambodia. Figure 5 a typical cross section.

Figure 5: Typical Cross Section



TA 7986-CAM: TA Consultants.

<sup>20</sup> See GMS Flood and Drought Risk Management and Mitigation Project, linked document for more information and details (available online: <http://www.adb.org/sites/default/files/40190-013-cam-oth-02.pdf>).

49. The total base cost of the drainage improvements is \$8.15 million. The costs presented are base costs and include materials, labor, plant and equipment plus contractors overheads. This excludes physical or price contingencies. The cost of these additional climate-proofing measures is \$2.46 million. The PPCR loan will finance 100% of this incremental cost.

### **G. Other Climate Resilience Activities**

50. Overall, climate resilience activities will seek to strengthen the outcome of the Project in providing cost effective, climate-resilient measures in the two towns by adapting the proposed infrastructure to the impacts of climate change and climate variability. It will rehabilitate and upgrade 15.1 km of flood-vulnerable embankment and road in Kampong Chhnang; extend 9.89 km of the drainage system in the central area of Pursat, improve urban village environments to climate change-resilient condition thereby providing all-year access to markets, jobs, and social services in urban, port, and adjacent agricultural areas; and support sector coordination and operations through a Plan for Climate Change Adaptation in Urban Areas around the Tonle Sap—a need identified by Tonle Sap provincial and municipal governors during TSUADF preparation. Specifically, it will result in:

- (i) Increased science-based information and knowledge pertaining to climate change impacts to inform the design of future infrastructure investments;
- (ii) Enhanced resilience of flood protection and road infrastructure to climate variability and change in two key provincial capitals.
- (iii) Improved technical and financial planning capacity to mainstream climate change concerns into urban infrastructure development at national, provincial and local levels through the institutional development activities, including the establishment of urban service units and levy of an environmental sanitation fee to cover O&M and gradual depreciation.
- (iv) Enhanced quality of life of people living in Kampong Chhnang and Pursat, areas vulnerable to climate change through improved access to markets and other social services including early warning systems for disaster risk reduction

51. Factors considered in making engineering adjustments included cost-effectiveness, current climate variability and potential future risk. As described above there are different opinions on the extent and form of projected climate change impacts. Existing climate change impact assessments are insufficient for scientifically supported probability analyses of future climate change. Therefore, the civil engineering adjustments required to meet such expected future conditions are difficult to calculate quantitatively. In view of this margins of safety have been introduced in the infrastructure designs based on project scenarios.

#### **1. Solid Waste Management in Kampong Chhnang and Pursat**

52. **Output 1.2 and Output 2.2: Solid waste management.** The main effect of climate change on solid waste management in both towns will relate to the increased likelihood of more frequent or more intense extreme weather events. By collecting and pumping leachate over the vegetation, the controlled landfill mound will remain irrigated during possibly hotter and drier summers especially the grass that has been planted on previously worked areas of the landfill. External batters will be protected against erosion resulting from possibly higher rainfall intensities. The master drainage infrastructure will be sized to account for the projected higher rain fall intensities to prevent stormwater runoff entering the operating cells and associate recycling areas and stockpiles in the future. The project will also support procurement of a

chipper and/or construction of a pit burner on site to manage greater amount of debris damage (e.g., branches or trees) as a result of potentially more intense storms.

## 2. Community Mobilization and Environmental Improvements

53. **Output 3. Community Mobilization and Environmental Improvements.** This output aims to address the climate change and environmental needs of the urban poor and vulnerable ethnic groups—making the project more inclusive by extending benefits from large infrastructure investments to men and women in locations that are particularly susceptible to climate change impacts. Subcomponents will focus on (i) improved household sanitation for IDPoor 1 and 2 in the urban area of the current municipality area, (ii) climate change and hygiene awareness and action, and (iii) development of community resilient small-scale infrastructure improvements in pre-identified poor and vulnerable areas of the current municipality where all design solutions proposed will be required to demonstrate climate-proofing.<sup>21</sup>

54. This output will require close partnership with civil society organizations. It will be managed by an international NGO, with experience in community mobilization and urban development and sanitation. It will directly and indirectly assist community build and strengthen their capacity to better plan, manage and mitigate risks associated with increasing climate extremes, including the use of early warning systems. The Project will emphasize risk reduction strategies aimed at preventing flood and drought events from becoming disasters for the affected population. It will also build on coping strategies and mechanisms of communities and promote community-driven disaster risk reduction and management.

55. The PPCR grant also will be partially applied towards output 3 on community mobilization and environmental improvements (about \$2.03 million or 47% of the total amount allocated for this output, estimated at \$4.34 million).

## 3. Sector Coordination and Operations

56. **Output 4: Sector coordination and operations.** The project will support the Government implement the TSUADF in partnership with provincial and municipal governments around the Tonle Sap Lake. Individual consultants will be recruited to develop a program of consultation and a Plan for Climate Change Adaptation in Urban Areas around the Tonle Sap. This would include a review of existing climate change design and urban regulations (i.e., building codes) in provincial towns around the Tonle Sap and recommendations, quantification and integration of climate change resilience features/measures into urban environmental improvements, revised building codes and other additional measures (e.g., appropriate household sanitation design).

57. This output will also support MPWT provide regular feedback, observations and lessons with the SPCR coordinator in the Ministry of Environment through the semi-annual coordination meetings that MOE convenes. It will support MPWT lead regular knowledge sharing forums,

<sup>21</sup> The Identification of Poor Households Program in Cambodia (IDPoor) is a nationwide targeting means for the poor based on poverty levels and poverty rates in different areas. It is led by the Ministry of Planning (MOP) in collaboration with the Department of Local Administration (DOLA) of the Ministry of Interior. The program is implemented with funding by the Federal Republic of Germany, the European Union, Australian Government Department of Foreign Affairs and Trade, UNICEF, and the Government of Cambodia, with technical assistance provided and coordinated by the German development cooperation through Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). The project will use this program in supporting community initiatives, specifically in financing household toilets for the poor that fall below the poverty line. Ministry of Planning identified 2,133 poor households in KCH and 3,456 poor households in PST.



including a semi-annual task force meeting on urban development with development partners. For instance, ADB has other GMS projects in Pursat and Kampong Chhnang, both supported by PPCR financing and interlinked with this proposed project. The Japan International Cooperation Agency (JICA) is also working in Kampong Chhnang (drainage works) and in Pursat (water supply and road development). The German development cooperation through Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is supporting the Kampong Chhnang municipality in developing its urban master plan. ADB coordinated closely with these agencies during project preparation to ensure proposed investments complement existing development partner investments and urban planning efforts.

58. This output will include initial support for establishment of urban service units (or special operating agencies) for improved delivery and management of decentralized urban services. Urban service units will be established in Kampong Chhnang and Pursat departments of public works and transport during the project, with the aim of becoming urban services management units under the municipality in accordance with the Government's Organic Law. The project implementation units will be converted into the urban services unit. In Kampong Chhnang, for instance, the provincial department of water resources and meteorology is a member.

59. PPCR financing in the amount of \$0.3 million (or about 70% of the total amount allocated for this output estimated at \$0.43 million) will support the Government implement the TSUADF around the Tonle Sap by developing a consultation program and a plan for climate change adaptation in urban areas.<sup>22</sup> The remaining \$0.2 million of the PPCR grant financing is reserved as contingency.

## H. Implementation Arrangements

60. The MPWT is the executing agency for the Project and will implement the PPCR-financed activities and enhancement. The project management unit (PMU) in the Directorate of Public Works will be responsible for overall project management and implementation, of which 30% will be women. The PMU will recruit a team of consultants for project management and implementation. This team of consultants will support the PMU in preparing detailed engineering designs with the climate resilience measures. The PMU will also recruit a NGO to support the implementation of Output 3, and a team of individual specialists to assist in implementing earmarked activities in Output 4. The PMU Project Director (Deputy General Director of the Directorate of Public Works) and the project management and implementation team leader will be responsible for coordinating the different activities in the project. A project implementation unit (PIU) will be established in Kampong Chhnang and Pursat to assist with project implementation and to help manage day-to-day activities. At least of 30% of PIU members will be women.

61. At the national and provincial levels, a coordination committee will assist in discussing and resolving any technical, strategic or policy-related issues. At the national level, a project steering committee will be established comprising of MPWT (chair), MLMUPC, MOI, MEF and TSA. Others may be invited to attend: MOE, SPCR Coordinator/MOE, MOWRAM, MOWA, MOH, etc. At the subnational level, a provincial coordination committee will be established comprising of the provincial governor (chair), deputy governors (deputy chairs) and select member of the provincial technical coordinating committee.

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<sup>22</sup> It complements MPWT's existing plan on the transport sector (MPWT. 2012. *National Strategic Plan for Climate Change Adaptation and Greenhouse Gas Mitigation in Transport Sector*. Phnom Penh.)

62. The project will include four consulting packages:
- (i) **Package I: Project Management and Implementation Support (PMIS)** consultants. The scope of the consulting services involves five main components: (a) provision of engineering services; (b) provision of project implementation and management support; (c) capacity development and training of PMU and PIUs/USUs in project management and implementation; (d) building the capacity of the MPWT, provincial government and municipalities through on-the-job training in urban management, project identification and structuring; and (e) assisting government establish the National Urban Development Task Force. One package is proposed to accomplish all four of the above objectives for the project management and implementation support.
  - (ii) **Package II: Climate Change Adaptation in Urban Development.** The scope of the consulting services involves four main components: (a) provision of technical assistance to assist government prepare a strategic plan for climate change adaptation in the urban sector in and around the Tonle Sap; (b) quantification of potential climate change impacts and identification of measures to address these impacts; (c) capacity development and training to incorporate climate change adaptation and disaster risk reduction management aspects into the national building code, and (d) to provide knowledge for an effective debate on climate change issues and resilience. One package is proposed for the consulting services.
  - (iii) **Package III: Sector Strengthening and Capacity Development.** The scope of the consulting services is to assist the Ministry of Economy and Finance, the Ministry of Public Works and Transport (MPWT) and its provincial departments in Kampong Chhnang and Pursat, and the Municipalities of Kampong Chhnang and Pursat establish urban user units (USUs). The objectives of the assistance are: (a) to prepare all documentation required for the establishment of the USUs, based on the arrangements for the Siem Reap wastewater management (including an inter-ministerial prakas by MPWT and MEF); (b) to define their mandates, roles and responsibilities; (c) to prepare a road map and timetable for their establishment, and the staged assumptions of functions; (d) to prepare the organizational and staffing structure for each USU, including its reporting arrangements; and (e) to prepare detailed job descriptions for each proposed staff member in the USU and for its governing board (or equivalent).
  - (iv) **Package IV: NGO Support for Output 3 (CMEI): Package IV: NGO Support for Output 3 (CMEI):** The scope specifically aims to address the climate change and environmental needs of the urban poor and vulnerable in Kampong Chhnang and Pursat —making the project more inclusive by extending benefits from large infrastructure investments. The output will help extend project benefits to the poor and vulnerable groups and the NGO will help to translate Project principles into community action. This includes support for community planning and prioritization, and provision of community-driven climate-resilient urban environmental infrastructure. The involvement of local communities in planning, decision-making and supervision of the works will encourage local solutions and greater accountability of the services delivered. It will help to create ownership and provide benefits to those often marginalized and vulnerable.

## I. Terms of Reference for PPCR-supported Climate Change Adaptation in Urban Development (Package II)

### 1. Description

63. The overall goal of the consulting services is to strengthen resilience to climate change in the urban sector within and around the Tonle Sap Basin. Assistance will be provided to the six Ton Sap provinces—Pursat, Kampong Chhnang, Kampong Thom, Kampong Chan, Siem Reap and Battambang, and to the Municipal Board of Governors of Pursat and Kampong Chhnang. Key objectives of the assistance are:

- To develop a strategic plan for climate change adaptation in the urban development sector in and in the Tonle Sap Basin.
- To quantify potential climate change impacts in all urban areas in the Tonle Sap Basin and to identify appropriate planning and design measures to address these impacts (as requested by the six provincial governments around the Tonle Sap).
- To revise building codes within all six Tonle Sap provinces to include latrine construction and standards, amongst others.
- To encourage effective debate on climate change adaptation.
- To ensure coordination with the PMIS consultant team and Package IV NGO teams in ensuring additional climate change measures are incorporated into the design of infrastructure interventions and community awareness programs, household sanitation and small-scale developments (Package II Team Leader).

64. The scope of the consulting services involves four main components: (i) provision of technical assistance to assist government prepare a strategic plan for climate change adaptation in the urban sector in and around the Tonle Sap Basin; (ii) quantification of potential climate change impacts and identification of measures to address these impacts; (iii) capacity development and training to incorporate climate change adaptation and disaster risk reduction management aspects into the national building code, and (iv) to provide knowledge for an effective debate on climate change issues and resilience. One package is proposed for the consulting services.

65. Key tasks are:

- Assist in the development of the strategic plan for climate change adaptation focussing on the urban sector in the provinces in and around the Tonle Sap Basin.
- Undertake a targeted analysis of tangible impacts of climate change in urban areas of the Tonle Sap Basin.
- Identify and quantify the potential effects of climate change on key towns in Tonle Sap Basins and assess the impact on the design of infrastructure to address these.
- Review the sustainability and capacity of current engineering designs, standards and guidelines in use by the various ministries involved in planning and infrastructure provision in view of climate change.
- Provide a comprehensive guide to the incorporation of climate change measures into spatial planning and the planning and design of infrastructure in the urban areas.
- Link the work to other ongoing initiatives including the national programme under the National Adaptation Programme of Action to climate change (NAPA), the Clean Cities programme, and projects supported by development partners, including work under the ADB TA for Mainstreaming Climate Change Resilience into Development Planning in Cambodia.

- Review the National Building Code and those in use with all Tonle Sap provinces, and propose measures for the inclusion of climate change adaptation.
- Draft regulations for latrine construction and appropriate standards.
- Incorporation of the above regulations into the building codes of the six Ton Sap provinces.
- Assist in the preparation of climate resilient community actions plans in Kampong Chhnang and Pursat.
- Establish and populate data base on good practices on climate change adaptation and building resilience.
- Conduct a series of workshops on climate change adaptation for key stakeholders.
- Ensure coordination and provide information (and feedback) to the PMIS consultant team and to the Package IV NGO teams in ensuring additional climate change measures are incorporated into the design of infrastructure interventions and community awareness programs, household sanitation and small-scale developments.

## 2. Staffing and qualifications:

Person & Task	Person-Months	Minimum Qualifications	Minimum Work Experience
<b><i>International Consultants</i></b>			
Climate Change/Urban Planner & Team Leader	6	Master's degree in civil engineering, urban planning, architecture, environmental science or a related subject	10 years' experience of urban development projects, strategic urban planning, and the design of building codes and regulations, including work in climate change resilience and/or disaster risk reduction. At least 3 years of which should be as team leader in climate change resilience or disaster risk reduction projects, including the preparation of strategic plans for climate change adaptation. Experience in south east Asia and on urban development projects financed by multilateral development funding agencies is essential.
<b>TOTAL</b>	<b>6</b>	Person Months of International Consultants	

<b>National Consultants</b>			
Civil Engineer	3	Master's degree in civil or municipal engineering or a related discipline	8 years' experience of urban infrastructure and vertical structure aspects of building codes, and climate change resilience and disaster risk reduction. Experience on urban development projects funded by multilateral development funding agencies is desirable. Fluency in written and spoken English is required.
Environment/Urban Climate Change Expert	4	Degree in environmental studies, meteorology or a related subject	5 years' experience of climate change and disaster risk reduction in the developed and developing world, including the preparation of strategic plans for climate change adaptation. Experience in south east Asia and on urban development projects financed by multilateral development funding agencies is desirable. Fluency in written and spoken English is required.
<b>TOTAL</b>	<b>7</b>	<b>Person Months of National Consultants</b>	
<b>GRAND TOTAL</b>	<b>13</b>	<b>Person Months of International and National Consultants</b>	

### 3. Detailed Terms of Reference

#### 66. Urban Development Specialist/Team Leader (International, 6 person months)

- Lead the team of individual consultants and ensure that key tasks identified on previous page are delivered through the assignment.
- Carry out a review of policies, standards and manuals to review current provision for climate change in infrastructure planning and provision, and urban development generally
- Identify and quantify the potential effects of climate change on key towns in Tonle Sap Basin and assess the impact on the design of infrastructure to address these.
- Review and assessment of sanitation standards and the building code
- Review the specific needs of sanitation requirement for men and women
- Review the sustainability and capacity of current engineering designs, standards and guidelines in use by the various ministries involved in planning and infrastructure provision in view of climate change.
- Design and undertake a programme of consultations with all Tonle Sap Provinces and Municipalities
- Propose revisions to building code to include latrine construction and standards
- Provide a comprehensive guide to the incorporation of climate change measures into spatial planning and the planning and design of infrastructure in the urban areas.
- Prepare a Draft Plan for Climate Change Adaptation in Urban Areas around the Tonle Sap
- Review comments and prepare Final Plan for Climate Change Adaptation in Urban Areas
- Ensure coordination and provide information (and feedback) to the PMIS consultant team and to the Package IV NGO teams in ensuring additional climate change measures are incorporated into the design of infrastructure interventions and community awareness programs, household sanitation and small-scale developments

67. **Civil Engineer** (National, 3 person months)

Assist the Team leader to:

- Carry out a review of policies, standards and manuals to review current provision for climate change in infrastructure planning and provision, and urban development generally
- Review and assessment of sanitation standards and the building code
- Review the specific needs of sanitation requirements for men and women
- Review the sustainability and capacity of current engineering designs, standards and guidelines in use by the various ministries involved in planning and infrastructure provision in view of climate change.
- Provide a comprehensive guide to the incorporation of climate change measures into spatial planning and the planning and design of infrastructure in the urban areas.
- Design and undertake a programme of consultations with all Tonle Sap Provinces and Municipalities
- Propose revisions to building code to include latrine construction and standards
- Prepare a Draft Plan for Climate Change Adaptation in Urban Areas
- Review comments and prepare Final Plan for Climate Change Adaptation in Urban Areas
- Coordinate and provide information (and feedback) to the PMIS consultant team and to the Package IV NGO teams in ensuring additional climate change measures are incorporated into the design of infrastructure interventions and community awareness programs, household sanitation and small-scale developments.

68. **Environment/Urban Climate Change Expert** (National, 4 person months)

- Carry out review and update of climate change policy and documentation
- Establish and populate data base on good practises on climate change adaptation and building resilience.
- Review the sustainability and capacity of current engineering designs, standards and guidelines in use by the various ministries involved in planning and infrastructure provision in view of climate change.
- Provide a comprehensive guide to the incorporation of climate change measures into spatial planning and the planning and design of infrastructure in the urban areas.
- Conduct a series of workshops on climate change adaptation for key stakeholders.
- Assist Team Leader to Prepare a Draft Plan for Climate Change Adaptation in Urban Areas
- Prepare climate resilient community actions plans.
- Coordinate and provide information (and feedback) to the PMIS consultant team and to the Package IV NGO teams in ensuring additional climate change measures are incorporated into the design of infrastructure interventions and community awareness programs, household sanitation and small-scale developments.

**J. Terms of Reference for PPCR-supported NGO (Package IV)**

**1. Introduction**

69. The project management unit for the proposed Integrated Urban Environmental Management in the Tonle Sap Basin (the Project) will recruit an international nongovernment organization (NGO) in accordance with ADB *Guidelines for the Use of Consultants* (2013, as

amended from time to time). The NGO will work in partnership with the Government, ADB, communities and project management and implementation consultation.

## **2. Project Background and Description**

70. The Project will contribute to increased economic activities and environmental protection in towns in the Tonle Sap Basin. It responds to the need of the municipal governments for integrated urban environmental management in urban areas around the Tonle Sap Lake. The project will improve urban services and climate change resilience in Kampong Chhnang and Pursat municipalities through urban area environmental improvements; community mobilization and environmental improvements; strengthened sector coordination and operations; and strengthened capacity for project implementation, and operations and maintenance (O&M). The project contributes to the Tonle Sap Urban Areas Development Framework (TSUADF) and Kampong Chhnang and Pursat urban development strategies to 2030.

71. The Project includes five outputs:

- (i) Output 1: Kampong Chhnang Urban Environmental Improvements,
- (ii) Output 2: Pursat Urban Environmental Improvements,
- (iii) Output 3: Community Mobilization and Environmental Improvements,
- (iv) Output 4: Strengthened Sector Coordination and Operations, and
- (v) Output 5: Strengthened Capacity for Project Implementation, and Operation and Maintenance (O&M).

72. The Project will provide investment for environmental improvements to the municipalities of Pursat, and Kampong Chhnang. Both play an important role as service centers for surrounding agriculture and value chain development. It will help support implementation of the Tonle Sap Urban Areas Development Framework (TSUADF) to guide future urban development in Serei Saophoan, Siem Reap, Stueng Saen, Battambang, Pursat, and Kampong Chhnang. The project will be in line with an urban development strategy for Pursat and Kampong Chhnang (for approval). The project is estimated at \$52.6 million, with a proposed \$37.0 million loan to be financed from ADB's Asian Development Fund resources and cofinancing from the Strategic Climate Fund (SCF) in the amount of \$5.0 million grant and \$5.0 million loan. The remaining \$5.6 million is estimated government and community counterpart financing.

## **3. Scope of Assignment**

73. The assignment includes development and implementation of project awareness activities, implementation of project output 3, and support in facilitating community understanding, support and partnership in the project.

74. Output 3, Community Mobilization and Environmental Improvements (CMEI), specifically aims to address the climate change and environmental needs of the urban poor and vulnerable in Kampong Chhnang and Pursat—making the project more inclusive by extending benefits from large infrastructure investments. It includes improved household sanitation for ID Poor 1 and 2 in the current municipality area; climate change and hygiene awareness and action; and community small-scale infrastructure improvements in pre-identified poor and vulnerable areas in each municipality. Small-scale infrastructure improvements will be prioritized by the communities and will be financed by the project (80%), national government (10%), and community (10%), net of taxes. The output will help extend project benefits to the poor and vulnerable groups. It will be implemented in partnership with an international nongovernmental organization (NGO).

75. The CMEI will help translate Project principles into community action. This includes support for community planning and prioritization, and provision of community-driven climate-resilient urban environmental infrastructure. The involvement of local communities in planning, decision-making and supervision of the works will encourage local solutions and greater accountability of the services delivered. It will help to create ownership and provide benefits to those often marginalized and vulnerable.

76. The output includes the following detailed sub-outputs and activities:

- (i) Household sanitation grants for IDPoor 1 and IDPoor 2 households within the defined municipality area). Any proposal that triggers safeguard categorization of A or B will not be eligible. This sub-output will be 100% financed by the project (or as otherwise agreed to in advance with ADB and the Government);
- (ii) Information, Education and Communication (IEC) activities to promote project awareness hygiene awareness, initiate behavioural change and disseminate climate change information to men and women. The project area for the IEC efforts will include sangkats in the existing municipal boundary and adjacent urban sangkats. This sub-output will be 100% financed by the project (or as otherwise agreed to in advance with ADB and the Government). It will generate information and opportunities for knowledge management to further strengthen the knowledge management aspects of the project; and,
- (iii) Small-scale infrastructure improvements in sangkats that are pre-identified by the project survey as being poor and vulnerable to poor urban environmental conditions (e.g., community sanitation, improved drainage with access roads, or community collection points for solid waste management). These components will connect directly with Output 1 and 2 investments to ensure that local communities are also direct beneficiaries. Communities residing in the urban sangkats of the existing municipal boundary area will be eligible for assistance. Proposal must be ADB safeguard categorization C for involuntary resettlement and environment and must benefit nonindigenous communities in order for it to qualify and be eligible for support. This sub-output will be 70% financed by the project, 20% by the government (include 10% taxes), and 10% by the community (or as otherwise agreed to in advance with ADB and the Government);

3. The sangkats that have been pre-identified for inclusion in the small-scale infrastructure improvements are listed in the Table below. Additional communities during implementation may be identified based on an in-depth needs assessment. The assessment and proposal will form part of the terms of reference of an international NGO, with experience in Cambodia, urban/environment/sanitation and community development. The NGO will be contracted for the implementation of this output.



**Table: Pre-identified Sangkhats for Output 3 (iii)**

Municipality	Village	Sangkat	No of Households (No. of People)	Pre-identified Need
Kampong Chhnang Municipality  (Total 7,928 households or 40,360 people. Covers 26 villages in 4 sangkats)	Chong Kaoh	Phsar Chhnang	352 (1,862 people)	<ul style="list-style-type: none"> <li>• Presence of vulnerable group: ethnic Cham</li> <li>• Top environmental issue identified by SES respondents is flooding, which coincides with the objectives of Output 1 of the Project.</li> <li>• Had specific request for small-scale infrastructure during project preparatory consultations (e.g., access road to mosque that they can use even during flood season) that is linked to Output 1 of the Project</li> </ul>
	Kandal	Phsar Chhnang	<ul style="list-style-type: none"> <li>• 211 (1,061 people)</li> <li>• According to Vietnamese: 685 HHs including them (approx. 3,425 people)</li> </ul>	<ul style="list-style-type: none"> <li>• Presence of highly vulnerable group -- ethnic Vietnamese<sup>23</sup></li> <li>• Relatively high percentage of poor HHs (36%) identified by the SES during project preparation.</li> </ul>
	Samroang	Phsar Chhnang	419 (2,188 people)	Highest percentage of poor among villages covered in the SES (38% of respondents are poor)
Pursat Municipality  (Total 13,314 households or 63,773 people. Covers 66 villages in 7 sangkats)	Kbal Hong	Pteah Prey	220 (1,013 people)	<ul style="list-style-type: none"> <li>• Highest percentage of poor among villages covered in the SES (45% of respondents are poor)</li> <li>• Top environmental issue identified by SES respondents is air pollution linked with garbage burning, which coincides with the objectives of Output 2 of the Project.</li> </ul>
	Kaoh	Lolork Sar	219 (980 people)	Relatively high percentage of poor HHs (36%) identified
	Tuol Mkak	Roleap	301 (1,432 people)	<ul style="list-style-type: none"> <li>• Relatively high percentage of poor HHs (27%) identified</li> <li>• Top environmental issue identified by SES Respondents is flooding, which coincides with the objectives of Output 2 of the Project.</li> </ul>

Note: Based on existing municipal boundaries for Kampong Chhnang and Pursat.  
Source: Asian Development Bank and Executing Agency.

#### 4. Time Schedule and Resources

77. The Project implementation period is seven years and the international NGO assignment is for six years months. However, interested organizations should indicate how long they will need in each position to work to achieve the successful completion of the assignment during the project duration. The NGO will be funded under ADB's SCF grant.

<sup>23</sup> ADB's Tonle Sap Basin Strategy (2005) identifies the Vietnamese and Muslim Cham as the ethnic minorities present in the region. It further states that ethnic minorities are disadvantaged due to insufficient representation at management and legislative levels; with the Vietnamese floating village residents experiencing additional deprivation due their language barriers, their classification as immigrants, and their lack of property rights. PPTA activities including FGDs have supported this information.

## 5. Expertise Required

78. The NGO recruited will work with the Government in developing and delivering project, hygiene and environmental sanitation awareness information. It will assist in implementing Output 3 of the project, specifically community mobilization and development activities, ranking of community priorities in urban environmental improvements, and preparation of a simplified feasibility study in coordination with the project implementation unit (PIU) and the project management and implementation support (PMIS) consultant team. The PIU and PMIS consultants (together with PMU) will be responsible for seeking clearance from the EA and ADB on the feasibility studies for small-scale community infrastructure, preparing bid documents and evaluation reports, monitoring the contracts, and supervising the construction. The NGO will facilitate flow of project information, mobilize and the community, and help the government generate project support and reach resolution on any grievances in a prompt manner. The NGO will work as a project partner with the Government, ADB and consultants.

79. The interested NGO will supply and assign coordination personal and national teams to the PIU in Kampong Chhnang and Pursat either from its own resources or in partnership with a specialized national NGO. Interested NGOs should determine the number and nature of experts they will require to achieve the objectives of the contract. Each NGO team placed in Kampong Chhnang and Pursat shall include expertise in climate change, technical/engineering, gender, hygiene, and community development. . Each team in each province shall comprise of at least 30% women. The technical proposal shall include composition of the proposed NGO team for each province and the comparative advantage it has in working in each province, especially within the local administrative and community structures. For instance, ongoing or completed projects with the local government (e.g., PDPWT or municipality), and/or expertise or experience working with any of the vulnerable groups identified in the table, and/or synergies with other development partner or NGO projects in the municipality. Submitted proposals will be evaluated against these specific requirements and criteria.

80. ADB requires the following two full-time key experts:

- (i) A community development manager/ team leader, and
- (ii) A project administer, and

81. The quality of the facilitation and mobilization skills of the NGO teams will have a significant influence on how beneficiary householders and communities are able to internalize the value of collective action for long-term maintenance of household sanitation and small-scale infrastructure environmental improvements. The NGO teams shall generate self-confidence and team building amongst community members for collective benefit. NGO teams will act as catalyst and facilitator to beneficiary households and communities. The NGO teams will work closely and in coordination with the PIU and the PMIS in day-to-day project implementation activities. They will provide specific inputs, including information on project progress for consolidation and inclusion into the overall progress report. The national gender and development specialist from the PMIS consultant team (Package I) will also assist the NGO as needed in the area of gender mainstreaming.

82. The NGO Team in each province will add value by facilitating the following community awareness tasks:

- (i) community mobilization to enhance the quality of project implementation;

- (ii) awareness raising on the importance of climate change, health and hygiene in urban areas; and
- (iii) awareness raising to enhance the quality of improved hygiene leading to the improved health of communities (i.e., behavior-change efforts will focus on (a) stopping open defecation, encouraging proper use and maintenance of household latrines, and promoting personal hygiene practices such as hand washing, clean bodies, and menstrual hygiene management).

83. The NGO team shall have experience in participatory rural appraisal methodology as communities will be fully involved in (i) the conduct of small-scale infrastructure feasibility studies; and (ii) prioritization and selection of small-scale urban environmental improvements based on informed choice. These informed choices will take into consideration: (i) beneficiary needs; (ii) cost effectiveness; (iii) social equity; (iv) land acquisition and environmental issues; and (v) ease and costs of operation and maintenance. Small-scale improvements shall correspond to the needs and wishes of the community and household, with a realistic assessment of the beneficiary's abilities to finance and manage the facilities.

84. The PMU will consult with the PIU Manager and Deputy Project Manager in Kampong Chhnang and Pursat during recruitment of the NGO. The NGO teams will work with assigned PMU and PIU staff to help ensure successful implementation of the output. The PIUs will verify the performance of NGO staff prior to progress payments made by the PMU. The PMU will be responsible for the overall recruitment and management of the international NGO.

85. The Community Development Manager/Team Leader will be an individual with regional and country-specific experience who shall have the following minimum qualifications:

- (i) A minimum of 8 years' experience overseeing and implementing community mobilization projects in urban development, sanitation and hygiene; preference will be given to candidates with previous demonstrated experience in climate change activities working around the Tonle Sap in Cambodia.
- (ii) Background in anthropological or sociological training to be able to understand the vulnerability context of the nonindigenous people in Kampong Chhnang and Pursat and their livelihood dependence on the Tonle Sap;
- (iii) Management experience of at least 3 years, with demonstrated ability to supervise a team and project staff;
- (iv) Familiarity with community development, sanitation and hygiene promotion and gender mainstreaming of projects in communities;
- (v) Ability to work with multiple stakeholders, including local governments, communities, civil society organizations, government, private sector and ADB;
- (vi) Excellent English language skills, including ability to produce regular high quality written reports, power-point presentations, and project updates;
- (vii) Responsible for developing and implementing a specific monitoring and evaluation system for CMEI output and activities.
- (viii) The Team Leader will be responsible for providing progress updates to the PMU for inclusion into the quarterly project progress reports, project liquidation of advances with supporting documentation, including the coordination and timely submission of feasibility reports and workshop and training records (disaggregated by sex and with specific outcomes listed).

86. The Project Administrator will be in charge of all administrative responsibilities of the NGO's assignment for the project, and will ensure all documentation required by the PMU and ADB is kept and is in accordance with ADB's procedures. This includes both financial

documentation and administrative matters. The Project Administrator will be an individual with the following minimum qualifications:

- (i) A minimum of 3 years' experience in accounting and record keeping for development projects;
- (ii) An understanding of the challenges of recordkeeping at the subnational governments and strategies for adapting to local situations while keeping within ADB regulations. This will be particularly important, given the proposed cost-sharing proposal for small-scale infrastructure investments;
- (iii) Have a willingness to review other ADB projects in Cambodia and in the region on how cost-sharing arrangements have been managed following good governance principles.
- (iv) Excellent computer skills (MS WORD and EXCEL);
- (v) Strong English language skills, with demonstrated ability to prepare financial reports; and
- (vi) Familiarity with ADB or World Bank regulations is an advantage.

87. In addition to the above required key experts, the proposing NGO should also include in their technical proposal, in the Personnel Workplan and in their financial proposal, all other "non-key experts" required in accordance with their proposed Approach and Methodology. The proposing NGO shall also determine and indicate the number of person-months for which key or non-key expert will be required.

88. All experts engaged under the contract, whether key or non-key experts, must be citizens of one of the ADB member countries.

## **6. Supervision**

89. Interested NGOs should indicate the management structure proposed of the team. The Community Development Manager/Team Leader will be under the supervision of the PMU Project Director (or designated to the PMU project manager). The Community Development Manager/Team Leader will keep the supervisor informed regularly by email of the progress in implementation of this assignment, identify any issues or possible delays to the accomplishment of this assignment, and propose and implement solutions to address such issues or possible delays. The Community Development Manager/Team Leader will support the supervisor in promoting and sharing information about the assignment and its implementation through preparation of presentations, progress reports, or data information.

## **7. Other Requirements**

90. By the end of month 2 of the assignment, the Team Leader will submit an inception report, detailing the progress of the assignment in relation to the overall project. The assignment should not be implemented in a vacuum; instead, it should be closely coordinated and timed with the overall project implementation. The inception report should indicate any proposed changes to the implementing arrangements, additional communities in the municipality for support, or changed circumstances affecting the project. It should also include a format / outline for future quarterly and annual cumulative assignment progress reports, with an agreed timeline for submission to the PMU and ADB.

91. The Team Leader shall also include in the inception report a proposed monitoring and evaluation system specifically for CMEI output and activities. Indicators and data shall be disaggregated by sex and a summary shall be provided to the PMU for inclusion in each

quarterly project progress report. A report with approach and methodology shall be provided in the technical proposal. It shall be confirmed with submission of the inception report, a progress update at project mid-term, and a final report at project end.

92. The draft final report is due 3 months before completion of the assignment in a format agreed to with the PMU Project Director and ADB in advance. The final report will incorporate comments from the Government and ADB, and shall be submitted in time for it to be attached to the project completion report, submitted by the Government to ADB.

## 8. Facilities to be provided by ADB and other Administrative Matters

93. The NGO team members will be field-based, highly mobile and will visit the different communities along the project sites in accordance with the specific needs. The NGO team members will establish an office in each province for daily activities. The Team Leader and Project Administrator will be required to work closely with the PMU Project Director. They shall be based in Phnom Penh and may work from the interested NGO office.

## 9. Travel and Accommodation

94. The NGO team members are expected to arrange and pay their own accommodation and travel as agreed to in advance with the PMU project director, in consultation with ADB. Reimbursement will be subject to and in line with ADB's terms and conditions of the contract.

## 10. Preparation of the Proposal

95. Interested NGOs are requested to prepare a detailed description of how they propose to deliver on the specific outputs of the contract in the section of their proposal called "Approach and Methodology." In this narrative, bidding NGOs shall be explicit in explaining **how** they will achieve the outputs, and include any information on their existing activities upon which they may eventually build, as well as the detail of what staff will comprise the NGO teams. The suggested page limit of this section is 20 pages. It is strongly recommended that the interested NGO meet and discuss the assignment with the PMU and undertake a reconnaissance visit to Kampong Chhnang and Pursat; any such meetings or visits should be reflected in the proposal.

96. Interested NGOs **must also describe** their experience in working with the Tonle Sap communities, in particular the Vietnamese, the Cham, the floating communities and the poor in Kampong Chhnang and Pursat. Experience working with the same groups in other Tonle Sap provinces will also be considered. Interested NGOs shall effectively communicate the vulnerable context, specific considerations (if any) and the importance of environmental and hygiene awareness activities amongst these groups.

97. Proposals will be evaluated based on the approach to meet the above consultancy requirements, desired NGO team expertise, necessary tasks and ensure coordination with the other consulting packages, especially Package I (project management and implementation support consultants) and Package II (climate change and urban development).

98. One curriculum vitae (CV) **only** must be submitted for each key and non-key expert included in the proposal. Only the CVs of key experts (community development manager/team leader and the project administrator) will be scored as part of the technical evaluation of proposals. The CVs of non-key experts will not be scored; however, the EA and ADB will review and individually approve/reject each CV for each position in the proposal.

99. All positions under the contract, key as much as non-key experts, **must** be included and budgeted for in the financial proposal in accordance with the person-months allocation required for each as defined by the proposing NGO.

### K. Monitoring Framework of Climate Resilience Measures

<b>Key Results and Indicators for Success (consistent with PPCR results framework):</b>	
<b>Results</b>	<b>Indicators</b>
(a) Increased resilience of households, communities, businesses, sectors and society to climate variability and climate change	<p>INDICATOR A1.3: Numbers of people supported by the PPCR to cope with effects of climate change represented by the following outputs:</p> <p>Estimated 20,000 households (90,000 persons) have access to climate resilient infrastructure (baseline: 0) resulting from the following outputs:</p> <ul style="list-style-type: none"> <li>• At least 15.1 km of embankment and road improved and constructed to a 1:50 year flood levels in Kampong Chhnang;</li> <li>• At least 9.89 km of drains are improved and extended in Pursat;</li> <li>• A landfill is developed in Pursat and in Kampong Chhnang, and household collection efficiency increased to at least 60%;</li> <li>• At least 1.5 ha of the existing wastewater stabilization pond facility (anaerobic and facultative ponds) is rehabilitated in Pursat;</li> <li>• At least 200 mm of riverbank on the Pursat river is reinforced;</li> <li>• Approximately 8 gabion groynes are constructed</li> <li>• on the Pursat river in two locations at 30 m intervals;</li> <li>• At least 5,200 ID poor 1 and 2 households in Kampong Chhnang and Pursat have pour-flush toilets; and</li> <li>• At least 2,000 poor and vulnerable households benefit from community driven climate resilience infrastructure in Kampong Chhnang and Pursat.</li> </ul>

<p>(b) Strengthened climate responsive development planning</p>	<p>INDICATOR A2.1: Degree of integration of climate change in national, including sector planning, resulting from strengthened institutional capacity, effective sector coordination, enhanced awareness and climate resilient development planning resulting from the following outputs:</p> <ul style="list-style-type: none"> <li>• A Plan for Climate Change Adaptation in Urban Areas around the Tonle Sap is adopted by Tonle Sap provinces;</li> <li>• A capacity development program is adopted by each municipality;</li> <li>• Revised building codes with refined latrine standards are developed and adopted by Tonle Sap provinces;</li> <li>• MPWT chairs at least two coordination meetings per year;</li> <li>• Semi-autonomous Urban Services Unit in Kampong Chhnang and Pursat municipalities are established and become operational (30% of staff are women);</li> <li>• Development of sub-regional Tonle Sap Urban Areas Development Framework;</li> <li>• Support to MPWT to convene national urban development task force meetings with other ministries and development partners in the urban sector (about twice per year), which would include topics of climate change resilience;</li> <li>• Initial support for establishment of urban service units (or special operating agencies) for improved delivery and management of decentralized urban services;</li> <li>• Implementation of the Tonle Sap Urban Areas Development Framework in partnership with provincial and municipal governments around the Tonle Sap through a consultation program and a plan for climate change adaptation in urban areas; and</li> <li>• Water-related cross-cutting issues such as solid waste management, wastewater management and flood risk management incorporated into O&amp;M plans.</li> </ul>
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(c) Strengthened adaptive capacities	<p>INDICATOR B1: Extent to which vulnerable households, communities businesses and public sector services use improved PPCR supported tools, instruments, strategies, activities to respond to Climate Variability and Climate Change, contributed through the following outputs</p> <ul style="list-style-type: none"> <li>• Implementation of the capacity development plan in all aspects of climate resilient project design and implementation, including monitoring, evaluation and reporting, extending to all municipalities;</li> <li>• Enhanced climate change and hygiene awareness and action;</li> <li>• Improved household sanitation for IDPoor 1 and 2 in the current municipality area of Kampong Chhnang and Pursat;</li> <li>• Improved building codes in provincial towns around the Tonle Sap to reflect key climate resilience features, including appropriate sanitation; and</li> <li>• Implementation of the Tonle Sap Urban Areas Development Framework in partnership with provincial and municipal governments around the Tonle Sap through a consultation program and a plan for climate change adaptation in urban areas.</li> </ul>
(d) Improved institutional framework in place	<p>INDICATOR B2: Evidence of strengthened government capacity and coordination mechanism to mainstream climate resilience provided through the following outputs:</p> <ul style="list-style-type: none"> <li>• Support to MPWT to convene national urban development task force meetings with other ministries and development partners in the urban sector (about twice per year), which would include topics on climate change resilience;</li> <li>• Initial support for establishment of urban service units (or special operating agencies) for improved delivery and management of decentralized urban services; and</li> <li>• Implementation of the Tonle Sap Urban Areas Development Framework in partnership with provincial and municipal governments around the Tonle Sap through a consultation program and a plan for climate change adaptation in urban areas;</li> </ul>



<p>(e) Climate responsive investment approaches identified and implemented.</p>	<p>INDICATOR B5: Quality of and extent to which climate responsive instruments/ investment models are developed and tested will be demonstrated by the following outputs:</p> <ul style="list-style-type: none"> <li>• Community small-scale infrastructure improvements in pre-identified poor and vulnerable areas in each municipality designed and implemented;</li> <li>• Potential impacts of climate change and/or natural hazards on the project identified and integrated as part of project design (e.g., flood risk management); and</li> <li>• Development and dissemination of a number of knowledge products including: integrated urban environmental O&amp;M manuals, standard operating procedures for community small-scale infrastructure environmental improvements, development of a plan for climate change adaptation in urban areas, and review and expansion of existing strategies (e.g., flood mitigation, stormwater drainage, solid waste management, and disaster risk management).</li> </ul>
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Source: Asian Development Bank