**A REVIEW OF FLOOD PROTECTION INVESTMENT PROJECTS FINANCED BY THE WORLD BANK**

***Prepared by the Water Resources and Watershed Management Thematic Group[[1]](#footnote-1)***

**World Bank Lending in Flood Protection**

Between FY87 and end of calendar year 2011, the World Bank had approved 188 projects (only investment operations) that included at least one activity related to flood protection. Total funding for these projects, including IBRD loans, IDA credits and grants, amounted US$14.3 billion, out of which direct World Bank support to flood protection was about US$4.4 billion or 30 percent of overall commitments. Support for flood protected experienced the highest level ever in FY11, in term of both number of projects as well as commitment amounts (Figure 1). Bank financing participation for all flood protection activities is estimated at 49 percent of activities’ costs.

**Figure 1: Approved Flood Protection Projects by Fiscal Year**

**Source:** Comprehensive database on flood protection projects prepared on the basis of the data contained in the Water Portal, accessed on January 6, 2012.

**Note:** \* It only includes projects approved by end of calendar year 2011.

The flood protection portfolio is characterized by a sharp decline in commitments (in current prices) during the period FY01-03, reaching the lowest point (about US$33 million) in FY03. The period FY07-11 saw an increase in commitments for flood protection and the number of projects presented to the Board more than any other previous quinquennium (Figure 2). The increase in commitment was driven by two large projects: the FY07 Odra River Basin Flood Protection Project in Poland (with US$160 million commitment to flood protection) and the FY11 Padma Multipurpose Bridge Project in Bangladesh (with US$324 million commitment to flood protection).

**Figure 2: World Bank Support to Flood Protection by Quinquennium**

**Source:** Comprehensive database on flood protection projects prepared on the basis of the data contained in the Water Portal, accessed on January 6, 2012.

**Regional Distribution of Flood Protection Commitments**

Overall Bank commitments for flood protection made between FY87 and end-December 2011 are dominated by projects in three regions: East Asia and Pacific with 34 percent of total commitment, South Asia with 25 percent and Latin America and Caribbean with 19 percent (Figure 3). A closer analysis indicates that 60 projects in 9 countries, led by China, account for nearly 80 percent of the overall Bank commitment for flood protection (Figure 4).

**Figure 3: Overall Bank Commitments for Flood Protection by Region**

**Source:** Comprehensive database on flood protection projects prepared on the basis of the data contained in the Water Portal, accessed on January 6, 2012.

**Figure 4: Bank Commitments for Flood Protection by Country**

**Source:** Comprehensive database on flood protection projects prepared on the basis of the data contained in the Water Portal, accessed on January 6, 2012.

**Note:** It only accounts for 78 percent of the overall Bank commitment. It shows countries with more than US$100 million commitments for flood protection. The various colors in the bars indicate commitments for flood protection by project. In the case of China for example, there are 19 projects supporting flood protection. In the case of Bangladesh, the number of projects amounts to 13.

**Dedicated and Non-Dedicated Flood Protection Projects**

Overall, the flood protection portfolio includes dedicated and non-dedicated flood protection projects. In this review, a dedicated flood protection project is defined as the one that meets the following two criteria: at least 40 percent of its commitment is allocated to flood protection; and the greatest proportion of its commitment is allocated to flood protection. Seventy seven projects or about 41 percent of the approved projects fit the definition of dedicated projects. The number of dedicated projects experienced a considerable increase from FY04 onwards, reaching the pick of 12 projects in FY11 (Figure 5).

**Figure 5: Number of Dedicated and Non-Dedicated Approved Flood Protection Projects by Fiscal Year**

**Source:** Comprehensive database on flood protection projects prepared on the basis of the data contained in the Water Portal, accessed on January 6, 2012.

**Regional Distribution of Approved Dedicated Flood Protection Projects**

Data from approved dedicated flood protection projects approved between FY87 and end-December 2011 reveal that three-quarters of Bank commitment is concentrated in East Asia and Pacific, South Asia and Latin America and the Caribbean, with East Asia and the Pacific committing far more than any other region, about 40 percent or US$1.1 billion. Support for flood protection under these dedicated projects represents 70 percent of overall Bank commitments. Bank financing participation in these projects is estimated at 45 percent of flood protection activities’ costs. Both East Asia and the Pacific Region and South Asia tend to lend more on average per project at US$72.7 million and US$54.1 million, respectively (Figure 6).

**Figure 6: Total and Average World Bank Commitment in Dedicated Flood Protection Projects by Region**

**Source:** Comprehensive database on flood protection projects prepared on the basis of the data contained in the Water Portal, accessed on January 6, 2012.

The region with the largest number of dedicated (and approved) flood protection projects is Latin American and Caribbean (21), follow-up by East Asian and Pacific (15) and Africa (14) (Figure 7). China has the largest number of dedicated projects (7). Twenty-three dedicated projects in China (7), Bangladesh (6), Argentina (4), Poland (1), India (3) and Iran (2) account for more than three-quarters of the World Bank commitments for flood protection (Table 1).

The dedicated flood protection projects approved between FY87 and end-calendar year 2011 are spread over 6 Sector Boards. The Urban Sector Board oversees more dedicated flood protection projects (38 percent) than any other sector board, which represents 16 percent of the volume of commitments. It is followed by the Agriculture and Rural Development Sector Board, which oversees 25 percent of the projects and 40 percent of the commitments, and the Water Sector Board, which oversees 21 percent of the projects and 41 percent of the commitments (Figures 8 and 9).

**Figure 7: Number of Dedicated Flood Protection Projects by Region**

**Source:** Comprehensive database on flood protection projects prepared on the basis of the data contained in the Water Portal, accessed on January 6, 2012.

**Figure 8: Number of Dedicated Flood Protection Projects by Sector Board**

**Source:** Comprehensive database on flood protection projects prepared on the basis of the data contained in the Water Portal, accessed on January 6, 2012.

**Figure 9: Volume of Commitment Dedicated Flood Protection Projects by Sector Board**

**Source:** Comprehensive database on flood protection projects prepared on the basis of the data contained in the Water Portal, accessed on January 6, 2012.

**The Flood Protection Pipeline**

The FY12-13 pipeline includes 33 projects with at least one activity related to flood protection, with a total expected funding of US$1.8 billion. About 50 percent or US$0.88 billion of World Bank commitments are expected to finance flood protection activities. Although number of projects and commitments for flood protection for FY12-13 are expected to be lower than those for FY11, lending prospects in flood protection are showing a substantial increase over the period FY08-10 (Figure 10).

**Figure 10: Flood Protection Projects by Fiscal Year**

**Source:** Comprehensive database on flood protection projects prepared on the basis of the data contained in the Water Portal, accessed on January 6, 2012.

More than half of these projects (17) are considered dedicated flood protection projects, and account for 86 percent or US$0.76 billion of all expected commitments for flood protection. This represents 76 percent of expected commitments under the dedicated projects. The pipeline shows that 6 projects will go to the Board in FY12 and 11 in FY13 (Table 2). The Urban Sector Board is expected to oversee 53 percent of the dedicated flood protection projects and 66 percent of the commitments. This is followed by the Water Sector Board, which is expected to oversee 23 percent of the projects and 21 percent of the commitments.

**Table 1: World Bank Approved Dedicated Flood Protection Projects Since FY87**

| **Country** | **FY** | **Project Name** | **Total Cost**  **US$ million** | **Flood Protection Cost** | | **World Bank Commitment (US$ million)** | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **%** | **US$ million** | **IBRD** | **IDA** | **Grant** | **Total** | **For Flood Control** |
| **Africa** | | | | | | | | | | |
| Africa | 2007 | Eastern Nile Flood Prevention and Early Warning Project Phase 1 | 4.1 | 50 | 2.0 | - | - | 3.5 | 3.5 | 1.7 |
| 2012 | Strengthening ICPAC as a regional centre of excellence for disaster risk reduction | 0.4 | 50 | 0.2 | - | - | 0.4 | 0.4 | 0.2 |
| Benin | 2008 | Second Decentralized City Management Project - Additional Financing | 46.6 | 70 | 32.6 | - | 40.0 | - | 40.0 | 28.0 |
| Burkina Faso | 2011 | Maintreaming Disaster Reduction (GFDRR) | 1.4 | 100 | 1.4 | - | - | 1.4 | 1.4 | 1.4 |
| Central African Republic | 2011 | Emergency Urban Infrastructure Rehabilitation and Maintenance Project - Additional Financing | 23.9 | 49 | 11.7 | - | 23.9 | - | 23.9 | 11.7 |
| Ethiopia | 2009 | Flood Risks Prevention Project | 0.3 | 100 | 0.3 | - | - | 0.3 | 0.3 | 0.3 |
| Madagascar | 1990 | Antananarivo Plain Development | 68.6 | 40 | 27.4 | - | 30.5 | - | 30.5 | 12.2 |
| Mali | 2011 | Maintreaming Disaster Reduction (GFDRR) | 1.4 | 100 | 1.4 | - | - | 1.4 | 1.4 | 1.4 |
| Sao Tome and Principe | 2011 | Adaptation to Climate Change | 4.1 | 80 | 3.3 | - | - | 4.2 | 4.2 | 3.3 |
| Senegal | 2012 | Disaster Risk Management and Climate Change Adaptation Project | 5.0 | 100 | 5.0 | - | - | 5.0 | 5.0 | 5.0 |
| Seychelles | 2008 | National Disaster Preparedness and Response Project | 2.4 | 50 | 1.2 | - | - | 0.9 | 0.9 | 0.5 |
| Togo | 2009 | Emergency Infrastructure Rehabilitation and Energy Project | 26.8 | 40 | 10.7 | - | 25.0 | - | 25.0 | 10.0 |
| 2011 | Emergency Infrastructure Rehabilitation and Energy Project - Additional Financing | 15.0 | 86 | 12.9 | - | 15.0 | - | 15.0 | 12.9 |
| Uganda | 1999 | Nakivubo Channel Rehabilitation Project | 22.4 | 79 | 17.7 | - | 22.4 | - | 22.4 | 17.7 |
| **East Asia and Pacific** | | | | | | | | | | |
| China | 2008 | China Bengbu Integrated Environment Improvement Project | 224.0 | 50 | 112.0 | 100.0 | - | - | 100.0 | 50.0 |
| 2011 | Huai River Basin Flood Management and Drainage Improvement | 597.4 | 65 | 388.3 | 200.0 | - | - | 200.0 | 130.0 |
| 2005 | Hunan Urban Development Project | 364.2 | 45 | 163.9 | 172.0 | - | - | 172.0 | 77.4 |
| 1993 | Taihu Basin Flood Control Project | 497.3 | 100 | 497.3 | 100.0 | 100.0 | - | 200.0 | 200.0 |
| 1994 | Xiaolangdi Multipurpose Project | 2,294.7 | 50 | 1,147.4 | 460.0 | - | - | 460.0 | 230.0 |
| 2009 | Xining Flood and Watershed Management | 188.0 | 60 | 112.8 | 100.0 | - | - | 100.0 | 60.0 |
| 2000 | Yangtze Dike Strengthening Project | 545.5 | 97 | 529.1 | 210.0 | - | - | 210.0 | 203.7 |
| East Asia and Pacific | 2011 | Building Community Resilience in EAP (GFDRR) | 0.2 | 50 | 0.1 | - | - | 0.2 | 0.2 | 0.1 |
| Fiji | 2010 | Integrated Flood Management - Nadi Basin Pilot | 1.4 | 80 | 1.1 | - | - | 0.8 | 0.8 | 0.7 |
| Indonesia | 2006 | Emergency Rehabilitation of Drainage and Flood Protection Systems in Banda Ache | 4.5 | 80 | 3.6 | - | - | 4.5 | 4.5 | 3.6 |
| 2009 | TA for Jakarta Flood Mitigation | 5.0 | 50 | 2.5 | - | - | 5.0 | 5.0 | 2.5 |
| Malaysia | 1987 | Western Johore Agricultural Development Project (02) | 148.3 | 62 | 91.9 | 55.0 | - | - | 55.0 | 34.1 |
| Samoa | 2004 | Cyclone Emergency Recovery Project | 6.0 | 75 | 4.5 | - | 4.5 | - | 4.5 | 3.4 |
| Vietnam | 2006 | Natural Disaster Risk Management Project | 102.5 | 70 | 71.8 | - | 86.0 | - | 86.0 | 60.2 |
| 1999 | Three Cities Sanitation Project | 119.5 | 43 | 51.4 | - | 80.5 | - | 80.5 | 34.6 |
| **Europe and Central Asia** | | | | | | | | | | |
| Albania | 2008 | Disaster Risk Mitigation and Adaptation Project | 10.2 | 43 | 4.4 | 3.0 | 6.2 | - | 9.2 | 3.9 |
| Central Asia | 2011 | Central Asia Hydrometeorology Modernization Project | 27.7 | 66 | 18.3 | - | 20.7 | - | 20.7 | 13.7 |
| Croatia | 1999 | Kopacki Rit Wetlands Management Project | 0.8 | 60 | 0.5 | - | - | 0.8 | 0.8 | 0.5 |
| 1998 | Reconstruction Project for Eastern Slavonia, Baranja and Western Srijem | 50.0 | 68 | 34.0 | 40.6 | - | - | 40.6 | 27.6 |
| Cyprus | 1988 | Southern Conveyor Project (02) | 164.5 | 94 | 154.7 | 30.0 | - | - | 30.0 | 28.2 |
| Georgia | 2005 | Irrigation and Drainage Community Development Project Additional Financing | 16.1 | 65 | 10.5 | - | 13.0 | - | 13.0 | 8.5 |
| Kyrgyz Republic | 1999 | Flood Emergency Project | 14.1 | 69 | 9.7 | - | 10.0 | - | 10.0 | 6.9 |
| 2011 | Coordination of Emergency Situations | 1.5 | 100 | 1.5 | - | - | 1.5 | 1.5 | 1.5 |
| Poland | 2007 | Odra River Basin Flood Protection | 489.0 | 87 | 425.4 | 184.0 | - | - | 184.0 | 160.1 |
| Romania | 2004 | Hazard Risk Mitigation & Emergency Preparedness Project | 196.7 | 50 | 98.3 | 150.0 | - | - | 150.0 | 75.0 |
| Serbia | 2007 | Serbia Irrigation and Drainage Rehabilitation Project Additional Financing | 62.5 | 90 | 56.3 | 49.4 | - | - | 49.4 | 44.4 |
| **Latin America and Caribbean** | | | | | | | | | | |
| Argentina | 2006 | Argentina - Urban Flood Prevention and Drainage APL 2 | 91.6 | 70 | 64.1 | 70.0 | - | - | 70.0 | 49.0 |
| 1997 | Flood Protection Project | 420.0 | 85 | 357.0 | 200.0 | - | - | 200.0 | 170.0 |
| 1993 | Flood Rehabilitation Project | 270.0 | 40 | 108.0 | - | - | - | - | - |
| 2005 | Urban Flood Prevention and Drainage APL1 | 190.0 | 94 | 178.6 | 130.0 | - | - | 130.0 | 122.2 |
| Brazil | 2009 | BR Municipal APL: Sao Luis Enhancing Municipal Governance and Quality of Life Project | 59.4 | 52 | 30.9 | 35.6 | - | - | 35.6 | 18.5 |
| 2007 | BR Municipal APL1: Uberaba | 28.8 | 41 | 11.8 | 17.3 | - | - | 17.3 | 7.1 |
| Central America | 2011 | Central America DRR & CCA Program | 0.7 | 100 | 0.7 | - | - | 0.7 | 0.7 | 0.7 |
| 2009 | Central America Mitch +10 Report and Summit | 0.2 | 100 | 0.2 | - | - | 0.2 | 0.2 | 0.2 |
| Costa Rica | 2011 | Adaptive Natural Resources Management will Bolster Cabécar Communities | 0.2 | 100 | 0.2 | - | - | 0.2 | 0.2 | 0.2 |
| 2010 | Costa Rica Pilot on Early Warning Systems for Hydrometeorological Hazards | 0.3 | 70 | 0.2 | - | - | 0.3 | 0.3 | 0.2 |
| Dominica | 1999 | Dominica Emergency Recovery & Disaster Management Project | 6.0 | 68 | 4.1 | 2.5 | 1.8 | - | 4.3 | 2.9 |
| Ecuador | 2008 | Disaster Risk Reduction Program for the Municipalities of Quito | 1.0 | 100 | 1.0 | - | - | 1.0 | 1.0 | 1.0 |
| 1991 | Guayas Flood Control | 150.0 | 50 | 75.0 | 59.0 | - | - | 59.0 | 29.5 |
| Grenada | 2001 | Emergency Recovery & Disaster Management Project | 11.8 | 68 | 8.0 | 5.1 | 5.0 | - | 10.1 | 6.8 |
| Guyana | 2008 | Conservancy Adaptation Project | 5.0 | 97 | 4.9 | - | - | 3.8 | 3.8 | 3.7 |
| Haiti | 2012 | Disaster Risk Management and Reconstruction | 60.0 | 50 | 30.0 | - | 60.0 | - | 60.0 | 30.0 |
| Jamaica | 2010 | Community-based Landslide Risk Reduction (JSDF Grant) | 2.5 | 100 | 2.5 | - | - | 2.5 | 2.5 | 2.5 |
| OECS Countries | 2011 | Regional Disaster Vulnerability Reduction APL1 - Grenada and St. Vincent and the Grenadines | 53.1 | 68 | 36.1 | - | 20.9 | - | 20.9 | 14.2 |
| St. Lucia | 2009 | Disaster Management Project II - Additional Financing | 4.0 | 90 | 3.6 | - | 3.0 | - | 3.0 | 2.7 |
| 2004 | Disaster Management Project II | 8.9 | 60 | 5.3 | 3.7 | 3.8 | - | 7.5 | 4.5 |
| 1996 | Watershed and Environmental Management Project | 7.1 | 80 | 5.7 | 2.6 | 2.7 | - | 5.3 | 4.2 |
| **Middle East and North Africa** | | | | | | | | | | |
| Djibouti | 2007 | Flood Emergency Rehabilitation - Additional Grant | 2.0 | 40 | 0.8 | - | 2.0 | - | 2.0 | 0.8 |
| 2010 | Natural Disaster Risk Assessment and Monitoring System | 0.9 | 50 | 0.5 | - | - | 0.9 | 0.9 | 0.5 |
| Iran, Islamic Republic of | 1992 | Sistan River Flood Works Rehabilitation Project | 100.0 | 92 | 92.0 | 57.0 | - | - | 57.0 | 52.4 |
| 1992 | Tehran Drainage Project | 95.6 | 95 | 90.8 | 77.0 | - | - | 77.0 | 73.2 |
| Yemen, Republic of | 1990 | Taiz Flood Disaster Prevention & Municipal Development Project | 28.8 | 40 | 11.5 | - | 15.0 | - | 15.0 | 6.0 |
| 2002 | Taiz Municipal Development and Flood Protection Project | 50.0 | 74 | 37.0 |  | 45.2 |  | 45.2 | 33.4 |
| 2008 | Taiz Municipal Development and Flood Protection Project | 22.1 | 52 | 11.5 | - | 20.0 | - | 20.0 | 10.4 |
| **South Asia** | | | | | | | | | | |
| Bangladesh | 1996 | Coastal Embankment Rehabilitation | 87.8 | 85 | 74.6 | - | 53.0 | - | 53.0 | 45.1 |
| 1999 | Coastal Embankment Rehabilitation - Additional Financing | 16.5 | 58 | 9.6 | - | 16.5 | - | 16.5 | 9.6 |
| 2009 | Dhaka Water Supply and Sanitation Project | 165.7 | 51 | 84.5 | - | 149.0 | - | 149.0 | 76.0 |
| 1999 | River Bank Protection Project - Additional Financing | 45.0 | 94 | 42.3 | - | 45.0 | - | 45.0 | 42.3 |
| 1996 | River Bank Protection Project | 192.0 | 93 | 178.6 | - | 121.9 | - | 121.9 | 113.4 |
| 2008 | Water Management Improvement Project | 136.7 | 64 | 87.5 | - | 102.3 | - | 102.3 | 65.4 |
| India | 2010 | Bihar Flood Management Information System Phase II | 1.5 | 100 | 1.5 | - | - | 1.5 | 1.5 | 1.5 |
| 1991 | Dam Safety Project | 196.8 | 87 | 171.2 | 23.0 | 130.0 | - | 153.0 | 133.1 |
| 2007 | Bihar Flood Management (DFID) | 0.6 | 100 | 0.6 | - | - | 0.6 | 0.6 | 0.6 |

**Table 2: World Bank Dedicated Flood Protection Projects in the FY12-13 Pipeline**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Country** | **FY** | **Project Name** | **Total Cost**  **US$ million** | **Flood Protection Cost** | | **World Bank Commitment (US$ million)** | | | | |
|  |  |  |  | **%** | **US$ million** | **IBRD** | **IDA** | **Grant** | **Total** | **For Flood Control** |
| **Africa** | | | | | | | | | | |
| Senegal | 2012 | Stormwater Mgt. and Climate Change Adaptation Project | 86.2 | 60 | 51.7 | - | 55.2 | - | 55.2 | 33.1 |
| Togo | 2012 | Emergency Infrastructure Rehabilitation & Energy Project - Additional Financing | 14.0 | 80 | 11.2 | - | 14.0 | - | 14.0 | 11.2 |
| **East Asia and Pacific** | | | | | | | | | | |
| China | 2013 | Guangxi Laibin Water and Environment | 160.0 | 50 | 80.0 | - | - | - | - | - |
|  | 2013 | Ma'anshan Cihu River Basin Improvement Project | 286.0 | 50 | 143.0 | 110.0 | - | - | 110.0 | 55.0 |
| Indonesia | 2012 | Jakarta Urgent Flood Mitigation Project | 189.9 | 100 | 189.9 | 139.6 | - | - | 139.6 | 139.6 |
| Mongolia | 2012 | Improving Disaster Risk Management in Mongolia | 2.7 | 50 | 1.4 | - | - | 2.7 | 2.7 | 1.4 |
| Pacific Islands | 2013 | Integrated Flood Management: Pilot Project, Nadi, Fiji | - | 100 | - | - | - | - | - | - |
| Solomon Islands | 2013 | Increasing Resilience to Climate Change and Natural Hazards. | 2.7 | 60 | 1.6 | - | - | - | - | - |
| Vanuatu | 2013 | Mainstreaming Disaster Risk Reduction. | 2.7 | 60 | 1.6 | - | - | - | - | - |
| **Europe and Central Asia** | | | | | | | | | | |
| Albania | 2013 | Water Resources and Irrigation Project | 40.0 | 50 | 20.0 | 40.0 | - | - | 40.0 | 20.0 |
| Kazakhstan | 2013 | Syr Darya Control and Northern Aral Sea Project - Phase II | 325.8 | 40 | 130.3 | 165.8 | - | - | 165.8 | 66.3 |
| **Latin America and Caribbean** | | | | | | | | | | |
| Brazil | 2013 | BR Federal DRM Project | 100.0 | 60 | 60.0 | 100.0 | - | - | 100.0 | 60.0 |
| Colombia | 2013 | Barranquilla Urban Flood Management | 250.0 | 100 | 250.0 | 150.0 | - | - | 150.0 | 150.0 |
| Dominica | 2013 | Third Phase Disaster Vuln.Reduction APL for Dominica | 15.0 | 50 | 7.5 | - | - | - | - | - |
| OECS Countries | 2013 | Second Phase Disaster Vulnerability Reduction APL for St. Lucia | 22.0 | 50 | 11.0 | - | 10.0 | - | 10.0 | 5.0 |
| **South Asia** | | | | | | | | | | |
| Sri Lanka | 2012 | Metro Colombo - Towards a Flood Resilient Urban Environment | 1.2 | 100 | 1.2 | - | - | - | - | - |
|  | 2012 | Metro Colombo Urban Development Project | 267.9 | 100 | 267.9 | 117.0 | 100.0 | - | 217.0 | 217.0 |

1. Prepared at the request of Thematic Group members in January 2012. For additional information about this note and the database, please contact Rita Cestti, Rcestti@worldbank.org. [↑](#footnote-ref-1)