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IMPLEMENTATION COMPLETION AND RESULTS REPORT

(IBRD-74360)

ON A

LOAN

IN THE AMOUNT OF EUR 140.1 MILLION

(US\$184 MILLION EQUIVALENT)

TO THE

REPUBLIC OF POLAND

FOR THE

ODRA RIVER BASIN FLOOD PROTECTION PROJECT

January 28, 2021

Water Global Practice
Europe and Central Asia Region

CURRENCY EQUIVALENTS
(Exchange Rate Effective June 30, 2020)

Currency Unit = Polish Zloty (PLN)

PLN 3.96 = US\$1

EUR 0.89 = US\$1

US\$1.12 = EUR 1

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AAD	Annual Average Damage
B/C	Benefit/Cost
CBA	Cost/Benefit Analysis
CEB	Council of Europe Development Bank
CPS	Country Partnership Strategy
CPF	Country Partnership Framework
EBRD	European Bank for Reconstruction and Development
EFA	Economic and Financial Analysis
EFRP	Emergency Flood Recovery Project
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
ERR	Economic Rate of Return
EU	European Union
FD	Floods Directive
GDP	Gross Domestic Product
GoP	Government of Poland
ICPO	International Commission for the Protection of the Odra
ICR	Implementation Completion and Results Report
IPE	International Panel of Experts
IRR	Internal Rate of Return
JASPERS	Joint Assistance to Support Projects in European Regions
M&E	Monitoring and Evaluation
NGO	Nongovernmental Organization
NDP	National Development Plan
O&M	Operation and Maintenance
ORFPP	Odra River Basin Flood Protection Project
ORB	Odra River Basin
OVFMP	Odra-Vistula Flood Management Project

PAD	Project Appraisal Document
PAP	Project-affected People
PCU	Project Coordination Unit
PGW WP	State Water Holding Polish Waters
PIU	Project Implementation Unit
RAP	Resettlement Action Plan
RDP	Raciborz Dry Polder
RPF	Resettlement Policy Framework
RZGW	Regional Authority for Water Management
SAI	Supreme Audit Office
TA	Technical Assistance
WFD	Water Framework Directive
WFS	Wrocław Floodway System
WP	With Project
WOP	Without Project

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DATA SHEET

BASIC INFORMATION

Product Information

Project ID	Project Name
P086768	ODRA RIVER BASIN FLOOD PROTECTION
Country	Financing Instrument
Poland	Investment Project Financing
Original EA Category	Revised EA Category
Full Assessment (A)	Full Assessment (A)

Organizations

Borrower	Implementing Agency
Republic of Poland	Ministry of Environment

Project Development Objective (PDO)

Original PDO

The main development objective of the Project is to protect the population in the ORB against loss of life and damage to property caused by severe flooding. This would be achieved by: (i) reducing the extreme flood peaks through storage in a dry polder on the Odra River just upstream of Raciborz town, enabling a reduction of the flood peak downstream of the reservoir and allowing better control of the operation of the river system; and (ii) by increasing the flood carrying capacity of the Odra River channels through and around Wrocław. The Project would protect more than 2.5 million people against flooding in several towns such as Raciborz, Kedzierzyn, Kozle, Krapkowice, Opole, Brzeg, Olawa and Wrocław, and settlements in the three voivodships of Śląskie, Opolskie and Dolnośląskie.



PDO as stated in the legal agreement

The objective of the Project is to protect the population in the Odra River Basin against loss of life and damage to property caused by severe flooding, particularly by: (i) reducing the extreme flood peaks through storage in a dry polder on the Odra River upstream of Raciborz town and thus enabling a reduction of the flood peak downstream of the reservoir and allowing better control of the operation of the river system; and (ii) increasing the flood carrying capacity of the Odra River channels through and around Wrocław.

FINANCING

	Original Amount (US\$)	Revised Amount (US\$)	Actual Disbursed (US\$)
World Bank Financing			
IBRD-74360	184,000,000	173,278,350	166,561,150
Total	184,000,000	173,278,350	166,561,150
Non-World Bank Financing			
Borrower/Recipient	30,000,000	239,400,000	239,400,000
EC: European Commission	130,000,000	382,650,000	382,650,000
Foreign Multilateral Institutions (unidentified)	145,000,000	229,960,000	229,960,000
Total	305,000,000	852,010,000	852,010,000
Total Project Cost	489,000,000	1,025,288,350	1,018,571,150

KEY DATES

Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
21-Mar-2007	09-Jul-2007	26-Sep-2011	30-Nov-2014	30-Jun-2020



RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US\$M)	Key Revisions
31-Jan-2014	77.52	Reallocation between Disbursement Categories Change in Disbursements Arrangements Change in Procurement
10-Jul-2014	94.96	Change in Loan Closing Date(s)
20-Oct-2017	154.19	Change in Results Framework Change in Loan Closing Date(s) Change in Implementation Schedule
16-Feb-2018	161.39	Reallocation between Disbursement Categories

KEY RATINGS

Outcome	Bank Performance	M&E Quality
Satisfactory	Satisfactory	Substantial

RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US\$M)
01	03-Aug-2007	Satisfactory	Satisfactory	0
02	29-May-2008	Satisfactory	Satisfactory	14.67
03	24-Oct-2008	Satisfactory	Moderately Unsatisfactory	14.67
04	04-Nov-2009	Satisfactory	Moderately Unsatisfactory	17.20
05	28-Jan-2010	Satisfactory	Moderately Satisfactory	17.20
06	29-Jun-2010	Satisfactory	Moderately Satisfactory	17.20
07	30-Apr-2011	Satisfactory	Moderately Satisfactory	20.50
08	27-Aug-2011	Satisfactory	Moderately Satisfactory	20.50
09	05-May-2012	Moderately Unsatisfactory	Moderately Unsatisfactory	26.38
10	25-Dec-2012	Moderately Unsatisfactory	Moderately Unsatisfactory	45.17
11	25-Jun-2013	Moderately Satisfactory	Moderately Satisfactory	65.20
12	05-Jan-2014	Moderately Satisfactory	Moderately Satisfactory	77.52



13	10-Jun-2014	Moderately Satisfactory	Moderately Satisfactory	94.96
14	22-Nov-2014	Moderately Satisfactory	Moderately Satisfactory	103.84
15	03-May-2015	Moderately Satisfactory	Moderately Satisfactory	136.83
16	25-Nov-2015	Moderately Satisfactory	Moderately Satisfactory	136.83
17	06-May-2016	Moderately Satisfactory	Moderately Satisfactory	136.83
18	18-Nov-2016	Moderately Unsatisfactory	Moderately Unsatisfactory	154.19
19	05-May-2017	Moderately Unsatisfactory	Moderately Unsatisfactory	154.19
20	07-Dec-2017	Moderately Satisfactory	Moderately Satisfactory	154.19
21	09-Jun-2018	Moderately Satisfactory	Moderately Satisfactory	161.39
22	11-Dec-2018	Moderately Satisfactory	Moderately Satisfactory	161.39
23	10-Jun-2019	Moderately Satisfactory	Moderately Satisfactory	167.55
24	17-Dec-2019	Satisfactory	Satisfactory	167.55
25	23-Jun-2020	Satisfactory	Satisfactory	167.55

SECTORS AND THEMES

Sectors

Major Sector/Sector (%)

Public Administration 19

Central Government (Central Agencies)	1
Sub-National Government	5
Other Public Administration	13

Transportation 20

Rural and Inter-Urban Roads	5
Railways	2
Other Transportation	13



Water, Sanitation and Waste Management	61	
Other Water Supply, Sanitation and Waste Management	61	
Themes		
Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)	
Finance	13	
Finance for Development	13	
Disaster Risk Finance	13	
Urban and Rural Development	39	
Disaster Risk Management	39	
Disaster Response and Recovery	13	
Disaster Risk Reduction	13	
Disaster Preparedness	13	
Environment and Natural Resource Management	50	
Environmental policies and institutions	25	
Water Resource Management	25	
Water Institutions, Policies and Reform	25	
ADM STAFF		
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I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

A. CONTEXT AT APPRAISAL

Context

- 1. Large floods in the Odra River Basin (ORB) and its tributaries are frequent.** In the 19th century, major floods were recorded in 1813, 1829, 1854, and 1880, while in the 20th century 12 large floods were recorded, of which the July 1997 flood was by far the largest. The 1997 flood was caused by extremely heavy rain, with some meteorological stations recording as much as 400 mm over a four-day period. The total July 1997 rainfall was four times that of the long-term average. As a result, an area of 650 km² was inundated in the three voivodships¹ of Slaskie (Upper Silesia), Opolskie, and Dolnośląskie (Lower Silesia) damaging 37,000 buildings, 866 bridges, and over 2,000 km of roads. An estimated 129 km of dikes were reported to be destroyed. The estimated damages in these three voivodships because of the 1997 flood, including the costs of rescue, stress, and loss of public and private property and production, were about PLN 8.5 billion (US\$2.3 billion). It caused the loss of 54 lives and flooding of some 700,000 households, while about 110,000 people were evacuated.
- 2. The flood of July 1997 exposed the weakness of the flood protection system in the ORB, which was developed after a flood in 1903.** The protection system could not withstand the peak discharges, and as a result major urban centers were flooded for extended periods. The flood forecasting, monitoring, and warning systems performed poorly. The monitoring systems were damaged early, and the communication systems failed, leaving uncoordinated operations of hydraulic structures.
- 3. The response of the Government of Poland (GoP) to flood recovery was swift.** The international community provided support, and the World Bank led a major effort to assist in flood damage recovery. The Emergency Flood Recovery Project (EFRP) (US\$500 million) was financed through a World Bank loan of US\$200 million² and co-financed by the European Investment Bank (EIB) while other donors focused on the rehabilitation of the damaged municipal and rural infrastructure. The EFRP was an important step in the coordination between the donors assisting the country with the recovery. Along with recovery, investments were needed to improve the flood protection system to reduce the risks of loss of life and damage to property due to recurring floods. The message collectively conveyed by authorities was that interventions were needed to ensure that an event like the floods of 1997 would never happen again.

Box 1. Long-standing Relations with Poland on Flood Risk Management

Because of the work carried out by the World Bank and the strong expertise that was made available to the implementation of the EFRP as well as in the preparation of the Odra River Basin Flood Protection Project (ORFPP), the World Bank was recognized by the GoP as an important partner from a technical point of view as well and managed to position its services near the center of the reconstruction works after the 1997 flood. This allowed the World Bank to assist in improving coordination between the donors on flood risk management and leveraging additional financing from the European Union (EU) Cohesion Fund and the Council of Europe Development Bank (CEB). This collaboration between donors has proven crucial to enable additional funding that was needed for the completion of the project. The collaboration in Poland, and more specifically on flood

¹ A voivodship is the highest-level administrative division of Poland, corresponding to a 'province' in many other countries.

² Project ID: P053796 - Loan/Credit No.:42640.



risks in the ORB, has also strengthened the relationship between the World Bank and European institutions, including the JASPERS³ program. This collaboration has been the basis to further develop several other endeavors in the region to reduce flood risks. It also paved the way for World Bank-led programs to increase the capacity of the countries in their accession process and adhere to the Water Framework Directive (WFD)⁴ and the Floods Directive (FD)⁵ of the EU. Currently, the World Bank is implementing flood risk management initiatives in, among others, Poland, Romania, and Bulgaria while on water quality the World Bank supports 11 countries involved in the Danube Water Program to improve the efficiency and quality of water supply and wastewater service delivery in the region. The strong involvement allows the World Bank to transfer its global knowledge and expertise related to technical, social, environmental, and governance aspects to strengthen the sector and improve the region's water security.

4. **As Poland joined the EU on May 1, 2004, it became clear that the World Bank's role, both in terms of lending and advisory services, needed to evolve to adapt to the new situation** as other institutions like the EU Cohesion and Structural Funds, CEB, the EIB, and the European Bank for Reconstruction and Development (EBRD) were likely to be longer-term partners for financing Poland's flood control systems. However, initially their ability to assist was constrained by Poland's weak institutional capacity to develop and implement a large program of high priority investments in flood control. The World Bank did have the required experience to support a flood risk management program under such circumstances.

5. **The Country Partnership Strategy (CPS) for Poland, published in March 2005,⁶ aimed to align the World Bank's program both with Poland's development agenda as a new EU member and with the GoP's decision-making processes.** The CPS developed in partnership with Poland, on the basis of collaborative approach, was geared to provide the flexibility and capacity for rapid response required for the World Bank to remain relevant in helping meet the challenges that faced Poland as an upper-middle-income country and a new member of the EU. The GoP's development strategy contained in the National Development Plan (NDP) 2004–2006 and in the NDP 2007–2013 had as its overriding objective to put the economy on a path of high and sustainable growth, through improved competitiveness of firms and regions; contribute to the recovery of employment; and promote strong social cohesion. For the environmental protection and water resources management sector the NDP identified two priority areas: (a) improving the quality of surface water and quality and distribution of drinking water and (b) securing flood safety.

6. **Poland collaborated with Germany, the Czech Republic, the EU, and the International Commission for the Protection of the Odra (ICPO) to develop a longer-term Floods Management Program for the ORB.** After the 1997 flood, each member of the ICPO prepared a national program. Poland prepared the *Oder 2006 Program* to complement the preceding *Oder 2005 Program* that mainly focused on improving inland navigation. The main emphasis of the *Oder 2006 Program* was flood protection and navigation, in addition to water quality protection, hydropower production, land use planning, and forestry and nature protection in the ORB. The program included interventions for a total of PLN 9.0 billion, with PLN 4.3 billion (about 47 percent) for flood protection.

³ JASPERS = Joint Assistance to Support Projects in European Regions. JASPERS helps cities and regions absorb European funds through top-quality projects.

⁴ Directive 2000/60/EC.

⁵ Directive 2007/60/EC.

⁶ Report No. 31702 – PL.



7. **To reduce flood risks in the ORB, the GoP sought support from the World Bank for its knowledge, expertise, and experience in the sector, in addition to its financing.** Two main components of the *Oder 2006 Program*, the construction of a Raciborz Dry Polder (RDP) and the modernization of the Wrocław Floodway System (WFS), were included in the preparation of the ORFPP. Additionally, it was expected that the World Bank could play a key role in providing support for (a) institutional strengthening, (b) strengthening of project management, (c) the preparation of a flood management and protection strategy also for the Vistula River Basin, and (d) stable funding. This led to the agreement that the World Bank would be in charge to ensure that the project was implemented in accordance with the loan agreement being co-financed by the EU Cohesion Fund and the CEB.

8. **The ORFPP fitted well in the priority for promoting convergence through improved investment climate and enhanced competitiveness.** The GoP recognized that the World Bank's involvement in project preparation and implementation would lead to transfer of knowledge and skills. Although Poland's developments were expected to lead the authorities to initiate graduation from World Bank borrower status, there was still an agenda of important reforms in areas in which the World Bank was the key technical partner. The World Bank's activities in Poland focused on areas that were consistent with the development priorities of Poland as laid out in the NDP. The Government showed interest that the World Bank remained engaged in the three areas supporting the key priorities: (a) promote fiscal adjustment and reverse negative debt dynamics through restructuring of expenditures; (b) promote convergence through an improved investment climate and enhanced competitiveness; (c) reduce poverty, encourage social inclusion, and bring employment closer to the targets of the Lisbon Strategy⁷ (2000).

Theory of Change (Results Chain)

9. **The Project Development Objective (PDO) as stated in the legal agreement was 'to protect the population in the Odra River Basin against loss of life and damage to property caused by severe flooding'.** This PDO was a resultant, among others, of the broadly communicated aspiration to improve flood risk management ensuring that a flood like 1997 would never happen again.

10. **Achieving the PDO was perceived as necessary to realize long-term impacts:** to increase economic returns with reduced future losses and fiscal burden to the country, reduce the incidence of poverty, and create an improved investment climate and enhance competitiveness and thus countrywide economic growth. The indicator for the outcome, as included in the Project Appraisal Document (PAD), is 'the area inundated, damages avoided, and lives saved under floods of various magnitudes or with return periods such as 10, 20, 50, 100, 200, 300, 1,000 or 5,000 years'. This was to be verified by monitoring the project results, including improvement of land use and development plans, and taking corrective actions if the expected area would not be protected. Extensive data analysis and modeling work done during preparation indicated that the flood of 1997 had a statistical probability of 1:1,000 or return period of 1,000 years.

11. **The intermediate outcomes leading to the PDO, as included in the PAD, are the full protection against floods of the 1997 magnitude (a) between Raciborz and Wrocław city and (b) in Wrocław supported by the improved flood risk management capacity.** The intermediate results indicators are (a)

⁷ The aim of the Lisbon Strategy, launched in March 2000 by the EU heads of state and government, was to make Europe "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion."



the reduction in area inundated, damages avoided, and lives saved with floods of various magnitudes in the project impact area; (b) reduced flood emergencies in Wrocław city; (c) improved lead time in forecasts and better communication between agencies responsible for flood management and operation of flood control infrastructure, including the facilities constructed under the project; and (d) implementation of RAP,⁸ design of infrastructure, and construction completion on time.

12. **To achieve the outputs leading to the intermediate outcomes, the project developed alternatives and selected the combination of the RDP with the WFS as the preferred package of interventions.** These alternatives to provide flood protection against an event comparable to 1997 included (a) raising dikes along the river; (b) constructing reservoirs on the tributaries of the Odra; and (c) raising dikes, where necessary, in combination with a 'dry' polder at Raciborz. These options were evaluated using state-of-the-art hydraulic modeling and economic assessments. Option (a) was discarded because of the extremely high costs. The effectiveness of option (b) was questioned, especially during coincidence of the flood waves on the tributaries and the Odra. Option (c) was evaluated by far as the superior solution as it would reduce the peak flow of large floods by about 20–50 percent and the corresponding water levels by about 0.5–1.0 m for more than 500 km of dikes. For each individual structural intervention, alternative studies were carried out using state-of-the-art modeling instruments. Based on regulations issued by the GoP for the design of major structures and embankments, a control flood with a return period of 1,000 years was used for the designs of the RDP and WFS coinciding with the return period of the flood that occurred in 1997.

13. **To achieve the outputs leading to the intermediate outcomes, the project programmed several structural and nonstructural interventions.** These included the realization of the RDP, improvement of the WFS and the establishment of a flood management center, establishment and operation of a flood forecasting system with improved capacity of staff, and development of updated management plans. Nonstructural interventions also included the preparation and implementation of RAPs for project-affected people (PAP) and EMPs. Furthermore, the capacity of staff was improved for M&E. The reconstructed Theory of Change is shown in figure 1.

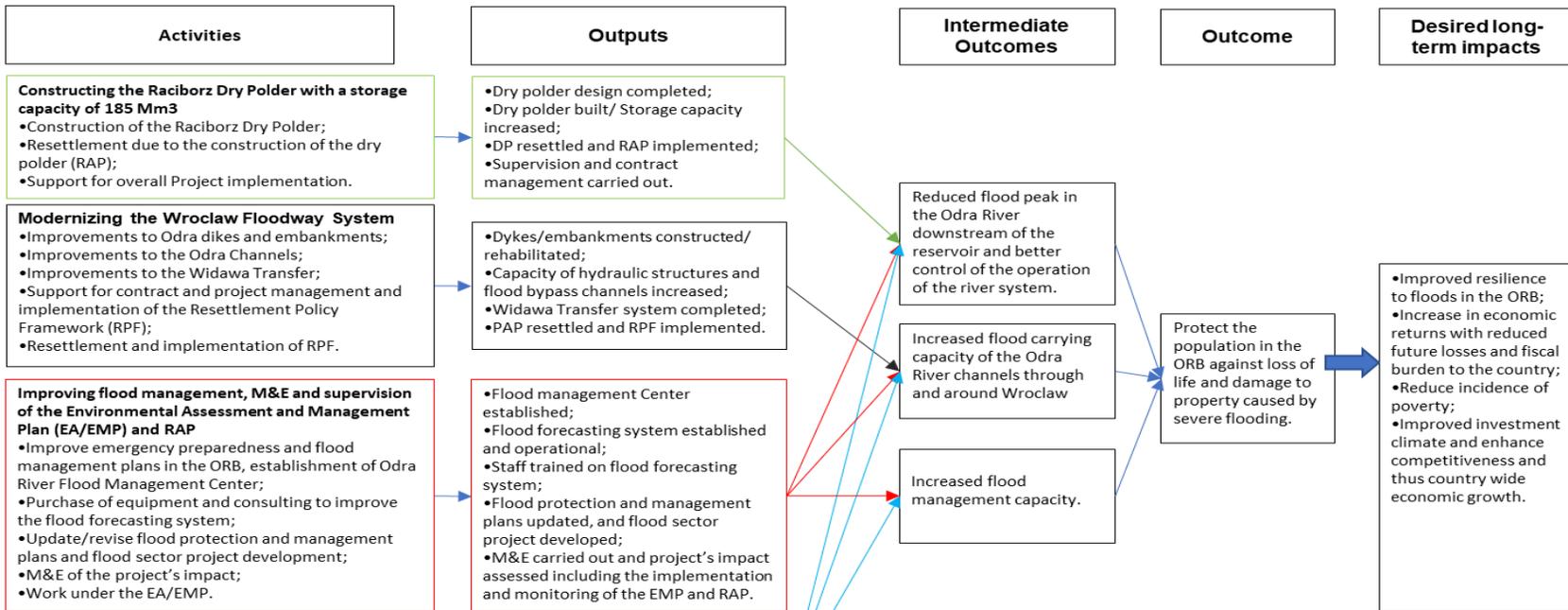
⁸ RAP = Resettlement Action Plan.



Figure 1. Reconstructed Theory of Change

Problem Statement: Large floods in the Odra River Basin (ORB) are frequent causing economic losses and, in largest floods, loss of lives. These floods impose a huge cost to the Polish economy resulting in substantial fiscal burden to the country. The flood protection system in the ORB, about 100 years old, has many weaknesses: (i) a protection system that could not withstand large floods and needs additional investments to bring it to the required standards in order to eliminate loss of life and damage to property due to recurrent floods, and (ii) weak emergency preparedness and flood management in the ORB.

Project Development Objective (PDO): to protect the population in the Odra River Basin against loss of life and damage to property caused by severe flooding.



Critical assumptions: i) resettlement can be carried out in parallel with project implementation, co-financing of the project by EU Cohesion Fund and CEB, iii) successful recruitment of consultants for monitoring and evaluation (M&E) of the Project impact, including the implementation and monitoring of the environmental management plan (EMP), and the resettlement action plan (RAP).

Note: EA = Environmental Assessment; EMP = Environmental Management Plan; M&E = Monitoring and Evaluation; PCU = Project Coordination Unit; RPF = Resettlement Policy Framework; TA = Technical Assistance.



Components

14. **At the appraisal stage, activities programmed for project implementation** were (a) construction of the RDP; (b) modernization of WFS; (c) improving flood management, M&E, and supervision of the EMP and RAP; and (d) project management, TA, and training. The activities were structured in four components, as described in the following paragraphs. The costs refer to the estimated costs at appraisal and costs at project closure.

15. **Component A: Construction of Raciborz Flood Retention Reservoir (US\$218.3 million/US\$486.9 million).** A dry polder was to be constructed on the Odra River not far from the border with the Czech Republic near the town of Raciborz with a total capacity of about 185 million m³ to retain flood water.

16. **Component B: Modernization of Wrocław Floodway System (US\$253.9 million/ US\$383.7 million).** The flood protection system of Wrocław city needed to be modernized by improving the flood protection dikes and capacity of the hydraulic structures and improving the capacity of the flood bypass channel.

17. **Component C: Improving Flood Management, Monitoring & Evaluation and Supervision of EA, EMP and RAP (US\$26.6 million/ US\$14.74 million).** The component would (a) improve emergency preparedness and flood management plans; (b) support improving the flood forecasting system; (c) improve flood protection and management plans and assist in development of projects in the flood sector; (d) monitor and evaluate the project's impact, including implementation and monitoring of the EMP, and the RAP; and (e) implement works identified under the EMP that were not included in other components.

18. **Component D: Project Management, Technical Assistance, and Training (US\$5.2 million/ US\$6.7 million).** This component was included to provide ongoing support to improve project management, improve the contracting of experts, and provide TA and the training for staff to improve the capacity of the project's team members.

B. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE)

Revised PDOs, Indicators, and Outcome Targets

19. **During project implementation, the PDO did not change nor did its indicators.** In the restructuring paper of January 2014, the targets of the PDO and the intermediate indicators were clarified, including explicitly the design discharge of 1997: "Full protection against floods of the 1997 magnitude. The hectares that will be affected: 0 ha. The value of assets that will be lost: 0 PLN. People who will die: 0." Therefore, a split rating is not needed in the rating of this project.

Revised Components

20. The components of the project were not revised during implementation of the project.



Other Changes

21. **Through restructuring, several changes in the project were agreed upon.** These changes are summarized in the following paragraphs and were documented in four restructuring papers in 2014, 2017 (2), and 2018.

22. **In January 2014, changes were made in the disbursement arrangements and procurement provisions:** (a) increase the authorized allocation for the special account, (b) reallocate loan proceeds among disbursement categories, (c) increase the percentage of expenditures to be financed, and (d) modify the selected procurement processes and thresholds.⁹ Changes in the authorized allocation were necessary to maintain timely payments to contractors and implementation and progress. Reallocation and increases of the expenditures to be financed was needed to make better use of the different sources of funding (IBRD, CEB, EU, and different types of national budget). Finally, modification of the selected procurement processes and thresholds was agreed upon to facilitate project implementation by allowing more flexibility for the remaining recruitments and small works.

23. **In June 2014, the closing date was extended by three years and one month until December 31, 2017.** The GoP and World Bank agreed upon actions that will be undertaken by the GoP to complete the project by new closing date.¹⁰ This extension was needed to accommodate delays in the procurement of the major civil works contracts critical to the RDP and WFS (particularly A1 and B3 subcomponents). These delays resulted from complications arising from EU accession, changes in the Government, and the project's large and complex procurement packages and safeguard requirements. Despite these challenges, 10 major contracts (out of 12), committing nearly 90 percent of the total project proceeds, were in full implementation at the time of extension. A three-year extension was estimated to be necessary to allow for at least a one-year time period to test the performance of the RDP.

24. **In October 2017, an additional extension of the closing date for two years and six months from December 31, 2017, to June 30, 2020,¹¹ was agreed upon and the implementation schedule was adjusted accordingly.** This was largely due to delays resulting from a contractual dispute, associated with construction of the RDP, which was cancelled, leading to the eventual termination of the management contract in October 2016. The time necessary for completion of the RDP was estimated to be approximately two years following mobilization of a new contractor, which was expected to be in December 2017. The GoP confirmed the desire to extend the World Bank loan, agreeing that the PDO could not be achieved without the completion of the RDP. Changes also affected the disbursement estimates to account for the proposed extension, and the respective implementation and procurement plans from FY18 onward were updated.

25. **In the restructuring paper of October 2017, modifications were made to the Results Framework** to reflect the indicators, values of the baselines, and targets that were originally reflected in the PAD so that they could be tracked going forward. The target end dates were modified to reflect the proposed new closing date.

⁹ Report No: RES13525, January 2014.

¹⁰ Report No: RES15432, June 2014.

¹¹ Report No: RES29007, October 2017.



26. In January 2018, there was a reallocation of funding sources¹² allowing optimal use of different funding sources for the project (IBRD, EU, and CEB), including full disbursement of the IBRD loan.

Rationale for Changes and Their Implication on the Original Theory of Change

27. The changes mentioned earlier had no implication on the original Theory of Change.

II. OUTCOME

A. RELEVANCE OF PDOs

Assessment of Relevance of PDOs and Rating

28. **The relevance of the PDO is High.** Poland was severely struck by flooding in 1997 with considerable economic, social, and environmental damage, and support was needed to recover and improve the flood protection system to reduce risks of future floods. Over the last 15 years, several flooding events have struck the country leading to continuous focus on flood risk management. The current Country Partnership Framework¹³ (CPF) for Poland (FY19—FY24) under ‘Resilience to Environmental and Global Threats’ includes the objective to build resilience to climate related events. This is to be achieved through more effective mitigation of the impact of floods to promote shared prosperity, economic competitiveness, and equity and inclusion. Furthermore, the CPF indicates that the World Bank Group is taking a comprehensive and holistic approach to flood management, combining infrastructure investments with policy measures and institutional arrangements that support performance as these are determined to be critical for long-term, sustainable, social, economic, and environment development of the affected areas. Floods are a recurring aspect presented in the CPF that affect the development of the country and its importance in the collaboration between the GoP and the World Bank. Additionally, the institutional strengthening needed to achieve the PDO is closely related to the CPF’s objective to advance evidence-based design of policy and institution. Therefore, the operation provides clear evidence of the alignment of the PDO to national priorities and the current CPF.

29. **Poland is complying with the requirements of the second cycle of the FD and invests close to US\$450 million per year to reduce flood risks.** This clearly indicates that despite the 15 years that separate the period of preparation of the ORFPP from the date of its completion, the project’s objectives are still valid. Climate change observed in the 21st century has made evident the need for appropriate water management in river basins using a systemic approach and the need to provide efficient flood risk management and sustainable development that will ensure protection of the natural environment. Recently, a new program ‘Stop Floods’ has been initiated with EU funds. This program¹⁴ supports the development of flood risk management plans under the EU FD, leading to a six-year program to be initiated in 2022.

30. **The relevance of the PDO is High in the light of the ongoing work to reduce flood risks in the country including the Odra-Vistula Flood Management Project (OVFMP).** The ORFPP and the relevance of its PDO have been a strong motivation to continue collaboration on flood risk management and prepare

¹² Report No: RES31240, January 2018.

¹³ Report number 125670, May 2018.

¹⁴ <https://stoppowodzi.pl/en/about-project/>.



the OVFMP as a follow-up project. This also indicates the strong anchoring role of flood risk management in the long-term engagement between the GoP and the World Bank, starting with the EFRP, followed by the ORFPP and currently the OVFMP.

B. ACHIEVEMENT OF PDOs (EFFICACY)

Assessment of Achievement of Each Objective/Outcome

31. **The PDO consists of one objective: protect the population in the ORB against loss of life and damage to property caused by severe flooding.** Table 1 presents the result achieved against the key outcome indicator for the project.

Table 1. Achievement of PDO Indicators

Outcome	PDO Indicator	Target	Achieved
Protect the population in the ORB against loss of life and damage to property caused by severe flooding.	Reduction in area flooded, damages avoided, and lives saved due to floods of various magnitudes and return periods.	Full protection against floods of the 1997 magnitude. The hectares that will be affected: 0 ha. The value of assets that will be lost: 0 PLN. People who will die: 0.	As confirmed by state-of-the-art modeling, the project infrastructure will allow to discharge floods such as the 1997 flood without causing inundations, damage to assets, or human loss in the project area. The required combination of structural and nonstructural interventions to achieve the PDO have been implemented fully. The project protects up to floods comparable to the 1997 event when 650 km ² was flooded, causing US\$2.3 billion in damage and the loss of 54 lives.

32. **Based on the systemic approach and thorough hydraulic modeling (figure 2) during project preparation, it was recognized that to achieve the PDO a mix of structural measures (building the RDP and improving the WFS) and nonstructural interventions (improving flood risk management and flood forecasting capacity) was necessary.** These interventions were divided in different components. Two components focused on the construction of works for the RDP and on improving and reconstructing the WFS. These works were fully implemented: among others, the construction of the RDP with a retention volume of 185 million m³; strengthening of 59.74 km flood embankments, including the (re)construction of associated infrastructure; and the improvement of 37.5 km of the Odra River and WFS channels to increase their conveyance capacity of flood waters. Along those structural interventions, the flood management center was established, and the early flood warning systems have improved significantly. This allowed for timely initiation of the protocols to operate the infrastructure and inform people active in the flood plains that discharges were increasing. Furthermore, the increased capacity to prepare flood risk management plans¹⁵ also supported the national and regional water management authorities to timely anticipate and adapt to developments affecting the required flood risk protection level. To secure proper operation and sustainability of the flood risk management system a third component included

¹⁵ During the first cycle of the FD, flood risk management plans were developed between 2011 and 2015 for two different levels relating to the country’s administrative areas—river basins and water regions. The works were conducted simultaneously for the river basins of Odra, Vistula, and Pregoła and nine water regions. Currently, Poland is preparing flood risk management plans for the second cycle (2021–2027).



warning system is fully operational. This allows for timely initiation of the protocols to operate the infrastructure and inform people active in the flood plains that discharges are increasing. Furthermore, the increased capacity of the beneficiary to prepare flood risk management plans also supports the national and regional water management authorities to timely anticipate and adapt to developments affecting the required flood risk protection level. This includes the capacity to develop emergency preparedness and update the existing flood management plans in the ORB with the participation of the local governments, concerned agencies, and stakeholders. Over the duration of the project, many activities were developed and financed to provide TA and training. This involved the participation of external experts, the organization of foreign visits, and the participation in networks to exchange knowledge.

36. **With the completion of the activities, the PDO for the ORFPP is achieved.** During implementation, the calibration of models and validation of model results was done using new information becoming available, including improved digital elevation models. This was done with the World Bank's support while capacity of the beneficiary was increased to carry out such controls. The hydraulic modeling has been repeated during implementation, using updated information to ensure that the design parameters and dimensions of the infrastructure would comply with the PDO. Recent modeling confirmed that the structural interventions can discharge floods that are comparable to the event in 1997 without damage to property or loss of lives in Wrocław and the upstream area between Wrocław and the RDP. Owing to the combination of the structural and nonstructural interventions supported by the project, it is reasonable to state that these areas are protected up to a 1,000-year flood. As a result of the ORFPP implementation more than 2.5 million people benefit from this high level of flood protection. Therefore, the PDO is achieved.

37. **Achievement of the PDO is fully attributable to the project.** No interventions are known upstream affecting flood risks in the project area. Changes in the water system and in land use upstream can influence the return period obtained by the project. However, the effect of the project itself is fully attributable based on the results of the hydraulic modeling in combination with increased capacity to operate and maintain the flood management system. The operational efficacy of the RDP has already been tested with the October 2020 flash floods.¹⁶ During this period the system functioned as foreseen. The polder was able to retain close to 45 million m³ of water, with a flood reserve of 140 million m³ of water while reducing the flood wave downstream by at least 30 percent at the peak.

38. **The project is also exemplary in the strengthened collaboration between the involved authorities.** This includes the collaboration between the PCUs and the Project Implementation Units (PIUs), the collaboration with the city of Wrocław, the interaction with strong and influential nongovernmental organizations (NGOs), and above all the interaction with the municipality and people living in the villages of Nieboczowy and Ligota Tworkowska. The successful resettlement program and implementation of environmental and social safeguards is important and valuable experience to the GoP, which has already been transposed to other projects in the country and projects in other countries.

Box 2. Resettlement for the RDP: International Best Practice

For construction of the RDP, a socially and legally complex process had to be carried out resettling close to 250 families, in total nearly 700 residents of the villages of Nieboczowy and Ligota Tworkowska. This was necessary

¹⁶ The flash flood of 2020 had a return period much lower than 1,000 years; however, the event demonstrated that the infrastructure was fully operational and was operating as expected.



as the villages were located in the polder and at risk of flooding during operation of the RDP. This has been one of the largest resettlement operations by the World Bank and Poland for the implementation of flood control measures. Aside from the houses, church, and cemetery, all public facilities needed to be relocated.

After strong initial opposition, even leading to violent resistance, the project managed to influence the position of the majority for the better. This was a result of a thorough communication process. Sharing information, listening to ideas of affected people, allocating enough time to explain why interventions were needed, being transparent on possible compensation, and offering alternatives to the stakeholders led to a mutual trust that was crucial for the success of the project. The task team of the World Bank, as 'third party', played an important role in creating this trust between the people living in the area and the authorities, especially the RZGW Gliwice responsible for project implementation. Local authorities, including the mayor of the Lubomia Municipality, stood in the frontline strongly opposing project implementation. The exhaustive participative process helped slowly gain confidence and support for the resettlement that encompassed the construction of a completely new village with all services restored. The global experience of the World Bank and the ability to present successful operation was of high added value.

The process was long (2003–2018) and many changes over this period affected the implementation of the resettlement program. Changes in the Polish Government, Polish law, project organization, and many other aspects needed to be considered and reconsidered during this period. The developments made the project extra complex. Nevertheless, project organization, with the support of the World Bank, managed to convey the message that the new situation would strongly improve their living conditions. The new city has now been built, and the resettled people have indicated repeatedly that they are content with the new situation.

During project implementation, this best practice was already shared at a national and international level through newspaper articles, presentations during events, blogs, videos, and study visits. The project has demonstrated how a careful participative process can build trust, improve alternatives offered, increase willingness to collaborate, and lead to strong improvement of living conditions while maintaining social cohesion after resettlement.

39. With this systemic and integrated approach, the GoP (and PGW WP), with support of the World Bank, has reached a high safety level for floods.¹⁷ Preparation and implementation of the project is highly comparable to state-of-the-art programs like the Dutch Room for the River.¹⁸ Experts involved in these programs have also been involved in the ORFPP and transferred their knowledge to Polish stakeholders and especially to the responsible flood risk management authorities. This has led to high-end modeling work during preparation of the project and adaptation of the systematic and integrative approach. The project is an example to many other projects that are implemented or initiated on how to build (structural and nonstructural) what is needed for sustainable flood risk management.

40. The impact of this project clearly goes beyond its PDO and is transformational for flood risk management in the country and exemplary for projects in the region. In general, flood risk management projects tend to be complex. This is caused by the spatial, social, and economic impacts on the people involved and the broad range of government authorities and other stakeholders who need to be involved in planning and implementation. The ORFPP has managed this participative process extremely well,

¹⁷ Many cities along rivers adopted flood risk levels between 50 and 100 years (Verwey, Adri, Yann Kerblat, and Brendan Chia. 2017. *Flood Risk Management at River Basin Scale: The Need to Adopt a Proactive Approach*. World Bank).

¹⁸ After the near flooding in 1993 and 1995, the Netherlands decided that the concept of 'Living with Water' should be adopted instead of fighting against it. The program covers different interventions, of which some are comparable to the works in the ORFPP. As a result of this program, large parts of the Netherlands are protected against floods with return periods of 1,250 years, while for some parts that lie below sea level the allowable flood frequency is once every 10,000 years. These levels are high because large areas are below sea level and floods would be extremely damaging and cause many casualties.



especially considering the technocratic and top-down approach strongly imbedded in Polish water management culture at the turn of the century.

41. **As a result of the activities, the capacity of the beneficiary has improved significantly and will also support flood risk management in other regions of Poland.** Improved capacity has also supported the country in the development of river basin management plans under the EU WFD and the flood risk management plans to adhere to the EU FD to protect the population against loss of life and damage to property caused by severe flooding. The increased capacity is also of high added value to the development and current implementation of the OVFMP (P147460).

42. **The reduction of flood risks and the increased social, environmental, and economic activity bordering the Odra and its canals is evidence of the added value of flood risk reduction to the desired long-term impacts.** These long-term impacts include (a) improved resilience to floods in the ORB, (b) increased economic returns with reduced future losses and fiscal burden to the country and reduced incidence of poverty, and (c) improved investment climate and enhanced competitiveness and thus countrywide economic growth. These effects were substantiated by the study on 'The Leveraging Potential of Public Investments in Flood Protection: The Case of Wrocław, Poland'¹⁹ estimating that the direct effects of these public investments on land value are in the order of at least hundreds of millions of dollars.

43. **The project has also led to important partnerships with organizations outside the project, leading to spillover effects in Poland and in other countries of the region.** One of the examples of this regional spillover is the exchange of experiences with countries in the Balkans. While Poland could present its strong experience with works execution, it was clear that the project could learn from better forecasting know-how and hardware available, especially in the basin of the Sava River and managed by the International Sava River Commission based in Zagreb. Over the years, colleagues met in joint workshops. The Odra Project was also the subject of keynote presentations at several international professional forums in the United States and Europe, among others, at the 2015 Amsterdam International Water Week, where the project figured prominently.

44. **The project was transformational and, in many ways, exemplary.** The work done, the capacity built, and the experience gained is of high added value for other projects in Poland and abroad. The experience with the resettlement program is exceptional and has already been used in many international events as an example of best practice, presenting clear evidence of the importance of thorough citizen engagement. The expertise of the World Bank, the TA offered, and the training provided was highly valued by the actors and has not only increased the capacity to manage the floods in the Odra but is now also applied to the flood risk management activities in the basin of the Vistula River. Knowledge, experience, and increased capacity are also crucial add-ons to Poland's endeavors to adhere to the European WFD and FD. The project has also increased the aesthetic value of the riverfront in the city of Wrocław, offering the municipality and the city's inhabitants opportunities for new economic activities. Furthermore, the project has strongly improved collaboration between different authorities in the region, finding ways to integrate water management in spatial development.

¹⁹ Yu, W. 2020. *The Leveraging Potential of Public Investments in Flood Protection: The Case of Wrocław, Poland*. Washington, DC: World Bank. 31 pp.



Justification of Overall Efficacy Rating

45. Based on full achievement of the PDO and taking into account the additional benefits not captured by the scope of the PDO, the overall efficacy is rated Substantial.

C. EFFICIENCY

Assessment of Economic and Financial Efficiency

46. The efficiency analysis of the project at appraisal was done through an economic and financial analysis (EFA) using incremental cost-benefit analysis (CBA) methodologies based on the assessment of costs (for 100 percent of total project costs) and benefits in with project (WP) and without project (WOP) scenarios. Monetized tangible benefits include estimated reduction of flood damages and production of gravel during the life of the project; avoided losses of intangible benefits were assumed at appraisal to be 20 percent of the tangible benefits, assumption kept at the Implementation Completion and Results Report (ICR) stage. The efficiency analysis at the ICR stage was done using the same methodologies, the same assumptions, and replicated spreadsheet models similar to those used at appraisal though it also included an analysis of design and implementation efficiency. Results of the efficiency analysis undertaken at the ICR stage compared with the one at appraisal are summarized in table 2. The assumptions and estimations are presented in annex 4, along with the recalculated EFA at the ICR stage.

Table 2. Results of the Efficiency Analysis

	At Appraisal	At ICR
Economic Internal Rate of Return, Project	17.4%	15.1%
Raciborz Dry Polder	16.7%	13.0%
Wrocław Floodway System	16.6%	17.0%
Economic Net Present Value, Project (€, millions)	232.15	139.54
Benefit/Cost Ratio (B/C), Project	1.99	1.62
Raciborz Dry Polder	1.86	1.31
Wrocław Floodway System	2.1	1.96
Project Costs		
Component, Raciborz Dry Polder (€, millions)	202.3	458.79
Wrocław Floodway System (Euro million)	233.9	345.6
Total project costs incl. Design, Supervision, Project Management, M&E, and training (€, millions)	505.0	886.78
Total overrun at market prices	-	76%
Cost overrun at constant 2002 prices	-	48%
Time overrun (years)	-	6

Note: a. The efficiency analysis is based on information included in the ICR prepared by the PCU (November 2020).

47. At the ICR stage, based on its achievements and incurred costs and expected future benefits and costs as detailed in annex 4, the developmental impact of the project was recalculated and the



economic internal rate of return (EIRR), over the same time frame as at appraisal, was reestimated. The additional CBA indicators, not included at appraisal, were also calculated, including economic net present values (ENPVs) and benefit/cost (B/C) ratios for both the appraisal and ICR stages. The cost and time overruns affected but did not impair project viability, that is, the EIRR at appraisal was estimated at 17.4 percent, while at closing, six years after originally planned, it has been reestimated at 15.1 percent, still well above the assumed 10 percent opportunity cost of capital in Poland. Component-wise, the RDP's EIRR at the appraisal stage was 16.7 percent and at the ICR stage it was 13.0 percent while those for the modernization of the WFS were 18.1 percent and 17.0 percent, respectively.

48. **Primary benefits of the project are higher at ICR as was perceived during preparation.** This is the result of increased economic growth because of project activities. Real gross domestic product (GDP) in the area was 3.52 percent while for the economic analysis at preparation 1.3 percent was estimated. Especially for Dolnośląskie, the GDP grew at 4.58 percent per year, well above the national average. This increase is also attributable to the improvement in flood risk management. This has reduced the risk for investment and has attracted more investments in the region. Economic returns, albeit slightly lower than those estimated at appraisal because of the increased costs, are still significantly high, with an overall ENPV of €139.5 million (constant prices 2002) with an overall B/C ratio of 1.62 at the ICR stage. At the ICR stage, a simulation for the EIRR was performed to assess its sensitivity to reduction of benefits; a 10 percent reduction in benefits results in about 1 percent reduction in the EIRR, meaning that the EIRR is resilient to the reduction of benefits.

49. **The EIRR of 15.1 percent is well in line or even relatively high in comparison with other flood risk reduction projects managed by the World Bank.** The Jakarta Urgent Flood Mitigation Project (P111034) (2012–2019) (US\$139 millions), including dredging, embankment repairs, and civil works, had an EIRR of 16 percent and the Argentina Rio Salado Integrated River Basin Management Support Project (P161798) (2017–2022) (US\$300 million) estimated an internal rate of return (IRR) of 11.7 percent at appraisal. The study carried out by the World Bank on economics of flood risk reduction²⁰ presents the IRR for different structural interventions being in the range of 7.1–12.9 percent for dams, 10.6–31.0 percent for flood diversion, and 1.6–10.3 percent for levees. The actual IRR depends on local circumstances, but the ORFPP scores relatively high with 15.1 percent even after the delays and cost overruns.

50. **Cost overruns reached 76 percent, which includes about 28 percent price escalations due to inflation between 2002, when the original costs for appraisal were estimated, and 2011, when the final designs were prepared.** At constant prices of 2002 (that is, taking out the effect of inflation) the cost overrun is 48 percent. The final design cost estimates produced by the design consultants for both the RDP and WFS in 2011 were well above the cost estimates at appraisal (see table 3). However, compared with the final design cost estimates, the actual contractor prices for both the RDP and WFS were below those estimated by the final design consultants; that is, competition for the civil work contracts during project implementation resulted in competitive market prices for the implementation of both the RDP and WFS, which reflect efficiency gains that are taken into account for the overall rating of the project efficiency at the ICR stage.

²⁰ Hawley, Kate, Marcus Moench, and Lea Sabbag. 2012. *Understanding the Economics of Flood Risk Reduction: A Preliminary Analysis*.



51. **The cost overruns were financed in their integrity by the beneficiary and with funds from the EU Cohesion Fund.** The World Bank disbursed €131.94 million, about 91 percent of the original commitment (€140.1 million) while the CEB disbursed €204.66 million, and the European Commission disbursed €340.56 million.²¹

Table 3. Financing of Cost Overruns

Source	Amount Estimated at Appraisal (€, millions)	Disbursed at Closing (€, millions)
Borrower	30.0	209.62
IBRD	140.1	131.94
European Commission	130.0	340.56
CEB	204.9	204.66
Total	505.0	886.78

Design and Implementation Efficiency

52. **Despite the six-year overall extension, the final duration of project implementation is aligned with international experiences for projects of the same scale and high level of complexity, especially given the limited flood management experience in Poland.** In comparison with experiences like the Room for the River program²² and other international flood risk management projects, an implementation period of close to 15 years is not uncommon, even more so if the projects include large resettlement programs and a complex set of structural and nonstructural interventions as is the case for the ORFPP. O&M of the existing flood management systems or upholding of the capacity of Polish water management were not Governmental priorities up to the devastating flood in 1997. In comparison, the Netherlands, before starting the Room for the River program, had a long-standing history and strong institutional capacity on integrated water resources and flood risk management. Even so, after the event of 1995 more than 20 years were needed to fully implement the program. Considering this, the duration of the ORFPP is by no means exceptional.

53. **The project completion dates were postponed twice through restructuring; the first extended project closing to December 2017, and the second extension was to June 2020.** The start-up phase took about three years, which was longer than foreseen. This was mainly caused by complications in establishing the required institutional framework and governmental organization. Additionally, preparing the final design and getting the environmental and construction permits took longer than expected. The main cause for this was the change in policy and legal environment induced by the EU accession process. Because of the delays, recruitment of contractors for both the RDP and WFS contracts started only in or after 2012 with newly defined completion dates, leading to a first extension up to 2017. The second extension was the result of a breach in contract for the construction of the RDP and time overruns caused by the extremely complex resettlement process and negotiating proper compensation of PAP keeping in mind Polish regulations and World Bank standards.

²¹ Rate of exchange PLN 3 per EUR (December 2010) was used to convert Polish Zloty cost figures provided by the PCU for the WFS component.

²² The Room for the River program was only completed in 2018, close to 23 years after the initial impetus. This period was necessary to build political support; prepare required policies; allocate the necessary funds; and come to an agreement between the different authorities involved on responsibilities related to financing, design, implementation, and O&M.



54. **Flood risk management projects are often time-consuming.** They are extremely complex from a technical perspective but even more so from a social and economic point of view. Most of all, because of their spatial impacts, these projects involve many stakeholders with different interests. Therefore, these projects require thorough participation programs involving different authorities (national, regional, and local), NGOs, the private sector, and foremost the people who live in the areas at risk and those affected by the interventions. Because of these complex processes, long implementation periods are no exceptions in flood risk management.

Justification of Overall Efficacy Rating

55. **Efficiency is rated Substantial** given the high EIRR being well above Poland's and international benchmarks for flood risk management projects and the fact that, while the project suffered delays and cost overruns, these did not significantly affect the project's financial and economic efficiency nor lead to an extraordinary project duration considering international experiences.

D. JUSTIFICATION OF OVERALL OUTCOME RATING

56. Based on the abovementioned assessment and ratings—the relevance of the PDO is rated High, the efficacy of the PDO achievement is rated Substantial, and the efficiency of the Project is rated Substantial—the overall outcome of the Project is rated Satisfactory.

E. OTHER OUTCOMES AND IMPACTS (IF ANY)

Gender

57. **At the time this project was prepared, gender tagging was not yet an established practice within the World Bank.** As a result, this project does not have the now-familiar triplex of analysis, activities, and indicators linked to gender aspects. Nevertheless, training sessions, consultations, and environment and social safeguards management did extensively consider gender inclusion with the intention of bridging the existing gender gaps in the region, for example related to employment, economic opportunities, and access to improved living conditions.

Institutional Strengthening

58. **Institutional strengthening has been an important aspect from the beginning of the project and was covered by Components C and D.** The activities included TA and training to establish a team that was capable to implement the project in relation to technical, environmental, social, legal, and financial aspects as well as improve the organization's procurement capacity. The institutional strengthening has also prepared responsible authorities to improve planning on water resources management and implement flood risk management projects in other regions of the country. The project introduced use of economic analysis. The World Bank-mandated economic CBA of flood management investments was new to government agencies; the project offered a critical learning opportunity. This also prepared the GoP to adhere to the EU WFD and the EU FD as they require an economic CBA. The project also improved the capacity to prepare flood contour maps. PIU capacity to carry out such analysis was initially absent as it requires extensive hydrologic analysis, including flood recurrence frequency and calculation of associated area inundation and damage, and comparison with cost of protection investment.



Mobilizing Private Sector Financing

59. **Interventions were implemented with public funds.** Nevertheless, a recent study²³ indicated that these public investments in conjunction with revisions to the spatial planning act encouraged real estate investments on previously flooded lands in the city of Wrocław. These public investments enabled previously flooded land to ‘catch up’ with the Wrocław market (both in terms of land sales and residential transactions). Even though it is difficult to quantify the direct effect of these public investments on land value, it has been estimated that minimum values are in the order of hundreds of million dollars. The increase of land and property value has also led to increased property tax generation. Urban development benefits are challenging to quantify, including aesthetic improvements along the riverfront, parks, and walking paths; new enterprises to support a growing tourism industry (for example, boating facilities, restaurants, and other vendors); and tourism (for example, Wrocław European Capital of Culture 2016 that draws over 5 million visitors).

Poverty Reduction and Shared Prosperity

60. **The conditions required for poverty reduction and shared prosperity improved.** Even though quantification of the cause-effect relation is extremely difficult, it is expected that with the results of the project the poor and vulnerable are better protected and their resilience increased. This is especially relevant for the reduction of flood risks in the area between the RDP and Wrocław where land use is mainly agrarian but also in the poorer areas of Wrocław. Even though poor people suffer only a fraction of economic losses caused by disasters, the impact for them is much stronger than for the wealthier people;²⁴ therefore, it can be stated that flood risk reduction has a strong impact on the welfare of the poor and vulnerable.

Other Unintended Outcomes and Impacts

61. **As already indicated, the project has generated several outcomes and impacts that are not included in the PDO but do add to the efficacy and efficiency of the project.** Additional to what is mentioned earlier and above the scope of the PDO, the project had unintended impacts related to (a) the increase in productivity of gravel mining in the RDP, (b) increase in awareness of the communities involved, (c) improvement in the level of trust between communities and authorities responsible for flood risk management, (d) the adoption of nature-based solutions, and (e) international exchange of experiences and promoting the use of best practices in other countries.

III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

A. KEY FACTORS DURING PREPARATION

62. **A key factor during preparation has been the implementation of the EFRP (US\$500 million with a World Bank loan of US\$200) that allowed for the preparation of the ORFPP.** This project allowed the

²³ Yu, W. 2020. *The Leveraging Potential of Public Investments in Flood Protection: The Case of Wrocław, Poland*. Washington, DC: World Bank. 31 pp.

²⁴ Hallegatte, Stephane, Adrien Vogt-Schilb, Mook Bangalore, and Julie Rozenberg. 2017. *Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters. Climate Change and Development*. Washington, DC: World Bank.



World Bank's team to conduct extensive reconnaissance of the institutional frameworks in place, capacity of the staff, and technical and financial requirements for project implementation.

63. **Intensive consultations with stakeholders had a strong impact on the preparation of the project components.** Since January 2002, a series of public meetings were held to discuss various aspects of the project with the affected population and also seek ideas and advice for mitigating negative environmental and social effects of the project and develop a pragmatic and effective resettlement plan. The consultation strongly affected the design of the RDP, considering stakeholders' objections to the idea of designing a multifunctional retention area that could also be used for generation of electricity and water supply.

64. **A key factor during preparation was the accession of Poland to the EU (May 1, 2004) as well as the international coordination between the Czech Republic and Germany in the ICPO.** As a consequence of the accession process, Polish law needed to be adapted, including harmonization of the environmental law with the relevant EU directives. These transposed Polish laws required preparation of a detailed Environmental Impact Assessment (EIA) for issuing a construction permit for the major components of the project. Therefore, it was decided to prepare the required EIAs together with the detailed designs and the bidding documents during implementation. An agreement within the ICPO led to the development of the *Oder 2006 Program* for Poland, including flood risk management.

65. **Collaboration with the CEB and the EU Cohesion Fund leveraged additional funding needed to implement the project and achieve the PDO.** The World Bank's involvement in the EFRP and preparation of the ORFPP allowed for mobilization of funds with a total of €204.66 million and €340.56 million from the CEB and EU Cohesion Fund, respectively.

B. KEY FACTORS DURING IMPLEMENTATION

66. **Several factors affected implementation.** Some factors resulted in a delay of implementation, while others were key factors for the success of the project.

67. **The start-up phase took about three years, which was longer than foreseen.** This was mainly caused by complications in establishing the required institutional framework and governmental organization. A main driver for this delay was the change of government just after initiation. After being established as a non-autonomous agency (auxiliary) under the National Water Management Authority in October 2007, the PCU became fully operational by the end of 2008 to perform its project-related tasks, including the establishment of PIUs in Raciborz and Wrocław. Two years later, the PCU as an auxiliary entity was liquidated and replaced by the autonomous Odra River Basin Flood Protection Project Coordination Unit (ORBFP-PCU), with own budget to be approved by the Ministry of Finance and with well-defined hierarchies and functions for its staff and the staff of the PIUs. The ORBFP-PCU started operations in January 2011. From 2011, the pace of project progress accelerated significantly.

68. **Preparing the final design and getting environmental and construction permits took longer than could have been expected.** The main cause for this was the change in policy and legal environment induced by the EU accession process. During project preparation, these potential complications were identified; however, it is reasonable to state that the high complexity and the numerous consequences of the additional requirements for the final designs and permits could not have been foreseen to their fullest extent. The project was approved based on prefeasibility studies completed in 2003. The final designs for major construction contracts were expected to take place during the initial implementation years.



However, after the complications with establishing a functional PCU, it took more than three years to complete the final design studies, and based on these the PIUs obtained construction permits. There were problems with the property rights of the initial designs, a time-consuming hurdle for project preparation in Poland. Additionally, changes needed to be made to adhere to the requirements of the WFD (Directive 2000/60/EC), the FD (Directive 2007/60/EC), and Directive 2011/92/EU concerning the assessment of effects of public and private projects on the environment. Adoption of EU policies and regulations took time to be replicated in Poland's policies and related laws, which then needed to be taken into account in the final designs and contract implementation; for example, the already conducted EIA procedures had to be repeated, designs had to be reviewed and in some cases revised, and the previously existing environmental documentation had to be updated and adapted.

69. **Because of the delays, recruitment of contractors for both the RDP and WFS contracts started only in or after 2012 with newly defined completion dates, September 2017 for the RDP and December 2017 for the WFS.** In June 2013, the contract for the construction of the RDP was signed with a completion date set for 2017. However, the construction contract was terminated in November 2016 because of breach of contract, with less than 50 percent progress in construction works.²⁵ Recruitment of a new contractor took just over a year, until November 2017 when the new contractor signed its contract with a completion date set for May 2020 and making the RDP operational in January 2020.

70. **During implementation of the works for the WFS, the leader of a joint venture responsible for contract of Subcomponents B2–4.2 was declared bankrupt.** The impact on the project was not significant. The Wrocław PIU handled this in a prudent manner and adapted, in coordination with the World Bank, the contract to enable members of the contracted joint venture to continue with the implementation of the works.

71. **Time overruns were the result of the extremely complex resettlement process ensuring proper compensation of PAP in line with Polish regulations and World Bank standards.** The process also needed to manage strong diverging interests and find compromises fitting stakeholders' economic, environmental, and social interests. In parallel, contracts for the RDP resettlement action plan were implemented as planned, including construction of all basic infrastructure for the new village (Nieboczowy) for the resettlement of PAP. This process included around 700 individuals belonging to about 250 households.

72. **A factor that significantly contributed to the success of the project was the relative stability in the project's organization.** Changes in government placed pressure on positions in the project's organization. However, there were no changes in the position of the Director of the PCU between the start of the project and the beginning of 2020. This offered stability in the institutional organization and was a key aspect for the project's success.

73. **Another key factor for successful implementation of the project was the growing interest and active participation of the different stakeholders in the implementation of the project.** Even though collaboration was difficult in the initial phase of the project with strong opposition to the RDP, good communication, transparency on compensation, and thorough project management led to growing

²⁵ During the selection procedure, the PCU advised against contracting the company with the lowest responsive bid. This advice was based on the company's financial stability and litigation history. However, the applicable World Bank procurement guidelines did not allow for disqualification of bids on such grounds alone.



understanding of the necessity of the intervention and trust in proper arrangements being in place to compensate the people affected. The fact that this project was supported by the World Bank also helped gain stakeholders' trust and open paths for collaboration. Stakeholders have indicated that the World Bank's technical expertise and open communication combined with the availability of information were success factors for good collaboration. Added value of the support received from the World Bank was crucial for the implementation of interventions. The thorough project organization with the Project Working Committee, the Project Steering Committee, and the Advisory Committees facilitated collaboration with and between local and central authorities and development of a shared understanding of the project's objectives. In total, 4 ministries and 24 central and local government institutions were engaged in its implementation.

IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

A. QUALITY OF MONITORING AND EVALUATION (M&E)

M&E Design

74. **The design of the M&E was based on a strong systemic approach grounded on extensive state-of-the-art modeling and detailed analytical work.** Based on the results of the hydraulic modeling performed during preparation and repeated periodically during implementation, design requirements for the different works were identified. In the preparation phase, conceptual designs were prepared, and parameters were evaluated taking into consideration the interoperability of the different components (rivers, canals, sluices, weirs, and so on) while using the discharges of the event of 1997 to test the performance of the designed water system. Choosing the 1997 discharge as design flood was a clear political statement ensuring that such an event should never occur again.

75. **This led to the identification of a clear set of design parameters for the infrastructural works and the required nonstructural interventions to enable safe discharge of the peak as occurred in 1997.** The systematic and integrative approach made clear that only infrastructural works would not be sufficient but also nonstructural interventions were needed to ensure timely and proper O&M of the system. Therefore, the M&E design also included indicators to monitor progress on and evaluate the improvement of the flood early warning system, increased institutional capacity on O&M as well as the capacity to develop flood risk management plans, and implementation of the RAP and EMP. In comparison, measuring the success of the Room for the River program in the Netherlands and the protection of the city of New Orleans in the United States is based on the level of completion of works designed for the required flood return period in combination with institutional and technical capacity to ensure proper operation of the built infrastructure.

76. **The PDO indicator and intermediate indicators were further clarified in October 2017.** The targets for the indicators were defined as 'Full protection against floods of the 1997 magnitude between Raciborz and Wrocław city' for Component A and 'Full protection of Wrocław against floods of the 1997 magnitude' for Component B. These were linked to the full completion of the works included in Components A and B. Component C's indicator was defined as 'Improved flood forecasting and better linkage of forecaster and communication with flood management' with the target to achieve 'Established institutional and communication setup for operation of various structures in the system'. To ensure that the implementation of Components A and B conformed to World Bank standards, Component D was to



assess the implementation of the RAP design of infrastructure and construction completion on time. For flood risk reduction projects that are based on a systemic integrated approach grounded on thorough modeling and analytical work, the combination of targets set for the completion of structural and nonstructural interventions is a proper way to measure the level of PDO achievement. Therefore, it is reasonable to say that M&E was well designed, allowing for thorough progress assessment during project implementation.

M&E Implementation

77. **The project M&E work was conducted by qualified staff as agreed with the World Bank**, and these staff undertook continuous monitoring, analysis, and reporting on outcome and intermediate indicators regarding the project's progress. Information on the implementation of subcomponents was presented in a concise manner. The PCU submitted quarterly and annual reports on time including information on progress (financial and physical), financial statements, and procurement. The annual reports also included the work plan for the year to come. During the initiation of project implementation, experts from the World Bank supported the beneficiary in the implementation of M&E while the beneficiary developed a robust institutional framework leading to strong capacity to report on and evaluate progress. This capacity was clearly displayed in the high-quality progress reports delivered by the GoP.

M&E Utilization

78. **M&E was appropriately used by the World Bank and CEB project review missions.** The Implementation Status and Results Reports prepared by the World Bank's task team provide a good overview of the progress during project implementation. Missions were used adequately to review progress, discuss delays, and agree on next steps. A midterm review of the project was conducted in 2011, providing a good overview of progress and recommending next steps. The midterm review indicated a potential risk for project delays, but signals were not sufficiently strong to adopt planning of the project.

Justification of Overall Rating of Quality of M&E

79. **The rating of the quality of M&E is Substantial.** The design of the M&E was tailored for the characteristics of a flood risk management project. M&E during implementation ensured that there was a good understanding of where the project was and allowed for proactive interventions meeting the challenges that occurred along the way. The quality of the reporting was good, and the beneficiary had developed a robust institutional capacity to carry out and use M&E.

B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

80. **During the appraisal and at the individual stages of implementation and completion of the ORFPP, 7 out of 10 social and environmental safeguard policies of the World Bank were applicable:** (a) OP/BP 4.01 (Environmental Assessment), (b) OP/BP 4.04 (Natural Habitats), (c) OP/BP 4.36 (Forests), (d) OP/BP 4.11 (Physical Cultural Resources), (e) OP/BP 4.12 (Involuntary Resettlement), (f) OP/BP 4.37 (Safety of Dams), and (g) OP/BP 7.50 (Projects on International Waterways).



Environmental and Social Compliance

81. **The principles of OP/BP 4.01 (Environmental Assessment) were applied to all works contracts.** The likely environmental impacts were typical and atypical, diverse, and frequently irreversible. In several cases, works had to be carried out in legally protected areas. For each contract, contract-specific EIA procedures were conducted separately. In most cases, the environmental impacts could be mitigated and, where needed, effects were compensated (see annex 5 for detailed description in the beneficiary's ICR). All mitigation and compensation measures, together with monitoring measures, were described in an EMP and agreed upon by the World Bank. The EIA and EMP preparation procedures were carried out with the participation of the interested local communities. These documents were widely consulted and incorporated the local communities' comments and suggestions at each stage of these processes. The produced documents were made publicly available.

82. **OP/BP 4.04 (Natural Habitats).** The principles of this policy were complied with for all works contracts carried out under Subcomponents A1 and A2 as well as B1, B2, and B3. On all contracts, it was necessary to use special procedures to ensure that the principles of this policy were properly applied.

83. **OP/BP 4.36 (Forests).** The principles of this policy were complied with for all works contracts carried out under Subcomponents A1 and A2 as well as B1, B2, and B3. On all contracts, it was necessary to fell trees and/or remove shrubs. These were compensated for in other areas in accordance with the principles of the policy.

84. **OP/BP 4.11 (Physical Cultural Resources).** The principles of this policy were complied with for all works contracts carried out under Subcomponents A1 and A2 as well as B1, B2, and B3 at the stage of preparation of the contracts and during their execution by providing ongoing archaeological and conservator's supervision. As part of the implementation of Subcomponent A2, 13 wayside shrines and conciliation crosses were relocated from the RDP area and reinstalled in the new village of Nieboczowy at places of religious worship (the church and chapel), preserving the historically valuable original elements of them.

85. **OP/BP 4.12 (Involuntary Resettlement).** One of the greatest challenges in the implementation of the safeguards in the project was to reconcile the regulatory framework applicable in Poland, including EU laws, with the requirements arising from OP 4.12, Involuntary Resettlement, especially given that there were significant differences in this respect regarding land acquisition for construction purposes. Where differences were found between Polish legislation and the provisions of OP 4.12, it was necessary to apply principles more favorable to PAP. The principles of this policy were applied to the works contracts carried out under Subcomponents A1 and A2 as well as in two cases under Subcomponent B1. To implement Component A, the dedicated Subcomponent A2 was separated out to efficiently carry out involuntary resettlement of the residents of the two villages located within the dry polder basin.

86. **OP/BP 4.37 (Safety of Dams).** The principles of this policy were complied with for all works contract carried out under Subcomponent A1. An international panel of experts was established to monitor and evaluate the civil works as well as the operation and monitoring plans prepared for the new installations.

87. **OP/BP 7.50 (Projects on International Waterways).** The principles of this policy were complied with and taken into consideration. The project was discussed bilaterally with the Czech Republic and



Germany. Letters to notify the riparian states and the Odra Commission, advising them of the project scope, design details, and possible environmental impact, were sent on June 10, 2005. Both Germany and the Czech Republic responded to the notification stating (through their letters of July 15, 2005, and July 11, 2005, respectively) that the works foreseen in the project are also elements of the international flood protection program that were coordinated with the Odra Commission.

88. **Within the framework of the project, a grievance redress mechanism was put in place with regard to environmental and social issues.** There are no outstanding environmental issues submitted within this mechanism. As far as social issues are concerned, there are still over a dozen cases pending (as of November 2020), which are associated with, among others, the need to complete the process of compensation payments. Due to the lengthy administrative and court procedures applicable in the Polish legal system and because of the uncertain legal status of some of the acquired properties, including unresolved inheritance cases by the entitled persons, these cases still need to be resolved. In all these cases, funds necessary for the payment of compensation were secured to be made available following the final decisions/rulings of public administration bodies. Moreover, some formal and legal issues are yet to be resolved with respect to the state treasury-owned plots where, owing to the water management reform in Poland, the managing entity has changed. These issues have no impact and importance for private individuals residing within the project impact area.

Fiduciary Management Compliance

89. **The planning and budgeting, accounting, internal control, cash flows, financial reporting, and findings of audits of the entities responsible for the implementation of World Bank-supported activities were appropriate.** Records were kept of the contracts and payments. Financial accounting support for the contracts performed under the ORFPP was provided through a dedicated software program allowing users to connect with the central SQL database located on the PCU's servers. All the changes made by the implementing agencies could be seen immediately at the PCU.

90. **The implementing agencies were obliged to promptly submit to the PCU reports on payments made in electronic form and in the form of tabulated statements of expenditures on a monthly and quarterly basis.** Based on the data received from the implementing agencies, the PCU prepared summary financial statements and quarterly interim financial reports, using the computerized management information system. The project's annual financial statements were used for the project's audit by the Supreme Audit Office (SAI). The project used the existing internal control procedures for verification, authorization, accounting, and payment in line with Polish public finance law. The project's financial statements, including the project's expenditures from all the financing sources and made by all the implementing agencies, were subject to external audits conducted by the SAI. Annual audits of the project's financial statements were provided to the World Bank within six months after the end of each fiscal year. The GoP publicly disclosed the audit reports on the project (PCU) website within one month of their receipt from the auditors and the World Bank's acceptance of these reports. The SAI will conduct a final audit for 2020.

91. **The project implementation has known significant challenges on the way including sometimes cumbersome and prolonged budgetary transfer of funds procedures** which affected flow of funds to the implementing entities and caused temporary delays in payments and additional workload due to reorganizations. However, because of good cooperation and coordination between the PCU, PGW WP, involved ministries and the World Bank, appropriate approaches were found to face the challenges.



92. **The overall procurement performance under the project was Satisfactory.** The PCU and the PIUs had adequate experience and capacity to manage the procurement processes in accordance with the World Bank's procurement guidelines. Throughout the project implementation period, the World Bank conducted several procurement trainings and workshops to further strengthen the PIUs' knowledge on the World Bank's procurement policies and procedures, as well as contract management aspects. The PIUs managed large-value contracts in an effective manner using modern contract management tools and alternative dispute resolution mechanisms for timely and efficient claims settlement. The PCU and PIUs followed the World Bank's procurement guidelines diligently. The SAI conducted procurement post reviews under the project on annual basis and no major issues were identified during the project's implementation.

C. BANK PERFORMANCE

Quality at Entry

93. **The World Bank's team conducted several missions with its experts and specialists to Wrocław and Raciborz.** These missions were integrated in the program of the EFRP to gather the information required and have the discussions needed to prepare the investment project. Where necessary, more detailed studies were carried out and consultants were contracted to assist in the preparation of the information needed.

94. **Highly experienced World Bank experts in technical, social, and environmental aspects as well as in finance and procurement provided timely advice to project management.** Support was also provided to properly manage public procurement processes and prepare the EMPs and RAPs. During the preparation and implementation of the project, the World Bank's team actively responded to any needs reported by the PCU.

95. **From the start of the project, the World Bank organized the necessary trainings to strengthen capacity on implementation arrangements and fiduciary aspects.** These trainings included a broad range of aspects from financial and economic aspects to environmental and social safeguards. Because of a delay between appraisal and implementation, capacity of the beneficiary's organization decreased while for implementation a broader group of staff needed to be trained. Support of the World Bank at this stage was perceived as crucial and of high quality. Ongoing training and sharing of expertise and knowledge led to the development of capacity that ensured successful project implementation compliant with World Bank standards.

96. **The World Bank's global expertise enabled the project to manage the challenges related to the high complexity of the project, strong opposition from stakeholders, and low capacity of the authorities responsible for water management.** The good collaboration between international and local World Bank experts provided a solid basis to prepare a project of high importance for Poland in the recovery from the floods of 1997 and reduce the risk of repetition. This solid expertise was also crucial in convincing the beneficiary of the added value of the World Bank and to agree to the high standards of the World Bank.

Quality of Supervision

97. **During implementation, the World Bank's team conducted regular, about every half a year, missions with its experts and specialists.** If necessary, ad hoc missions were held, combined with technical



visits to the construction sites and the offices of the PIUs and PCU. From the World Bank side, teams were mobilized to address all relevant project aspects, including technical aspects, social and environmental safeguards, and M&E. These regular visits helped identify problems in the implementation early and find proper solutions. Moreover, independent of these activities, the International Dam Safety Panel of Experts (IPE) provided advice aimed at supporting the design and construction of the dam and embankments of the RDP. The IPE conducted several independent missions and provided official opinions and reports on the detailed designs prepared for the RDP.

98. **The Polish Government highly valued the World Bank’s support during the implementation.** The Polish Ministry of Finance perceived the World Bank as a ‘knowledge bank’ bringing unique added value for the design quality and execution effectiveness (beyond what consultants or other financiers could provide). Between 2009 and 2015, the task team conversed annually with the Polish Minister of Finance who initially expressed skepticism about the project and the chances that the World Bank would be able to assist the Polish water administration toward successful completion. This opinion shifted by 2012 as disbursement progressed. In 2014, when the follow-up OVFMP was being prepared, and EIB proposed to take over and finance a large part of it, the minister declined that offer despite the EIB’s lower interest rate indicating that “the value of the quality of the advice and supervision that the Bank can provide leads to a lower net capital cost.”

99. **Other stakeholders also perceived the quality of the supervision provided by the World Bank as high and the support of the World Bank as a critical success factor.** A questionnaire was sent to a selected group of stakeholders²⁶ to receive feedback on the role of the World Bank in relation to technical support, innovation, communication, and stakeholder engagement. The responses indicated that the stakeholders perceived the quality of the experts as high. The support of the World Bank on communication was crucial in ensuring that all involved stakeholders were informed on the progress and next steps as well as consequences of the planned interventions. The World Bank’s role in communication and stakeholder engagement led to growing trust among directly affected people and interested actors. The stakeholders indicated that in most cases, technical issues during implementation could be solved during supervision missions, thus limiting delays. The IPE, specialists in dam constructions, made a huge impact on the final shape of the dry polder, especially on the materials used for the dam and the spillway structure, sharing their expertise and reviewing designs and progress reports as well as the O&M plan for the RDP. During a series of World Bank missions, technical experts with a broad range of expertise were able to acknowledge issues related to implementation and were able to provide valuable ideas on ways to go ahead. The beneficiary and stakeholders acknowledged that the World Bank’s technical expertise contributed significantly to the final success of the project.

Justification of Overall Rating of Bank Performance

100. Based on the above, the overall rating of World Bank Performance is Satisfactory.

D. RISK TO DEVELOPMENT OUTCOME

101. **The country has suffered, and still suffers in other regions, from extreme damage caused by floods, while the Flood Management and Water Security agenda remains a priority for the Government.** Especially the flood of 1997 had a high impact on the region’s and country’s economic development.

²⁶ Lubomia Commune, Ministry of Finance, PGW GP, PCU, PIUs, and consultants (AECOM/SWECO).



Investments to reduce risks have been significant over the last decade, and the country has shown its dedication to continue with the improvement of flood risk management in the ORB as well as in other basins. This is also shown by the commitment of the GoP to continue with the follow-on project on flood management for the Odra-Vistula to add to the development outcome of the ORFFP. Furthermore, the FD requires an update of the flood risk management plans for the river basins after every six years. At this moment, Poland is in the process of preparing the deliverables for the second cycle. More recently, the Government has also signaled its overall interest in thinking about Poland's long-term water security in the context of increasing climate variability, leading to droughts and floods, thus further consolidating and expanding the institutional work launched under the project.

102. The project's nonstructural measures support long-term sustainability and impact of the development outcome. The integrity and strength of the infrastructure is ensured through continuous quality control of the performance of the new structures. Capacity of the organization has improved to monitor effectiveness of the infrastructure and adapt, where needed, to maintain flood risk safety. With the flood management center, the flood forecasting system, the broad stakeholder participation, and other nonstructural interventions, the capacity has significantly increased to respond in an integrated manner in the face of floods. During implementation, the involved institutions have learned and evolved because of knowledge sharing and experience. This has helped the beneficiary overcome challenges during implementation and has added value for the follow-on project (OVFMP) under implementation. Increased awareness has also increased redundancy, giving more attention to the concept of multiple safety levels including (a) reducing probability of flood risks, (b) flood awareness in spatial planning and land use, and (c) increased preparedness in the case of an extreme event.

103. The GoP has allocated the necessary financial and technical resources to properly operate and maintain the new infrastructure. The allocation of budget and the ongoing efforts to hire and train the personnel required to operate and maintain the works and continue and further improve planning and issuing timely flood warnings are a clear sign of the Government's commitment to the project's objective. The non-infrastructure interventions have led to strong institutionalization of the responsibilities to manage risks. For all civil works, requirements for O&M have been documented. For the RDP, the O&M document has been reviewed by the IPE, leaving the beneficiary with recommendations to ensure optimal functioning of the infrastructure. During October 2020, discharges in the Odra increased due to floods, and the RDP functioned as intended under the Polish institutions' responsibility.

104. While the RDP was constructed, the mining of gravel proceeded as foreseen at appraisal. As a result of the extraction of gravel, in 30 years the total volume of the reservoir will increase to 270–300 million m³. A large part of this volume will be permanently filled with water because of interaction with groundwater. Nevertheless, the operational volume to retain peak floods will possibly increase to a maximum of 200 million m³, providing additional volume to further attenuate flood risks in the area downstream of the RDP.

V. LESSONS AND RECOMMENDATIONS

105. There is high added value in engaging with advanced beneficiaries on complex issues to learn lessons that can be carried over to other regions. Working on this project allowed the World Bank to develop a state-of-the-art approach to reduce flood risks. This knowledge and the approach applied are already transferred to other projects in Poland and abroad, especially in East Europe. This collaboration



has been the basis for a series of exchanges with other beneficiaries, and specific aspects like the resettlement program have been presented and flagged as best practice during international events. This project has strengthened capacity in Poland and assisted in the development of similar programs in neighboring countries with a comparable culture on water management. This has also improved the region's capacity to adhere to the water directives of the EU. The strong involvement allows the World Bank to transfer its global knowledge and expertise related to technical, social, environmental, and governance aspects to strengthen the sector and improve the region's water security.

106. **Using limited IBRD resources to leverage (and lead) a much larger financing consortium is an effective way to increase impact and build country systems and capacities in advanced clients.** The collaboration with the co-financiers (CEB and European Commission) has taken effort in preparation and during implementation to align expectations, objectives, and procedures and discuss questions and issues as they arose. However, this has enhanced effectiveness in implementing this complex project as it allowed to strengthen the World Bank's position in instances where the borrower felt inclined to deviate from agreements and best international practices. It has also helped speed up convergence of the national systems (notably on environment, river basin management, procurement and financial transparency, safeguards, economic analysis, and so on) with those of the EU that, in turn, are generally equivalent to the World Bank's and that will remain directive in the country after the World Bank has withdrawn. Operationally, the availability of three different financing sources proved critical to secure financial liquidity, lower capital cost, and maintain good relations with contractors owing to timely invoice payment during most of the implementation (EU convergence funds are paid only after works completion, CEB funds can be provided as annual advances, and World Bank funds can be furnished as partial advances).

107. **Straightforward engagement with citizens is a key to successful resettlement and project implementation.** Creating a dedicated platform for structured dialogue with local mayors, citizens, and businesses to engage in the development of the project, including clear financial propositions and guarantees for land acquisition and resettlement, resulted in trust and broad support for the interventions, especially the resettlement of about 250 families in the Raciborz area. At the project's onset, the project met with hostility due to opaque and unreliable communication by the PIU. The project proved instrumental to introduce new, more transparent (and EU-compliant) procedures in the safeguard practices of the water authorities. Additionally, the structured dialogue with the citizens supported open communication through workshops, hearings, newsletters, blogs, and videos improving the understanding of the objectives of the project. Complaints were handled in a timely and thorough manner and the added value of the World Bank has proven critical in bringing together the different stakeholders. The beneficiary has proven to function as a learning organization applying the knowledge shared by the World Bank experts. Citizen's engagement in flood risk management projects was a completely new experience in Poland, but lessons learned have been applied in other projects in Poland already.

108. **Flood risk management and waterfront development offer opportunities to leverage private investment as flood protection and hydraulic engineering projects can be designed to catalyze spin-off benefits.** The project was fully financed with national public funds solely aimed at flood protection (limiting itself to the 'water sector'). However, the infrastructure works allowed the city of Wrocław to add parallel investment for enhancement of boulevards, parks, and boating facilities along the river; restoration of the riverside of historical monuments; and improvement of bridges and city access corridors (for example, over the Widawa). At other locations, the river training works allowed to enhance nature values through fish passages, construction of underwater islands as habitats for fish and birds, and bank lines with natural shapes enhancing biodiversity. The study on 'Leveraging Potential of Public Investments



in Flood Protection: The Case of Wrocław' provides clear evidence on the impacts of these investments on the urban environment along the river corridors and how this has contributed to the growing tourism industry in the city as well as numerous small businesses (for example, restaurants and commercial establishments). This increased the land value and invited new investments in real estate. As it is difficult to quantify these indirect economic impacts, additional research is needed to identify opportunities for private investment to become involved in flood financing.

109. **The World Bank's procurement guidelines are generally effective but will benefit from new instruments to suit large complex works.** The World Bank's procurement guidelines for large works and large consultant services were time-consuming in preparation but over the long run proved transparent and effective: decisions on contract awarding (or retraction) were rarely challenged and were different from contracts under the national local system. The guidelines were initially resisted by the PIUs but in the end, were valued. Nonetheless, three observations need consideration:

- First, in two cases of large contracts, the award decisions of the Output-and Performance-Based Road Contracts favored the bidder against the recommendation of the PCU and task team leader, yet serious problems arose during contract execution, which in one case led to contract termination (RDP). In both the PCU and task team leader recommendations, the issues raised were the realism of the WFS works and the financial stability and litigation history of the company that presented the winning bid for the RDP.
- Second, this type of large complex works packages would benefit from more flexibility in contract types, including design and build contracts based on performance specifications (rather than quantity-based bidding documents). This would enable beneficiaries to optimally employ the design and implementation expertise of firms to achieve the PDOs while decreasing costs. Combining different works and phases of implementation has the potential to reduce delays in tender procedures, reduce implementation time, and make optimal use of contractor equipment and resources. Such instruments are increasingly common in large works tenders across Europe and in many emerging economies.
- Third, during implementation it became clear that the tender procedures should include a provision that allows disqualification of financial bids if they are significantly lower compared to other bids without proper clarification of the price difference. Lately, across Europe numerous instances were found where contractors issue bids below cost, causing excessive delays and malperformance.

110. **Involvement of the SAI for financial audit and ex post procurement review has contributed to better accountability and governance of the project.** As an independent audit body, the SAI has a constitutional mandate to audit the accounts of the central government and extra-budgetary funds and report back to the Parliament and inform the public. Relying on country systems for external audit is the World Bank's default position supporting building capacity, accountability, and transparency. Experience with the financial audit and procurement ex post reviews carried out by the SAI has been widely shared within the World Bank and in other countries during study tours and peer-to-peer meetings organized to build the capacity of SAIs in other countries.



ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: To protect the population in the ORB against loss of life and damage to property caused by flooding

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Reduction in area flooded, damages avoided and lives saved due to floods of various magnitudes and return periods	Text	<p>The hectares that were affected during the 1997 flood: About 485 000 ha.</p> <p>The value of assets lost during the 1997 flood: 14,0 billion PLN (including flood fighting costs).</p> <p>People died during 1997</p>	Reduction of flood peaks through storage and increased flood carrying capacity	Full protection against floods of the 1997 magnitude. The hectares that will be affected: 0 ha. The value of assets that will be lost: 0 PLN. People who will die: 0	<p>Measured as construction progress until project is fully finished:</p> <p>B1, B2 and B3 contracts are completed and delivering flood protection benefits.</p> <p>The contract for the construction of the Raciborz polder (contract A1-4) is completed.</p>



		flood: 57			
		05-Jul-2007	31-May-2014	30-Jun-2020	12-Jun-2020
<p>Comments (achievements against targets): As confirmed by state-of-art modeling the project infrastructure will allow to discharge floods such as the 1997 without causing inundations, damage to assets or human loss in the project area. The required combination of structural and non-structural interventions to achieve the PDO have been implemented fully.</p>					

A.2 Intermediate Results Indicators

Component: Construction of Raciborz Flood Retention Reservoir

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Component A. Reduction in area flooded, damages avoided and lives saved in cities and settlements between Raciborz and Wroclaw city	Text	<p>Area flooded during 1997.</p> <p>The hectares that were affected during the 1997 flood between Raciborz and Wroclaw: About 475 000 ha.</p> <p>The value of assets lost during the 1997 flood between Raciborz and Wroclaw: 9.0 to 9.2</p>	area flooded during different return periods	<p>Full protection against floods of the 1997 magnitude between Raciborz and Wroclaw city. The hectares that will be affected: 0 ha. The value of assets that will be lost: 0 PLN. People who will die: 0</p>	<p>Measured as construction progress until project is fully finished:</p> <p>The contract for the construction of the Raciborz polder (contract A1-4) is completed.</p>



		billion PLN (including flood fighting costs). People died during 1997 flood between Raciborz and Wroclaw: 54 05-Jul-2007	31-May-2014	30-Jun-2020	12-Jun-2020
Construction completion and expenditures	Text	0.00	1.00		Physical construction progress: A1, A2 & A3: 100 %

Comments (achievements against targets):

Component A has been completed for 100% and civil works are functioning as expected. A total area of about 1145 ha was acquired permanently for the purpose of the construction of the dry polder. This land was acquired by PGW WP RZGW Gliwice on a priority basis. The dry polder area is 26 km², the length of the embankments around the dry polder is 22 km, the maximum height of the earthen embankments – 11.1 m, whereas the water storage level is 9.0 m. The maximum storage elevation is 195.20 m a.s.l. With this the RDP has a storage capacity of 185 Mm³ as required to properly regulated discharges during a flood that is comparable to the event in 1997.

Component: Modernization of Wroclaw Floodway System

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Component B: Full protection	Text	Area flooded during	Area flooded during	Full protection against	Measured as



to Wroclaw city against flooding.		<p>1997 floods.</p> <p>The hectares that were affected during the 1997 flood in Wroclaw: About 9 000 ha.</p> <p>The value of assets lost during the 1997 flood in Wroclaw: 4.23 billion PLN (including flood fighting costs).</p> <p>People died during 1997 flood in Wroclaw: 0</p> <p>05-Jul-2007</p>	<p>different return periods</p> <p>31-May-2014</p>	<p>floods of the 1997 magnitude in Wroclaw. The hectares that will be affected: 0 ha. The value of assets that will be lost: 0 PLN. People who will die: 0</p> <p>30-Jun-2020</p>	<p>construction progress until project fully finished:</p> <p>B1, B2 and B3 contracts are completed.</p> <p>12-Jun-2020</p>
Construction completion and expenditures	Text	0.00	1.00		<p>Physical construction progress:</p> <p>B1, B2 & B3: 100 %</p>

Comments (achievements against targets):

Component B has been completed for 100% and civil works are functioning as expected, including:

Subcomponent B1 – for the rehabilitation of levees & channel protection four contracts were carried out between 2012 and 2014 to improve and construct flood embankments in and around Wrocław, including the (re)construction of associated infrastructure and service roads. Subcomponent B2 - In 2012 four works contracts were completed including the improvement and construction of retaining walls, channel widening, hydraulic structures. In 2015



the Boulevards of the Śródmiejska Odra River were modernized channels in the WFS were excavated and expanded including the construction of other hydraulic structures. Under subcomponent B3 the Widawa channel was widened to increase its discharge capacity and embankments were constructed.

Component: Project Management Technical Assistance and Training

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Component C: Improved flood forecasting and better linkage of forecaster and communication with flood management	Text	Status of forecast and communication during 1997 floods. No linkage between flood forecasting and management system 20-Jul-1997	These activities are successfully completed and indicators have been fully achieved. 31-May-2014	Established institutional and communication setup for operation of various structures in the system. 30-Jun-2020	These activities are successfully completed and indicators have been fully achieved. 12-Jun-2020

Comments (achievements against targets):

Component C has been implemented and improved flood forecasting and better linkage of forecaster and communication with flood management.

Under Component C the flood protection system and the system of hydro-meteorological forecasting (SMOK) were improved. Over the years 2009 – 2018, the Institute of Meteorology and Water Management (IMGW) carried out activities related to the implementation of quality control systems for hydro-meteorological measurements, the expansion of the functionalities of the Client Service System (CSS), the implementation of the Central Historical Database, and the development of quality control algorithms for hydro-meteorological measurements and hydrological forecasts. The full functionality of these systems was achieved in 2014. All modules of the system were used productively by IMGW. Under Component C, the PCU also undertook activities aimed at identifying new projects. In 2013 the Concept Notes were prepared for the Bank’s appraisal of three new flood protection projects: (i) the upper



Vistula basin; (ii) the Nysa Kłodzka valley; and (iii) the Middle and Lower Odra. This led to the signing of the Loan Agreement between the Republic of Poland and the IBRD on September 10, 2015 to co-finance the Odra-Vistula Flood Management Project (€460 million). The PCU also monitored on a regular basis the activities associated with the implementation of the Resettlement Action Plans (RAPs), with special attention to the construction of the new village of Nieboczowy and the process of land acquisition by the Lower Silesian Board for Amelioration and Hydraulic Structures (DZMiUW).

Component: Improving Flood Management, Monitoring & Evaluation and Supervision of EA, EMP and RAP

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Component D: Implementation of RAP design of infrastructure and constructions completion on time.	Text	Not yet due 20-Jul-1997	All RAP prepared 31-May-2014	Complete constructions of all project facilities. 30-Jun-2020	All RAPs prepared and RAP influenced designs (new village) completed. 12-Jun-2020

Comments (achievements against targets):

Activities under component D have been carried out and lead to improvements in flood management and monitoring and evaluation while implementation of EA, EMP and RAP has been supervised.

Under Component D, the PCU also undertook activities aimed at identifying new projects. In 2013 the Concept Notes were prepared for the Bank’s appraisal of three new flood protection projects: (i) the upper Vistula basin; (ii) the Nysa Kłodzka valley; and (iii) the Middle and Lower Odra. This led to the signing of the Loan Agreement between the Republic of Poland and the IBRD on September 10, 2015 to co-finance the Odra-Vistula Flood Management Project (€460 million).



B. KEY OUTPUTS BY COMPONENT

Objective/Outcome: Full protection against floods of the 1997 magnitude. The hectares that will be affected: 0 ha. The value of assets that will be lost: 0 PLN. People who will die: 0	
Objective/Outcome 1	
Outcome Indicators	Full protection against floods of the 1997 magnitude between Raciborz and Wrocław city. The hectares that will be affected: 0 ha. The value of assets that will be lost: 0 PLN. People who will die: 0.
Intermediate Results Indicators	<ol style="list-style-type: none"> 1. Dry polder design completed. 2. Dry polder built/storage capacity increased. 3. Dry polder resettled (250 families), and RAP implemented. 4. Supervision and contract management carried out.
Key Outputs by Component (linked to the achievement of the Objective/Outcome 1)	<ol style="list-style-type: none"> 1. The dry polder was designed and (2) built (26 km²/many structures/22 km embankment), increasing the storage capacity (185 million m³). 3. All PAP have been resettled (250 families) and the RAP was implemented as agreed. 4. Supervision and contract management was provided.
Objective/Outcome 2	
Outcome Indicators	Full protection against floods of the 1997 magnitude in Wrocław. The hectares that will be affected: 0 ha. The value of assets that will be lost: 0 PLN. People who will die: 0.
Intermediate Results Indicators	<ol style="list-style-type: none"> 1. Dykes/embankments constructed and rehabilitated. 2. Capacity of hydraulic structures and flood bypass channels increased. 3. Widawa transfer system completed. 4. PAP resettled and RPF implemented.
Key Outputs by Component	<ol style="list-style-type: none"> 1. Dykes/embankments are constructed and rehabilitated (59.7 km, structures, fish passages, and so on). 2. The capacity of hydraulic structures and flood bypass channels has been increased (>37.5 km). 3. The Widawa transfer system was completed, achieving a capacity of 3100 m³/s, >41 km of flood embankments; structures, and so on). 4. The PAP were resettled and the RPF implemented.



Objective/Outcome 3	
Outcome Indicators	Established institutional and communication setup for operation of various structures in the system.
Intermediate Results Indicators	<ol style="list-style-type: none">1. Flood management center established.2. Flood forecasting system established and operational.3. Staff trained on flood forecasting system.4. Flood protection and management plans updated, and flood sector project developed.5. M&E carried out and project's impact assessed including the implementation and monitoring of the EMP and RAP.
Key Outputs by Component	<ol style="list-style-type: none">1. Flood management center was established.2. Flood forecasting system was established and is operational.3. Staff is trained on flood forecasting system.4. Flood protection and management plans are updated, and flood sector project is developed.5. M&E was carried out and project's impact was assessed including the implementation and monitoring of the EMP and RAP.
Objective/Outcome 4	
Outcome Indicators	Complete constructions of all project facilities.
Intermediate Results Indicators	<ol style="list-style-type: none">1. Flood protection and management plans updated, and flood sector project developed.2. Follow-on project prepared.3. TA provided, and the PCU and implementing agencies' staff trained on operational matters.
Key Outputs by Component	<ol style="list-style-type: none">1. The flood protection and management plans were updated, and the flood sector project developed.2. A follow-on project was prepared and is initiated.3. TA was provided, and staff are trained on operational matters.



ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION

A. TASK TEAM MEMBERS

Name	Role
Preparation	
Masood Ahmad	Lead Water Resources Specialist and Task Team Leader
Stan Peabody	Lead Social Scientist
Mahwash Wasiq	Operations Officer/Economist
Barbara Letachowicz	Operations Officer - Environmental Engineer
Willem Van Tuijl	Consultant/Water Resources Engineer
Tjaart Schillhorn Van Veen	Consultant/Environmental and Safeguard Specialist
Elmas Arisoy/Salim Benouniche	Procurement Specialists
Iwona Warzecha	Financial Management Specialist
Nicholay Chistyakov	Disbursement Officer
Claudia M. Pardiña Ocaña	Senior Counsel
Hans Juergen Gruss	Chief Counsel
Kathy Sharrow/Rathna Chiniah	Program Assistant
B. Koshie Michel	Program Assistant
Malgorzata Michnowska	Program Assistant
Supervision/ICR	
Berina Uwimbabazi	Task Team Leader(s)
Barbara Ziolkowska	Procurement Specialist(s)
Iwona Warzecha	Financial Management Specialist
Sylvie Ngo-Bodog	Senior Program Assistant
Frederick Edmund Brusberg	Team Member
Andreas Rohde	Senior Water Supply and Sanitation Specialist
Mohammad Ilyas Butt	Procurement Team
Kristine Schwebach	Social Specialist
Winston Yu	Senior Water Resources Management Specialist
Małgorzata Michnowska	Program Assistant
Daria Goldstein	Lead Counsel
Nikola Ille	Environmental Specialist
Javaid Afzal	Senior Environmental Specialist
Dmytro Donets	Procurement Team
Hiromi Yamaguchi	Team Member
Daria Gulei	Procurement Team
Carolina Abigail Delgadillo Medina	Program Assistant
Grzegorz Aleksander Wolszczak	Urban Development Specialist
Irene Rehberger Bescos	Young Professional
Marie Krumova Chapuis	Water Resources Management Specialist

B. STAFF TIME AND COST

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US\$ (including travel and consultant costs)
Preparation		
FY05	49.208	221,589.20
FY06	34.658	120,743.22
FY07	21.080	96,800.75
Total	104.95	439,133.17
Supervision/ICR		
FY07	13.413	71,137.89
FY08	35.955	113,272.70
FY09	30.565	133,724.41
FY10	20.311	126,012.48
FY11	26.375	127,757.28
FY12	25.884	174,116.38
FY13	29.809	195,538.63
FY14	26.042	192,603.49
FY15	14.482	195,209.22
FY16	16.551	153,850.26
FY17	13.258	137,097.32
FY18	25.507	233,914.03
FY19	18.267	151,045.13
FY20	7.413	69,248.94
Total	303.83	2,074,528.16

* For FY21 the total no. of staff weeks is 14.61, and costs is US\$ 106,704.11



ANNEX 3. PROJECT COST BY COMPONENT

The table in this annex presents the project costs (in US\$, millions) per component.

Components	Amount at Approval (US\$, millions)	Actual at Project Closing (US\$, millions)	Percentage of Approval
Construction of Raciborz Flood Retention Reservoir	218.3	486.88	223.03
Modernization of Wrocław Floodway System	253.9	379.95	149.65
Improving Flood Management, Monitoring and Evaluation, and Supervision of EA, EMP, and RAP	27.0	13.7	50.47
Project Management Technical Assistance, and Training	5.8	6.25	107.76
Total	505.0	886.78	175.60



ANNEX 4. EFFICIENCY ANALYSIS

1. Efficiency analysis of the project at appraisal was done through an EFA using incremental CBA methodologies based on the assessment of costs (for 100 percent of total project costs) and benefits in WP and WOP scenarios. Monetized tangible benefits include estimated reduction of flood damages and production of gravel during the life of the project; avoided losses of intangible benefits were assumed at appraisal to be 20 percent of the tangible benefits, assumption kept at the ICR stage. The efficiency analysis at the ICR stage was also done using the same methodologies, same assumptions, and replicated spreadsheet models similar to those used at appraisal though it also included an analysis of design and implementation efficiency. Results of the efficiency analysis undertaken at the ICR stage and the one at appraisal are summarized in table 4.1.

Table 4.1. Efficiency Analysis (at ICR and Appraisal)

	At Appraisal	At ICR
Economic Internal Rate of Return, Project	17.4%	15.1%
Raciborz Dry Polder	16.7%	13.0%
Wrocław Floodway System	16.6%	17.0%
Economic Net Present Value, Project (€, millions)	232.15	139.54
Benefit/Cost Ratio (B/C), Project	1.99	1.62
Raciborz Dry Polder	1.86	1.31
Wrocław Floodway System	2.1	1.96
Project Costs		
Component, Raciborz Dry Polder (€, millions)	202.30	458.79
Wrocław Floodway System (Euro million)	233.90	345.60
Total project costs incl. Design, Supervision, Project Management, M&E, and training (€, millions)	505.00	886.78
Total overrun at market prices	-	76%
Cost overrun at constant 2002 prices	-	48%
Time overrun (years)	-	6

2. At the ICR stage, based on its achievements and incurred costs and expected future benefits and costs as described below, the developmental impact of the project was recalculated and the EIRR, over the same time frame as at appraisal, was reestimated; additional CBA indicators were also calculated, including ENPVs and B/C ratios for both the appraisal and ICR stages. Overall, the project design and implementation efficiency experienced some shortcomings, including significantly more time needed for the preparation of detailed engineering designs for implementation of all components/subcomponents, which resulted in a six-year time overrun and a 76 percent project cost overrun at market prices (48 percent at constant 2002 prices). Time and cost overruns have affected (but not impaired) project viability, that is, the economic rate of return at appraisal was estimated at 17.4 percent while at closing, six years after originally planned, it has been re-estimated at 15.1 percent, still well above the assumed 10 percent opportunity cost of capital in Poland. Component-wise, the RDP's EIRR at the appraisal stage was 16.7 percent and at the ICR stage it was 13.0 percent while those for the modernization of the WFS were 18.1



percent and 17.0 percent, respectively. Also, economic returns, albeit slightly lower than those estimated at appraisal, are still significantly high, with an ENPV of €140 million and an overall B/C ratio of 1.62 at the ICR stage, meaning that the present value of incremental benefits is well above (62 percent) the present value of incremental costs. Sensitivity EIRR for reduction of benefits was performed at the ICR stage; a 10 percent reduction in benefits results in about 1 percent in the EIRR, meaning that the EIRR is resilient to the reduction of benefits.

3. **At appraisal.** The economic evaluation identified as benefits of project activities the protection of the population in the ORB against loss of life and damage to property caused by severe flooding. An incremental CBA methodology for WP and WOP scenarios was used, at constant base 2002 prices, an evaluation period of 30 years, and using investment costs exclusive of tax duties. Under the WP scenario, because of the construction of the RDP and the modernization of the WFS, beneficiaries were expected to experience significantly lower flood damage losses than in the WOP scenario, at various flood severity levels, including a flood severity level similar to that of 1997. The main project benefits, referred to in the PAD as primary benefits, consist of expected reduction in flood annual average damages (AADs), calculated as the difference between the expected flood damages suffered by beneficiaries in the WOP and WP scenarios under various probable flood events.²⁷ For estimating the area inundated, hydraulic simulation models were developed, providing water levels for floods with various return periods. These levels were then overlaid on the topographic conditions (using digital terrain models) to estimate the area inundated WOP and WP. The actual damages of the 1997 flood, together with the modeled areas of various land use categories that were inundated, were used to derive unit rates on a per hectare basis for each land use category. Monetary values on the following kinds of damages were used to estimate the AAD: (a) property and contents of flood damage; (b) damages to public infrastructure and facilities; (c) agricultural production losses; (d) damages to trees; and (e) damages to the environment, land, and livestock.

4. The main assumptions regarding primary benefits at appraisal are outlined in table 4.2, including flood severity, flood probability, and associated annual flood damages under the WOP and WP scenarios. The expected reduction of flood AADs attributable to the project is estimated using the information in table 4.2. Looking forward, it was assumed that the expected reduction of ADD will vary in direct proportion to the growth of Polish GDP, which is found to be a reasonable assumption; that is, the capital invested in residential curtilage and all sizes of industrial, commercial, and touristic assets in the project area that could be subject to flood event damages would grow at the same rate as GDP. A 1.3 percent rate of GDP growth per year was assumed at appraisal to the project primary benefits attributable to the project for the whole evaluation period.

5. The identified secondary benefits attributable to the project at appraisal included extraction of gravel in the RDP project area, which would eventually result in 100 million m³ expansion of the dry polder storage capacity. PLN 20 million per year was assumed to be generated by such activities, growing at the same pace as the GDP. The intangible benefits²⁸ were assumed to be 20 percent of the primary benefits.

²⁷ While a primary benefit of the project is that it will decrease the threat of loss of lives from floods, the economic analysis at appraisal did not include an estimate of this benefit. Thus, the estimated primary benefits, that only include the reduction in AADs from floods, are a conservative estimation of the overall benefits from the project.

²⁸ These are unmeasurable but real benefits that arise from a reduction in negative factors such as stress, alcoholism, suicide rates, fear of floods, loss of control over situation, loss of memorabilia, and health problems as detailed in annex 9 of the PAD.

**Table 4.2. Flood Severity, Flood Probability, and Estimation of Average Flood Damage per Year**

Proximate discharge (m ³ /s)	Flooding probability	Annual Flood Damages (PLN, million)		Reduction in Annual Flood Damage (PLN million)
		WOP	WP	
1000	20.0%	0	0	0
1300	10.0%	559	228	331
1510	3.3%	904	369	535
1735	2.2%	1124	641	483
229	1.3%	5601	1064	4537
2260	1.1%	6049	1126	4923
2485	0.8%	6612	1215	5397
3008	0.5%	8273	2116	6157
3331	0.1%	10595	3496	7099
Expected reduction in Annual Damage (PLN million, 2002 prices)				256

Source: PAD, February 21, 2007, annex 9.

6. The investment costs, exclusive of taxes at constant 2002 prices, in the WP scenario were as outlined in table 4.3. The total investment costs were expected to be about PLN 1,352 million, including PLN 579 million for the RDP and PLN 670 million for the modernization of WFS. The O&M costs for the RDP, when completed, were estimated to be PLN 1.37 million per year, and the O&M costs for WFS were estimated to be about PLN 0.5 million per year. The investment costs in the WOP scenario were assumed to be zero.

Table 4.3. Investment Costs at Appraisal (PLN, millions, constant 2002 prices)

	2007	2008	2009	2010	2011	2012	2013	2014	Total
Raciborz Dry Polder	28.92	51.63	72.29	82.61	82.61	92.94	92.94	74.77	579
Modernization of the Wroclaw Floodway System	33.49	59.81	83.73	95.69	95.69	107.65	107.65	86.60	670
Final design + supervision	5.17	9.23	12.92	14.76	14.76	16.61	16.61	13.36	103
Total investment costs	67.57	120.67	168.94	193.07	193.07	217.20	217.20	174.73	1,352

Source: PAD, February 21, 2007.

7. Based on the above information and assumptions, using a spreadsheet model, a 17.4 percent EIRR was estimated at appraisal, which was verified at the ICR stage. Such estimated EIRR was well above the Polish opportunity cost of capita set at 10 percent. The sensitivity analysis of the EIRR to changes in investments costs was performed at appraisal, finding that the project could withstand 100 percent increases in investments cost without lowering the EIRR to less than 10 percent. Although no ENPV of the project was calculated at appraisal, using the 10 percent opportunity cost of capital and above information and assumptions, the corresponding ENPV is estimated at PLN 854 million at constant 2002 prices, of which, PLN 350 million is contributed by the RDP and PLN 504 million by the WFS (table 4.4). Likewise, B/C ratios have been estimated at 1.86 for the RDP, 2.10 for WFS, and 1.99 for the whole project, respectively.



Table 4.4. CBA Indicators at Appraisal

	EIRR	ENPV (@10% discount rate, PLN million)	B/C ratio
Rachiborz Dry Polder	16.7%	350.3	1.86
Wroclaw Floodway System	18.1%	504.1	2.10
Project	17.4%	854.3	1.99

8. A replication of the appraisal spreadsheet model was used to undertake the CBA at the ICR stage. Key assumptions at appraisal were maintained to obtain comparable results, including the use of constant 2002 prices for investment costs (exclusive of taxes) reported by the PCU for each year during project implementation as outlined in table 4.5. To convert the current prices information reported by the PCU into constant 2002 prices, Poland's GDP deflator was used.²⁹

Table 4.5. Actual Investment Costs at ICR (PLN, millions, constant 2002 prices)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Rachiborz Dry Polder	0.4	11.5	12.5	6.8	14.6	33.5	105.6	101.8	132.7	23.0	148.6	117.5	233.7	153.2	1,095.5
Modernization of Wroclaw Floodway System	0.0	0.0	0.0	0.0	0.8	79.8	77.4	241.9	212.8	126.6	88.2	12.4	11.9	2.0	853.7
Final design, supervision, project management, training	0.0	0.6	1.7	2.4	2.5	10.4	9.2	8.7	4.9	4.1	4.2	2.1	1.3	0.5	52.6
Total investment costs, constant prices 2002	0.4	12.1	14.3	9.2	17.9	123.7	192.2	352.3	350.4	153.7	241.0	132.0	246.9	155.7	2,001.8
Total investment costs, market prices (PLN million)	0.5	14.4	28.5	24.2	40.3	181.7	277.4	487.4	489.4	224.7	355.1	201.4	366.9	240.9	2,932.9

Source: Provided by the PCU, October 2020.

9. O&M costs, at constant 2002 prices, were confirmed to be similar to those at appraisal. Primary benefits (expected average flood damage reduction per year) were updated using real GDP rates of growth during project implementation period in the project area,³⁰ secondary benefits (value of actual gravel extraction per year from the RDP) were similar to those used at appraisal, and intangible benefits were assumed to be 20 percent of the primary benefits, same as at appraisal. Looking forward, beyond 2020, a 1.3 percent per year GDP rate of growth assumed at appraisal was maintained. The evaluation period was similar to that at appraisal, 30 years. As at the time of appraisal, at the ICR stage more than 2.5 million people were protected against flooding in the project area.³¹

10. Based on the above information, the EIRR for the project was re-estimated at 15.1 percent, 2.3 percentage points lower than that estimated at appraisal (17.4 percent) but still well above the 10 percent opportunity cost of capital in Poland. Component-wise, the RDP's re-estimated EIRR is 13.0 percent, compared with 16.7 percent at appraisal, and that of WFS was re-estimated at 17.0 percent, 1 percentage point lower than its 18.1 percent EIRR at appraisal. At the ICR stage, the ENPV is estimated at PLN 514

²⁹ Poland's GDP deflator.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
GDP deflator base 2002	114.4	118.8	123.3	125.4	129.4	132.5	132.8	133.5	134.5	134.9	137.5	139.1	143.2	146.6

Source: World Development Indicators, World Bank national accounts data, and OECD National Accounts data files

³⁰ Real GDP growth in the project area of intervention (śląskie, opolskie, and Dolnośląskie) during the project implementation period has been estimated at 3.52 percent per year; during the same period, Dolnośląskie's GDP grew at 4.58 percent per year, well above the national average (3.96 percent per year).

³¹ Borrower's Implementation Completion Report: Final Report on the Implementation of the Odra River Basin Flood Protection Project. October 2020.



million at constant 2002 prices, significantly below the ENPV (PLN 854 million) at appraisal stage but still significantly high; that is, the project as a whole will contribute to the economy an excess of PLN 514 million (equivalent to PLN 750 million at current 2020 prices) compared with the return of other projects at the opportunity cost of capital (10 percent). Component-wise, the RDP's ENPV at ICR is PLN 136 million, less than half its ENPV at appraisal, while the WFS's ENPV is PLN 377 million, which is about three-fourth its ENPV at appraisal, both still well above what the GoP could obtain in alternative projects at the opportunity cost of capital.

11. The B/C ratio for the project at ICR is estimated at 1.62 below than the 1.99 estimated for appraisal stage, the RDP's B/C ratio at ICR is estimated at 1.31 compared with 1.86 at appraisal stage and that for WFS is estimated at 1.96 compared with 2.10 at appraisal stage (table 4.6) ; however, in all cases (project-wise and component-wise), the B/C ratios are well above 1, which means that the present value of incremental benefits is well above the present value of incremental costs.

Table 4.6. CBA Indicators at ICR Stage

	EIRR	ENPV (@10% discount rate, PLN million)	B/C ratio
Rachiborz Dry Polder	13.0%	136.9	1.31
Wroclaw Floodway System	17.0%	376.7	1.96
Project	15.1%	513.5	1.62



ANNEX 5. BORROWER, CO-FINANCIER AND OTHER PARTNER/STAKEHOLDER COMMENTS

Comments of the borrower on ICR have been included in the report and were limited to suggestions on style.

Feedback Received from Stakeholders

For the purpose of this ICR, a questionnaire was sent to a limited number of stakeholders who played key roles in the implementation of the project. This was done in consultation with the PCU, which has played an active role in getting the required feedback. Feedback has been used to prepare the ICR. A summary of feedback received is presented below.

Feedback was received from the Lubomia Commune, PGW WP - RZGW Gliwice, Ministry of Finance, AECOM/SWECO, PIU Wrocław, and PCU Wrocław.

Questions posed to the stakeholders were related to the technical support of the World Bank, the added value of the World Bank in communication and stakeholder engagement, and how added value of the World Bank can be improved.

Technical Support

In general, the technical support of the World Bank in the preparation and implementation of the project was rated high. The regular visits of the World Bank's experts to the project sites provided ample opportunity to discuss technical issues and identify solutions for challenges. The authority, resulting from the professional qualifications, made it easier for the RWMA in Gliwice and constructors to solve difficult technical problems that arose during the construction process. The international panel of experts also played an important role in ensuring high technical expertise for the project.

The international experience bringing best practices from all over the world was also well appreciated and important to create trust among stakeholders. The World Bank has been involved in flood protection in Poland since the flood in 1997, providing technical expertise in terms of flood damage recovery and modernization of flood forecasting and warning systems. Feedback included that without the involvement of the World Bank in all aspects, including technical support for the project, the majority of which was co-financed by this institution, it would not have been possible to implement the project.

Communication

In relation to communication it was indicated that the World Bank's role was crucial in establishing and improving communication between RZGW Gliwice and the PAP. The World Bank played the role of a mediator helping parties reach agreements on many issues related to the project.

The World Bank acted in accordance with its procedures and presented the project on its websites. This contributed to the transparency of the project and the sharing of public information. Videos prepared presented well the objectives of the project, its scope, and implementation-related assumptions. The World Bank's measures associated with necessary resettlements were also received well. Presentation of the World Bank policies allowed for better understanding of those rules and for acceptance by people.



Because of those actions, the process was harmonic, and implementation was supported by the local communities.

The leading role of the World Bank in the communication process (regular contacts) has allowed good practices to be developed in the efficient flow of information and the achievement of the intended objectives.

Stakeholder Engagement

The World Bank's engagement was an important positive factor influencing the engagement of stakeholders, both during the preparation and implementation of the project itself. The presence of experts and the openness to contact both at the local level, reaching the villages, through the level of communes, districts, and voivodships, as well as at the level of governmental authorities, allowed for efficient communication of issues requiring the attention and actions of local and national authorities. The involvement mobilized to act as quickly as possible and make optimal decisions, after proper analysis of the issues of importance from different stakeholders.

The World Bank's role in stakeholder engagement for resettlement was crucial as was its support in the collaboration between the project's organization and the city of Wrocław. With the mediation role and the introduction of different solutions and win-win opportunities, interventions have become permanent features of the urbanized space of the capital of Lower Silesia. These actions, among others, allowed the successful completion and closure of the project with a high level of approval for the project from stakeholders.

Well-organized stakeholder engagement required and received a lot of commitment from the World Bank's team at every stage of project implementation. This commitment was appreciated by the stakeholders.

The added value of the World Bank's support in project preparation and implementation can be further increased by intensifying contacts with the World Bank's experts in the field to support implementation and through more training of local staff.

It should be noted that despite the difficult period and challenges caused by the pandemic, the communication solutions adopted by the World Bank were proficient to continue providing the technical support needed up to project closure.



ANNEX 6. SUPPORTING DOCUMENTS

- Project Appraisal Document (PAD), Report No. 31771-PL, February 21, 2007.
- Loan Agreement for Loan Number 7436-POL.
- Implementation Supervision Reports.
- Poland's Project Completion Report, November 2020.
- ORFPP (LN 7436-PL) September–October 2011 Midterm Review Mission.
- Aide Memoires of Implementation Support Missions.
- Restructuring Papers
 - Report No: RES13525, January 2014.
 - Report No: RES15432, June 2014.
 - Report No: RES29007, October 2017.
 - Report No: RES31240, January 2018.
- Country Partnership Framework FY19–FY24 for Poland, Report Number 125670.
- Country Partnership Strategy, Report No. 31702 - PL, March 9, 2005.
- Country Assistance Strategy, Report No. 24783 - PL, November 13, 2002.
- Odra River Basin Flood Protection Project Component A RACIBORZ DRY POLDER, Resettlement Action Plan, RZGW Gliwice, August 2005.
- Yu, W. 2020. *The Leveraging Potential of Public Investments in Flood Protection: The Case of Wrocław, Poland*. Washington, DC: World Bank. 31 pp.