UN HABITAT

3.2A WATER GATE REPAIR ANGKAOL AND PONG TEUK COMMUNES

WATER GATE REPAIR ANGKAOL AND PONG TEUK COMMUNES

INTRODUCTION

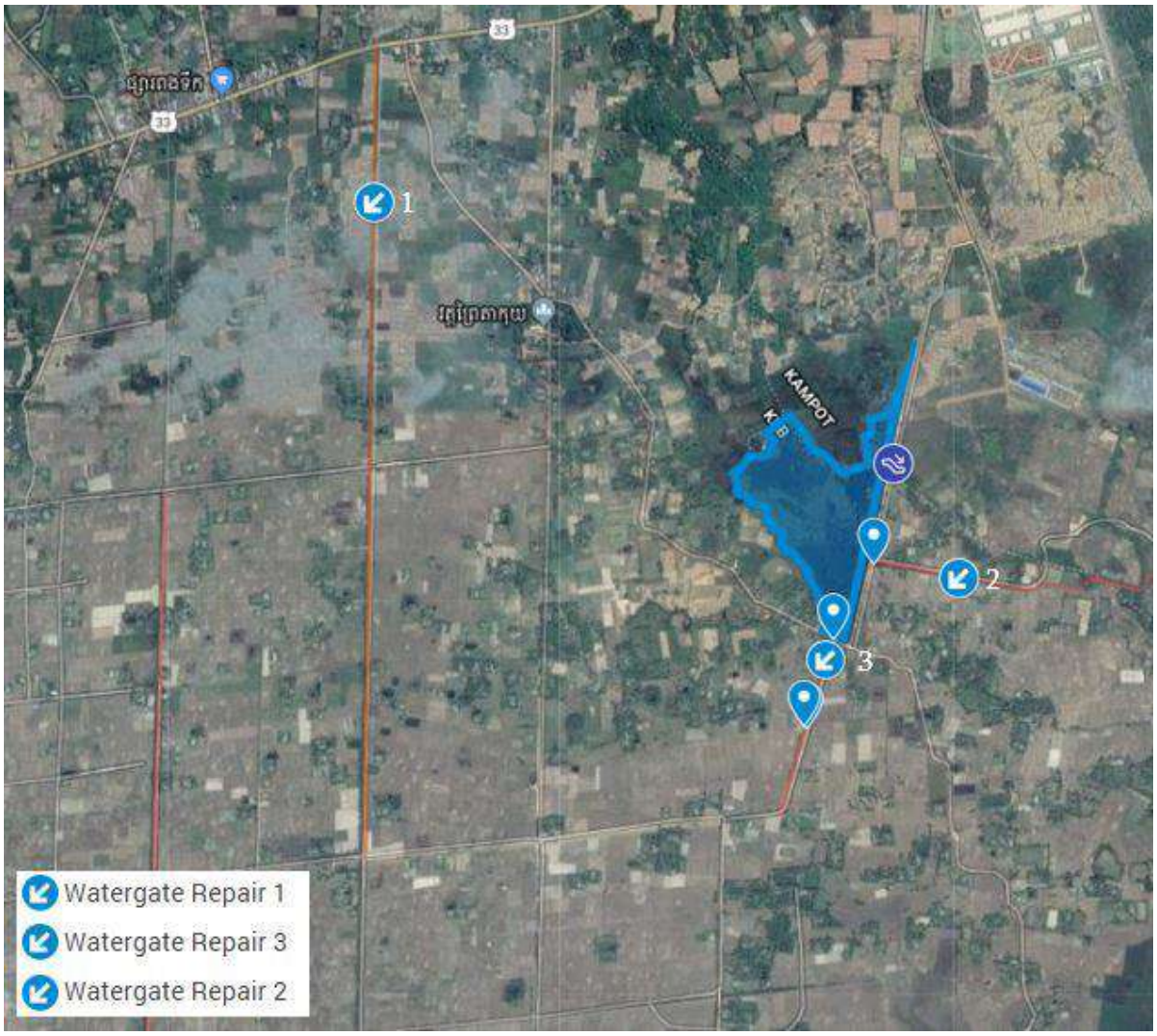
Three irrigation canals from the main reservoirs O Thmar and Rhones are not functioning as per their design. The community is therefore unable to divide the water and get the right water levels and amounts of water to agricultural areas or use it for drinking purposes.

Problem statement

The state of the current infrastructure means that the communities don't benefit from the existing water gates. Increasing periods of water shortage due decreased rainfall as a result of climate change enhance the problem of a non-functional irrigation system. Rice farmers depending on this water source for irrigation and all those dependent on it for domestic water use are likely to face increasing problems with water shortages in the dry season in the near future, particularly considering rapidly declining rainfall in the dry season.

Resilience to natural hazards refers to the ability to protect lives, livelihoods and infrastructure from destruction or damage, and to the capability to restore normalcy after natural hazard has occurred. This investment seeks to improve the resilience of the affected communes to the vulnerability of increasingly intense rainfall events and longer periods of draughts causing water shortage for cropping by repairing three water gates.

Location



Beneficiaries

The beneficiaries of this investment are the communities living in the area relying on water supply from the canals and dividing water by the water gates to water the rice paddies and other crops in the area.

- Commune
- Paddy field area

The community living and relying on this water source is 8,566 in Angkaol Commune and 10,987 in Pong Teuk Commune. The area of paddy field benefiting repair of these gates is approximately 600 hectares for water gate 1,130 hectares for water gate 2 and 230 hectares for water gate 3. The locations of the gates are indicated on the map above.

BUDGET

Gate repair Angkaol and Pong Teuk

The estimated costs of the gate repairs are presented below.

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Concrete gate 1	4.2 m^3	$104	$440
Gate with plate and spindle including frame	1	$3500	$3500
Filling material gate 1	6 m^3	$6.5	$39
Concrete gate 2	1 m^3	$104	$104
Filling material gate 2	3 m^3	$6.5	$19.50
Concrete gate 3	3 m^3	$104	$310
Sandbags needed for construction all gates	15 m^3	$13	$195
Labour (unskilled)	20 days	$15	$300
Labour skilled	10 days	$30	$300
Pump to drain work space	1	$120	$120
		TOTAL	$5,327.50

DATA COLLECTION

Inputs

The newly designed or adjusted gates will be in line with the currently installed systems throughout Cambodia. The following data input is used to assess the gate repair plan for Angkaol and Pong Teuk Communes

> Irrigation water productivity in Cambodian Rice System, 2011, C. Wokker, P. Santos, B. Ros and K. Griffiths. CDRI publication
> Climate-resilient irrigation guidance paper, 2014. Coastal Adaptation and Resilience Planning Component, Cambodia Climate Cange Alliance (CCCA)

Consultations

The following government agencies/organizations were consulted on the water gates.

- The Ministry of Environment in Phnom Penh pointed out that field data needed to be obtained by visiting the gates and reservoirs.
- The Department of Water Resources and Meteorology, Kep Province pointed out that there are 10 reservoirs in Kep Province. Not all of them are functioning effectively. Roness reservoir is not functioning at all, since the structure is too fragile to store water. The O Thmar reservoir is silted up and therefore is not able to store enough water. The gates downstream of O Thmar cause problems, making water division to the downstream communities difficult. Works to improve the functionality of these two reservoirs are described in outputs 3.4 and 3.4b.

The chief of Angkaol Commune pointed out that these gates need to be repaired because they cannot be operated properly due the current state of the structures. A site visit then took place that made the following observations:

Site Records

During the site visit it became clear that the downstream gates of O Thmar are damaged and therefore need to be repaired.
The gates that need repair are:

Figure 1 *"Watergate 1 in Pong Teuk Commune"*

Figure 2 *"Watergate 2 eroding embankment upstream and downstream embankment in Angkaol Commune"*

Figure 3 *"Watergate 3 scour underneath the watergate in Angkaol Commune"*

Details on water gates:

- Watergate 1 is missing the spindles and gate and the surrounding embankment is eroded
- Watergate 2 is suffering from erosion at the embankment both upstream and downstream

- Watergate 3 is having trouble due to scour on the gate bottom

IMPLEMENTATION

Design

The gates designs are standard for the area and seen throughout the province. The repair works are detailed per water gate. Mostly focusing on concrete works and precautions to prevent erosion.

Gate 1

Repair works on water gate one are slightly more comprehensive than the other gates. Water gate 1 needs a proper structure provided before two new spindles can be installed. To do so, the upper structure needs to be built with concrete and the also the lining around the gate, guiding the water, requires reconstruction.

Figure 4 "Missing spindle in gate 1"

The frame supporting the spindles can be installed in the concrete frame, similar to the existing gates (figure 2). The dimensions for one of the two spindles and gate board is given in Table 1. In Figure 5 the dimensions represented in the table match the standard design.

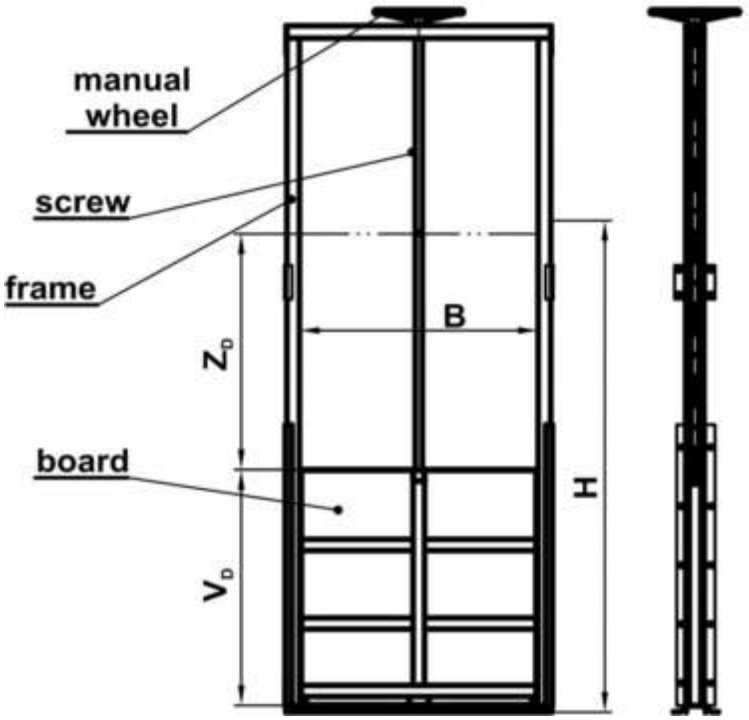


Figure 5 "Spindle design standard"

Table 1

Dimensions spindle and board structure

DESIGN STANDARD		UNIT	DIMENSIONS
Board Height	V_D	m	
Board Width	B	m	1
Frame Height	B	m	3

Work on the embankment on gate 1 includes adding material to prevent from eroding. The concrete sides need to be rehabilitated with concrete and filling material.

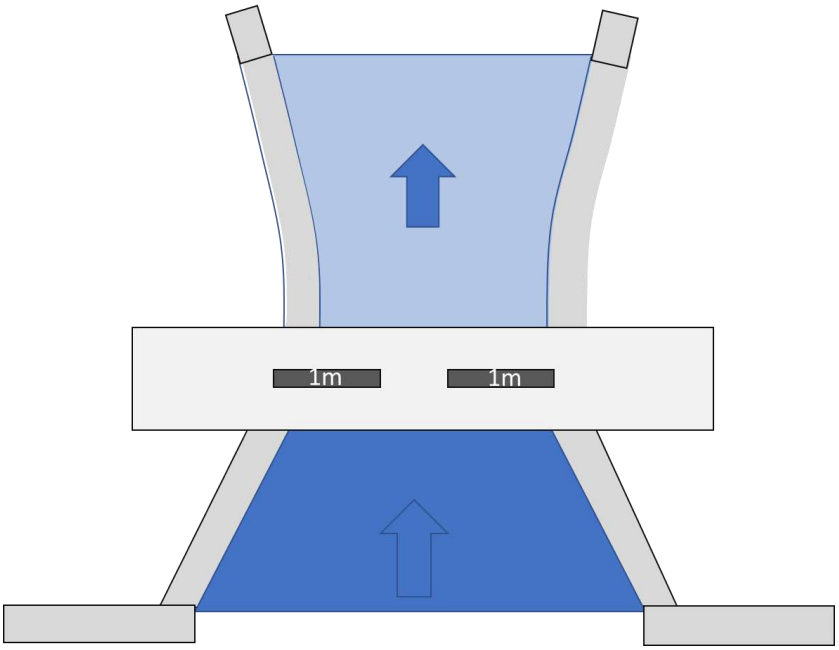


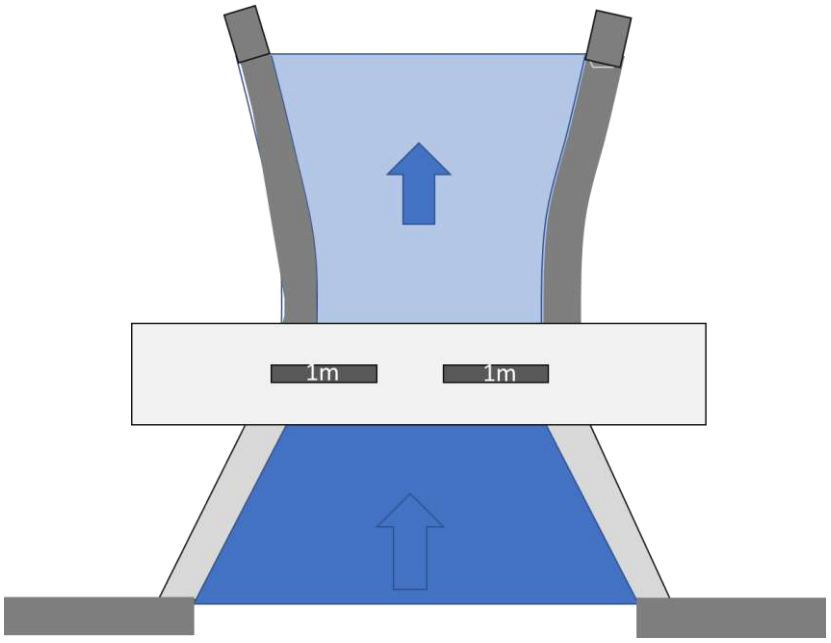
Figure 6 "Top view concrete water gate embankment"

The concrete thickness of the embankment is estimated to be 15 cm.

Gate 2

The concrete lining of the embankment for water gate 2 needs to be repaired. Figure 5 gives the concrete lining that needs to be constructed. The concrete guiding the water towards the gate is in place already. The concrete in line with the gates is missing, therefore the embankment upstream and downstream is eroding.

Figure 7 “Concrete lining in dark grey needs repair for Gate 2”



Gate 3
This gate has problems with scour. The concrete under the gate is eroding therefore water is passing underneath the gate causing more erosion on the foundation of the structure.

Community Engagement

Community engagement will be necessary to prevent the gates from clogging with solid waste. Capacity building on gate and canals management is described in the investment regarding the relining of the canals. For this reason, the activities under Component 1, Output 1.1 have been proposed. Further information on the community consultations that have taken place can be found in Part II, Section H of the proposal.

Construction

The construction of the concrete base of gate 3 can be carried out applying the method as depicted in the figure below. Sandbags are used in combination with a pump to block the upstream water flowing in. The pump takes out the water that is seeping in. The gate is closed so water cannot flow backwards. In case the water cannot be stopped by the gate from flowing back completely sandbags can be applied on the downstream side of the gate equally. The method can be used for all three of the gate repair tasks.

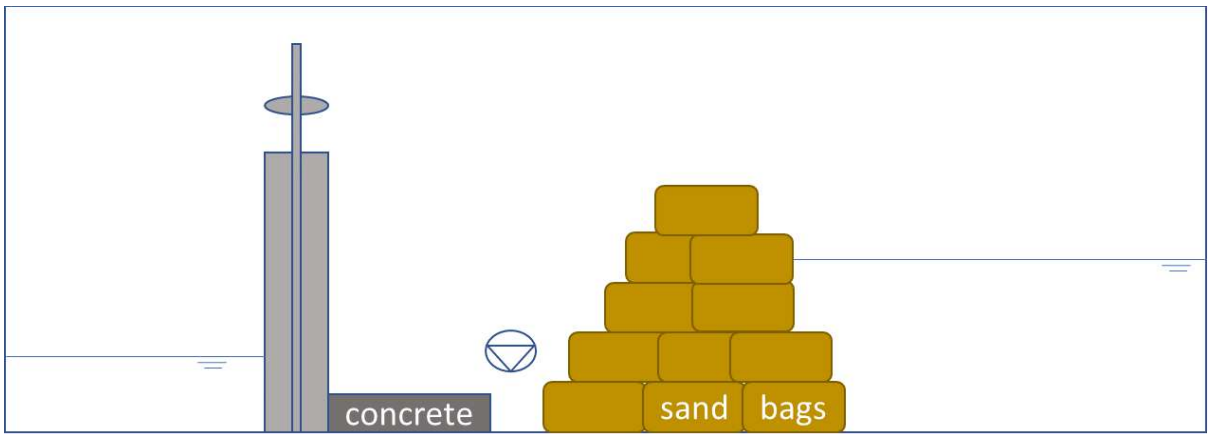


Figure 8 "Construction drawing concrete works"

Contractor Requirements

The contractor needs to be able to deliver laborers that are skilled to work with concrete. The work can best be carried out in the dry season therefore less pumping and sandbags are needed. Sandbags can be used on all the locations. Environmental and social safeguarding considerations regarding labour are detailed in the table below.

Key Risks & Safeguarding Issues

The repair works take part on existing infrastructure, are requested by the local community, therefore the no risks on social safeguarding issues are applicable in for this investment. However, further information of environmental and social safeguards can be found in Part II, Section K of the proposal.

TECHNICAL DRAWINGS

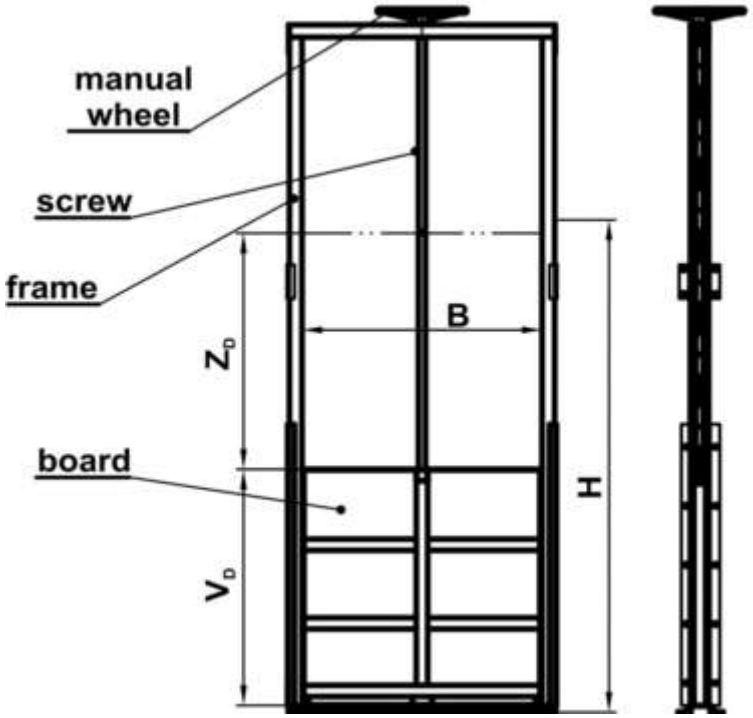


Figure 9 "Design water gate standard applied throughout coastal area"

PHOTOS

Figure 10 "Water gate 3"

Figure 11 "Downstream from water gate 3"

Figure 12 "Canal downstream from water gate 3"

Figure 13 "Canal downstream water gate 3"

Figure 14 "Erosion upstream water gate 1"

Figure 15 "Erosion embankments water gate 1"

Figure 16 "Missing gate = water gate 1"

Figure 17 "Eroded embankments around water gate 1"

ENVIRONMENTAL AND SOCIAL SAFEGUARD PRINCIPLE	RISK MITIGATION ACTIONS INCORPORATED IN THE DESIGN
Compliance with the law Projects/programmes supported by the Fund shall be in compliance with all applicable domestic and international law.	The waterbodies and gates are all on state public land and can be accessed by public tracks. All actions have checked and are compliant with relevant national laws, as detailed in the proposal Part II, Section E.
Access and Equity Projects/programmes supported by the Fund shall provide fair and equitable access to benefits in a manner that is inclusive and does not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. Projects/programmes should not exacerbate existing inequities, particularly with respect to marginalized or vulnerable groups.	The repair on the gate will improve the access to water to the community. The gates make it possible to have controlled waterflow and thereby improve the existing water system. Because the water bodies are all public land, it is expected that the water will be a 'public good' whereby it will not be possible to prevent individuals or groups from using it. Indeed, it will enhance the ability of all target beneficiaries to access water.
Marginalised and Vulnerable Groups Projects/programmes supported by the Fund shall avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. In screening any proposed project/programme, the implementing entities shall assess and consider particular impacts on marginalized and vulnerable groups.	The improvements to the water system will not marginalise vulnerable groups. The investment will improve the ability of women and vulnerable groups to access water.
Human Rights Projects/programmes supported by the Fund shall respect and where applicable promote international human rights.	There is no evidence to suggest that human rights will be violated. The gates improve the ability of the beneficiaries to access water
Gender Equity and Women's Empowerment Projects/programmes supported by the Fund shall be designed and implemented in such a way that both women and men 1) have equal opportunities to participate as per the Fund gender policy; 2) receive comparable social and economic benefits; and 3) do not suffer	The water dividing gate will benefit both men and woman equally. Men and women will be given equal opportunity to provide their labour to the construction process, under the People's

disproportionate adverse effects during the development process.	Process approach. Whenever women provide their labour, the project will ensure that they have access to separate bathrooms and hygienic products. All labourers (male and female) employed under the project will be given a mandatory briefing on the prevention of sexual harassment and exploitation prior to commencing their work.
Core Labour Rights Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.	Safety equipment will be required for workers on the site and provided for them. This activity will draw upon unskilled labour from the community. All workers in the project will be informed of their rights to organise, including joining formal labour unions, in accordance with the law. Unskilled labourers will be paid $300 per month (assuming an 8-hour working day, 5 days per week, this is 50% higher than the national minimum wage). All workers employed by the project (including under agreement of cooperation) will be aged 18 or over) See above provisions for women's labour.
Indigenous People The Fund shall not support projects/programmes that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.	The gate repair does not influence the UN Declaration on the Rights of Indigenous Peoples. There are no reports on current gate operations excluding certain areas or indigenous people. There is no evidence at the time of writing that there are any indigenous people or undocumented migrants in the target area
Involuntary Resettlement Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement. When limited involuntary resettlement is unavoidable, due process should be observed so that displaced persons shall be informed of their rights,	The works all involve work on public state-owned land and are accessed by public roads and tracks. There is no one living on or immediately adjacent to the proposed construction area and as such there is no discernible risk of resettlement

consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation.	
Protection of Natural Habitat The Fund shall not support projects/programmes that would involve unjustified conversion or degradation of critical natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as critical habitat; or (d) recognized as protected by traditional or indigenous local communities.	The area where the gates are constructed is on public land, adjacent to agricultural land. No natural habitat is endangered by the gate repair works.
Conservation of Biological Diversity Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.	There are no risks to the existence of biological diversity. The works are all located on sites where infrastructure already exists. Improved downstream water has the potential to boost aquatic biodiversity.
Climate Change Projects/programmes supported by the Fund shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.	The construction of the gates will involve steel and concrete, as well as transportation, and the associated emissions involved with that. However, once in operation, the gates will not cause any GHG emissions. The project is proposed to provide adaptation benefits.
Pollution Prevention and Resource Efficiency Projects/programmes supported by the Fund shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.	Resource efficiency is improved by the installation of the gate and repair of the other two structures. Possibilities to divide the water makes the communes more resilient to longer periods of draught with more efficient resource management.
Public Health Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.	The storage of fresh water increases the access to fresh water, which is beneficial to public health. The construction does not use hazardous materials or chemicals that could adversely affect public health.

Physical and Cultural Heritage Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level. Projects/programmes should also not permanently interfere with existing access and use of such physical and cultural resources.	The gate repair does not harm cultural heritage. There are no sites of cultural, spiritual or religious heritage in or around the gates or their adjoining canals.
Land and Soil Conservation Projects/programmes supported by the Fund shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.	The installation of the gates provides an increased supply of fresh water. Making the land more resilient to salt water ingress preventing from soil degradation.