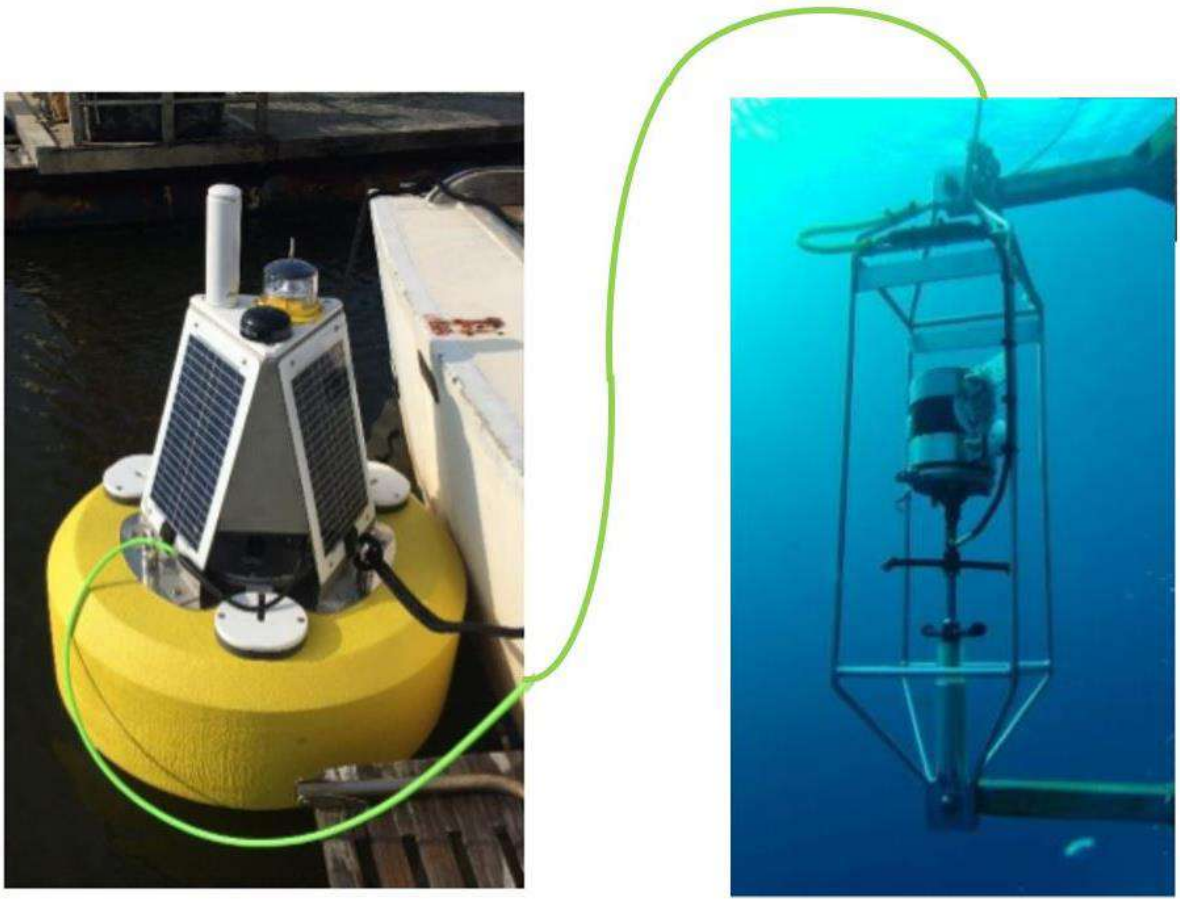
UN HABITAT

3.8 TIDE GAUGE IN PREY NOB DISTRICT

TIDE GAUGE IN PREY NOB DISTRICT

Investment ID: 3.8b

INTRODUCTION



Deliverables	Providing and installing a tide gauge and providing training in its operation and maintenance
Beneficiaries	Approx 30,000
Budget	US$ 52,380
Location	Provides improved flood warning to all low-lying areas of Prey Nob district

Problem statement

The communities of Prey Nob district lying on the coastal plain either side of the Kampong Smach estuary are increasingly experiencing flooding from the sea, and a sea defence embankment built in the period 1997-2001 is now reported as being overtopped every 2-3 years. There is a tide gauge within Preah Sihanouk province at Sihanoukville port, but this is on the opposite side of the Sihanoukville peninsula and does not necessarily record data reflecting the unusual tidal circumstances at the Kampong Smach, which has a shallow offshore shelf, a funnelling estuary mouth and the effects of several offshore islands affecting the tidal regime.

The Preah Sihanouk Provincial Department of Meteorology and Water Resources has requested installation of a tide gauge at the outer edge of the mangrove forest at Ou Oknha Heng, to provide accurate data on sea level rise in this location and thereby improve flood warning capability for the low-lying communities of Prey Nob district on both sides of the Kampong Smach.

Location

The proposed location is 700m from the Prey Nob sea defence embankment at the outer edge of the mangrove, on the edge of open sea water. At high tide the depth to the muddy sea bed is only 1.7m, and the mangroves reach approx. 15m height. The location is shown on the map below. This location has been selected by the Preah Sihanouk Department of Water Resources and Meteorology as a relatively accessible location within the bay beyond the Kampong Smach estuary. The bay here is very shallow, reaching no more than 3m water depth at normal high tide over 1km beyond the mangrove according to openly available bathymetric mapping. A tide gauge at this location will be able to give a good representation of the tidal regime within the entire bay.

Beneficiaries

There are 55,776 people listed as resident within the affected communes of Prey Nob District and of those approx. 30,000 live or work close to sea level in the low-lying coastal areas. The entire area depends on food produced in the coastal strip. On increasing occasions in recent years homes and crops have been damaged by incidences of sea water overtopping existing defences and coming further inland, and the district has a growing population which is straining the existing resources.

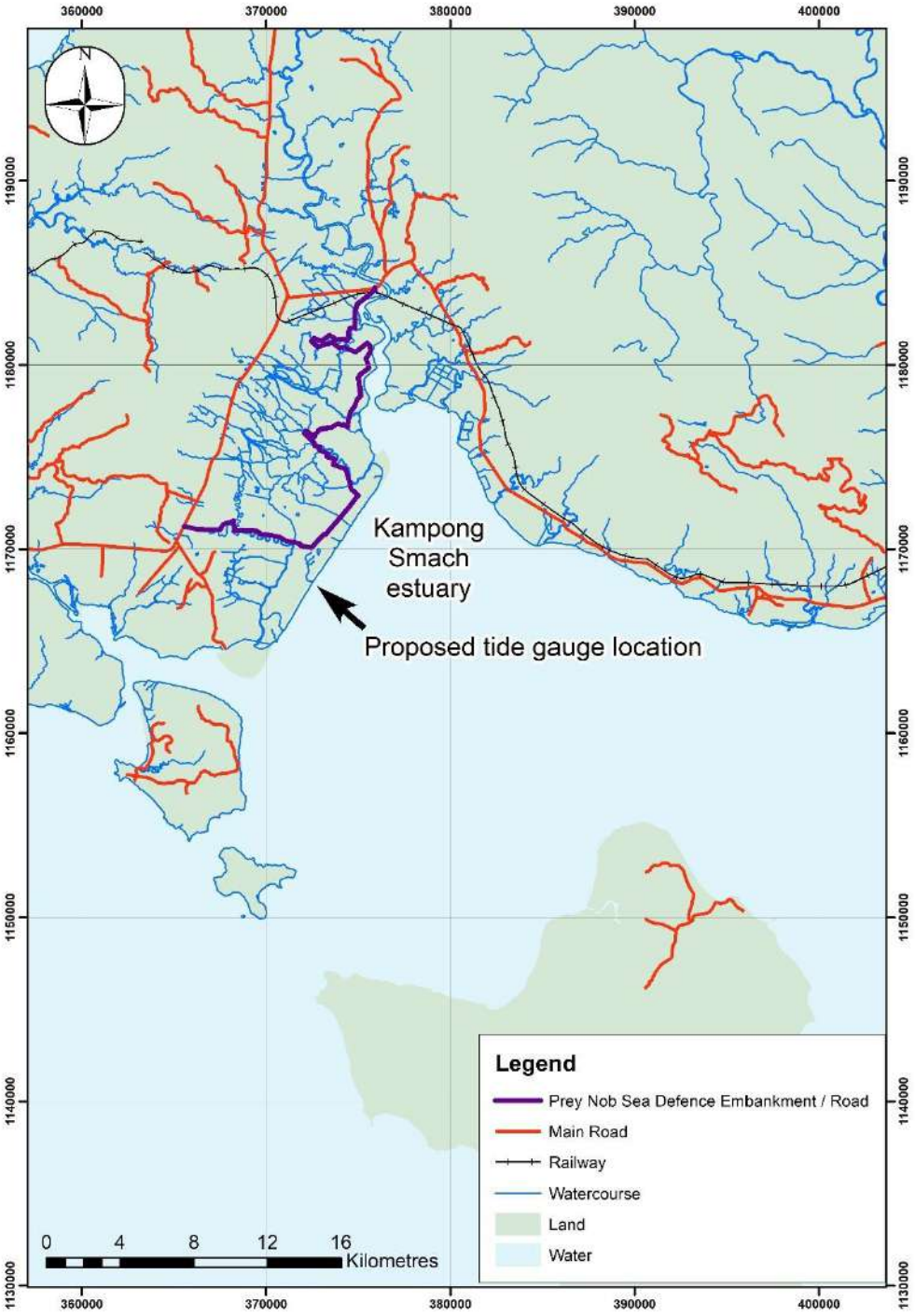


Figure 1 *"Kampong Smach estuary, with proposed tide gauge location indicated with a black arrow."*

BUDGET

Construction and installation of tide gauge

- Assume exchange rate of us$1.32 = GB£1.00, which is the approximate average over the period 01/04/2016 – 31/03/2018. Supplier's quote in GB£ is annexed to the end of this document – includes supply and installation. Shipping costs assumed based on commercial shipping charges.

There will also be ongoing running costs, including regular maintenance and a telemetry fee to the mobile phone network. It is assumed these will be paid by the Department of Water Resources and Meteorology once the installation is complete. The costing assumes installation by a trained specialist provided by the supplier.

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Provision of wave and tide gauge for remote, shallow location – type 'FSI Remote Coastal Reporter'			$23,250
Shipping, customs clearance, local shipping taxes, transshipment to shallow draught vessel for access to site and delivery			$23,760
Installation of same			$5,370
		TOTAL	**$52,380**

DATA COLLECTION

Inputs

This study has been informed by bathymetric data collected during a site visit, publicly-available online maps showing nearshore bathymetry in the estuary area and a quote from a commercial supplier of wave and tide gauges. Mapping has used Google Earth satellite imagery and openly available GIS data including geology, land use and watercourses.

Consultations

Consultation has been carried out with the national Ministry of the Environment, Preah Sihanouk Provinicial Department of Water Resources and Meteorology, Preah Sihanouk Provincial Department of the Environment and the leaders of Boeng Taprom, Ou Oknha Heng, Prey Nob, Ou Crou and Veal Rinh Communes.

Site Records

A site visit took place during approximately local normal high tide conditions, and a record was taken of the depth to bed at the location proposed for the gauge. This was 1.7m from the high tide water surface to the mud. It was observed that the area was sheltered on two sides by established mangrove forest at least 4m in height, open to the north-west to a shallow navigable channel between the mangroves approx 4m wide and open to the south-east to the sea. There is no mains electricity supply within 5 km of the site, so the gauge will have to work on solar / battery power. It was observed that the Smart mobile phone network provides coverage at the proposed deployment site to enable telemetry of the data.

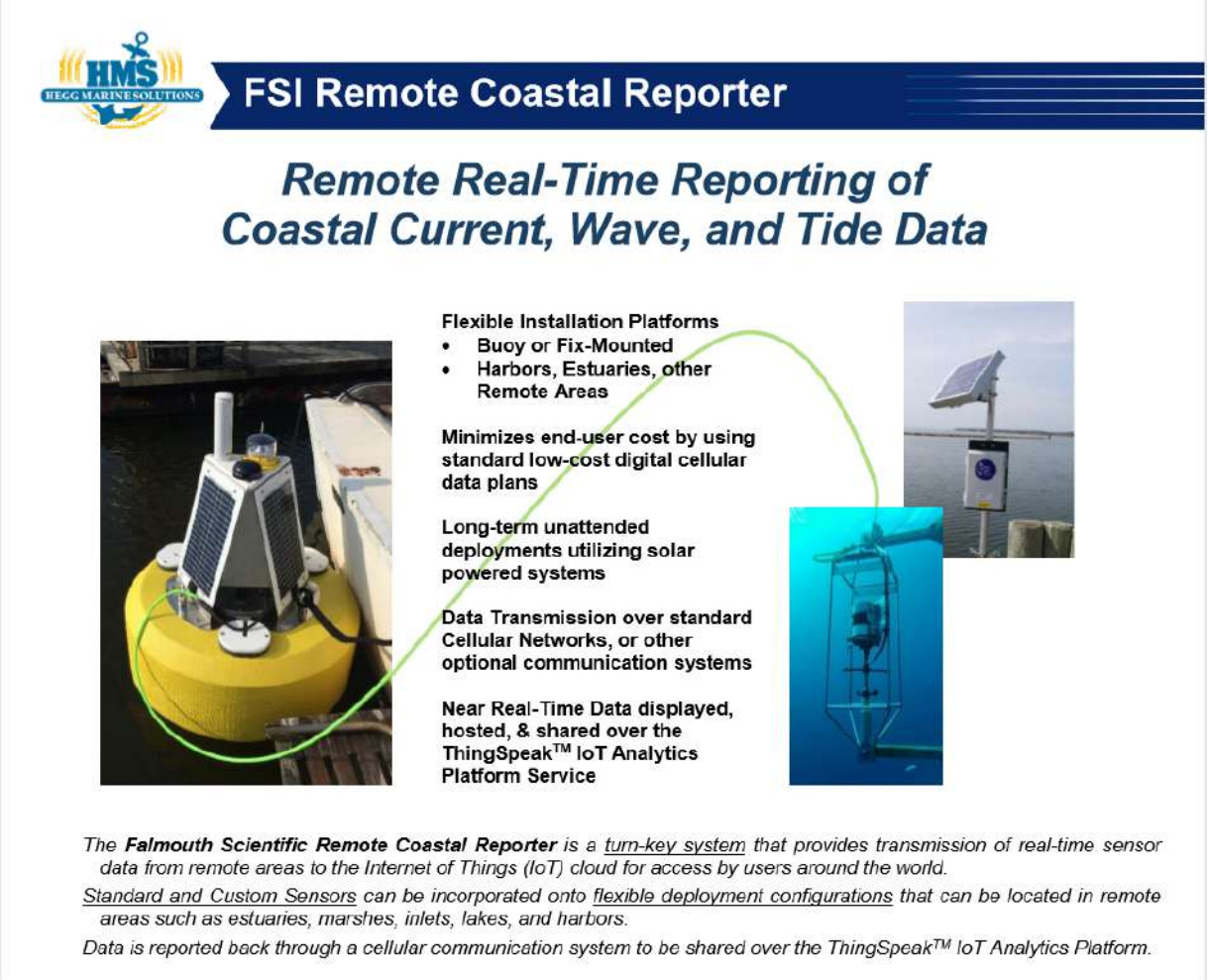
The particular constraints of this site are that the water is shallow throughout the bay, but this is a location that is relatively easily accessed by small boat. With high tides only 3m deep well off shore, the bay is not capable of taking deep draught vessels. The risk of vandalism is considered unlikely and the risk of damage by boat impact should be minimised as the channel is generally only used by a small fishing community and the above-water equipment is finished in hi-visibility yellow paint. The gauge will be used to build up a dataset of tidal conditions in the bay to facilitate prediction of high tidal levels. The next nearest existing tide gauge is in Sihanoukville port, in deeper water 20km away on the other side of a peninsula.

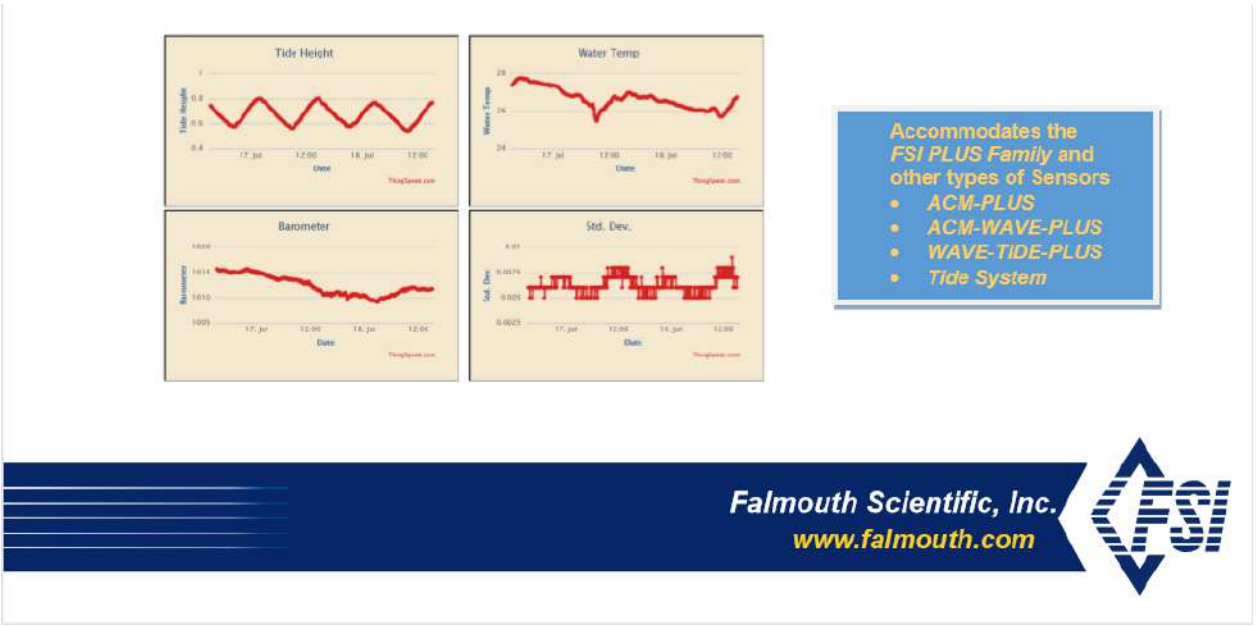
IMPLEMENTATION

Design

The requirements and constraints of the site were provided to a commercial supplier of wave and tide gauges for their advice. They recommended the FSI Remote Coastal Recorder, which is an acoustic device fixed under the water but with a cable connection to a small buoy on which is mounted the solar panels and telemetry equipment. Their brochure is attached on the next page and their costing is annexed to the end of this investment sheet. Although this form of gauge is designed to operate in a range of water depths up to 25m, it can also function effectively in much shallower waters, whereas many other gauges cannot.

Installation costs by a specialist approved by the supplier is included in the supplier's costing. The equipment will be provided with an O&M Manual and we have included a sum for training of maintenance operatives – this includes translation of the O&M Manual into Khmer.




Tide Height
Water Temp
Barometer
Std. Dev.
Accommodates the
FSI PLUS Family and
other types of Sensors
• ACM-PLUS
• ACM-WAVE-PLUS
• WAVE-TIDE-PLUS
• Tide System
Falmouth Scientific, Inc.
www.falmouth.com
FSI

Community Engagement

The community have been consulted on a number of occasions and we have additionally consulted with all the communes in Prey Nob district. There are no indications that the works would adversely impact anyone. The works should proceed with the full engagement of the community, using local labour and materials where possible (e.g. for the shallow draught vessel to deliver to site), and minimising disruption to the adjacent farming and fishing communities.

Construction

Access for installation will be from the water. It is assumed that the gauge and associated equipment will be transhipped at a local sea port (Sihanoukville) onto a shallow draught vessel which can then access the shallow waters where the gauge is proposed for deployment.

Contractor Requirements

installation should be carried out under the instructions of the approved supplier.

Key Risks & Safeguarding Issues

§ Environmental

The works will require components and machinery to be brought to site. Existing road access along the top of the embankment is both narrow and unsurfaced, and the installation location is a further 700m beyond the end of the road access, in open water. Therefore it is proposed that installation takes place from a floating platform or shallow draught vessel, loaded at a suitable local port (Sihanoukville) and transshipped to site.

Care should be taken to minimise any damage to the adjacent area of mangrove from any floating plant or machinery.

§ Social Safeguards

There are no anticipated social conflicts as a result of this installation. Care should be taken to ensure the gauge is not positioned so as to obstruct navigable access to the channel through the mangrove which could cause problems for the local fishing community.

§ Gender/Youth (if applicable)

No safeguarding issues identified

TECHNICAL DRAWINGS

To be provided by the manufacturer / supplier

PHOTOS

Figure 2 *"Proposed location for tide gauge at mouth of a narrow, shallow channel through the mangrove (indicated by arrow). Water access to here is only possible by a shallow draught vessel as the normal high tide level is less than 2m above bed."*

Table 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.	There are no anticipated legal issues. All actions concerning the installation have been 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.	This investment will deliver improved warning and understanding of high tides and enable better preparation for protection against sea water ingress into agricultural areas. This will help build local resilience to all the communities living in close proximity to the sea within Prey Nob district. It is generally the case that the poorest and most marginalized live in informal settlements on the edge of the mangrove and these communities stand the most to gain from improved flood warnings. There is a risk that information may not be provided to all those who need it. However, if critical information is broadcast by radio, as well as through elected commune council leaders, this provides the best opportunity to reach all those who require information. (It should be noted that the communes in question don't have literacy rates between 80 and 90%, meaning that broadcast/oral information is the best way to reach all community members.

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.	There are no anticipated issues regarding marginalised groups. There is some old data to suggest that small number of undocumented ethnic Vietnamese live in Prey Nob District but this was cross-checked with the elected Commune Council representatives and provincial level officials, who both assert that all undocumented ethnic Vietnamese have now been formalized and given Cambodian identity papers.
Human Rights Projects/programmes supported by the Fund shall respect and where applicable promote international human rights.	There are no anticipated issues regarding human rights.
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 disproportionate adverse effects during the development process.	There are no anticipated issues regarding gender equity. Information will be provided to all, as described in access and equity. No community labour is used in this activity.
Core Labour Rights Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.	There are no anticipated issues regarding core labour rights. Installation of the gauge will require input from outside specialists but local Department of Meteorology and Water Resources staff will be trained to maintain and operate the gauge. No community labour will be used in this activity

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.	There is no evidence of indigenous people or undocumented migrants in the target area, and consequently there is no risk that the activities will affect indigenous people. Please also see explanation provided above in marginalised and vulnerable groups.
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, consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation.	There is no resettlement required as a result of this investment. The installation will be in the ocean. The software will be housed in existing government offices, belonging to the Provincial Department of Water Resources and Meteorology.
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 installation will not affect the mangrove. There are no anticipated issues regarding any degradation of the natural habitat.
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 anticipated issues regarding any impact on biological diversity.

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.	This investment will help to better understand the local effects of climate change for the poor local communities, and enable more effective adaption. There will be no emissions, except for the inevitable emissions associated with shipping the tide gauge.
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.	The installation will not create waste material or pollutants of any type.
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.	This investment should benefit public health by improving the local flood warning capability, giving more time to evacuate or prepare for flooding if necessary. There are no anticipated negative effects.
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.	There are no anticipated issues regarding physical and cultural heritage.
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.	There are no anticipated issues regarding land and soil conservation.