

Deliverable 3 & Synthesis report**Preferred Climate Change Adaptation Strategy,
Lower Vam Co River Basin, Viet Nam**

Final version, 30 March 2013

*Water Partner Foundation in co-operation with:**Funded by:*PEOPLE'S COMMITTEE of LONG AN
DEPARTMENT OF SCIENCE AND TECHNOLOGY

Colofon

Title:

Preferred Climate Change Adaptation Strategy for the Lower Vam Co River Basin, Long An Province, Viet Nam. Deliverable 3 & Synthesis Report of the pilot project *Vamcopart*.

Document version:

Final version, 30 March 2013

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Citation:

Huntjens, P., Kool, J., Lasage, R., Sprengers, C., Ottow, B., Kerssens, P., Long, T.T., Phep, H.T. (2013) Preferred Climate Change Adaptation Strategy for the Lower Vam Co River Basin, Long An Province, Viet Nam. Deliverable 3 and Synthesis Report of the Vamcopart Pilot Project, Final version, 30 March 2013. Water Partner Foundation, 2013

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Revision history

<i>Issue date</i>	<i>Version</i>	<i>History</i>	<i>Issued to</i>
15-08-2012	First draft	Development of draft preferred strategy, based on outputs participation process, MCA, SOBEK-modelling en expert judgement	All project partners
05-09-2012	Second draft	Incorporation of feedback from CESTE and DOST on Intervention Sheets (Annex 4) (English version)	External Advisory Committee (EAC)
15-09-2012	Second draft	Translation to Vietnamese version by CESTE	Extended group of key stakeholders in Long An Province

15-10-2012	Final draft	Incorporation of feedback from External Advisory Committee (EAC) and Extended group of key stakeholders in Long An Province	All partners and EAC
30-03-2013	Final version & synthesis	<p>Incorporation of feedback Final Conference and updated version of MCA:</p> <p>New sections:</p> <ul style="list-style-type: none"> • Executive summary • Section 3.4: Evaluation of the participative planning process • Update section 6.3: update MCA results based on final MCA workshop on 27 February 2013 • Section 7.5: Investments planning & implementation • Section 8.3: Water Governance • Section 8.4: Technical & Non-technical recommendations • Chapter 9: Dissemination and upscaling • Reference list • Annex 5 and 6 	General release (unrestricted)
15-04-2013	Final version & synthesis	Vietnamese version (translated by CESTE)	General release (unrestricted)

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Executive summary

Introduction

This document presents the preferred¹ climate change adaptation strategy for the Lower Vam Co River Basin in Long An Province in Viet Nam under a 18-months pilot project, being executed in the period from 1 November 2011 until 30 March 2013.

Co-funded by the Dutch government (*Partners for Water* Programme), Long An province, and the International Water Governance Centre, the 385,000 EURO (495,000 USD) project “Participation in Climate Adaptation” offers the decision makers and stakeholders of Long An province with a clear overview of alternative strategies and measures for adaptation of the pilot area to climate change related threats, including floods, salt water intrusion, water scarcity, droughts and water pollution.

People living in the villages and cities of Long An, as well as the socio-economic development and ecosystems in this region, are under **serious threat from the impacts of climate change**. The pilot area covers the southern coastal districts, i.e. Can Duoc, Can Giuoc, Chau Thanh and Tan Tru, where flood from upstream combined with high tide from East Sea (via Soai Rap estuary) may lead to severe inundation. In addition, drought and salinity intrusion especially in the dry season are already causing serious problems for fresh water supply for domestic, agricultural and industrial uses in the pilot area. This problem is further aggravated by dwindling groundwater resources due to over exploitation. Under present conditions climate variability is already important to successful management of water. The impacts of climate change enlarge the existing complexities of achieving just socio-economic and sustainable development which involves multiple uses of water among growing numbers of users. In summary, climate change has severe negative consequences for human health, food production and industry in the pilot area.

Hence, it was recognized by the authorities of Long An Province that we need to be planning to adapt to the challenges and opportunities that a changing climate will bring. For this reason the pilot project developed an **integrated and community-based climate change adaptation strategy for the Lower Vam Co River Basin**. The strategy is based on a participative planning process at different levels (i.e. province, district, commune level), supported by innovative participation methods in combination with advanced decision support tools.

Taking into account **climate change scenarios for 2020 and 2050** the final preferred strategy offers a **consensus-based mix of measures**. This includes completing and upgrading the dyke systems and more room for rivers and nature to increase resilience and water discharge capacity of the Vam Co River Basin as a whole (e.g. retention areas and dyke replacements combined with reforestation in the upstream parts). It also offers a variety of measures for optimizing water supply and demand, including rainwater harvesting, sustainable groundwater exploitation, point-of-use conservation, water saving technologies in irrigation, land use change from agriculture to aquaculture, water recycling and reuse of grey water, treated sewage and industrial water. This optimal mix of measures will reduce the chance of flooding by the sea and by the river, and will also reduce demand for freshwater and should lead to better allocation of available freshwater resources in the districts.

¹ Preferred means based on the preference of stakeholders participating in this pilot project, taking into account the results of different phases of the participative planning process being implemented in this pilot project

With a tailor-made climate change adaptation strategy Long An Province will comply with, and partly implement in its own unique way the policy targets of the **National Strategy for Natural Disaster Prevention, Response and Mitigation** to 2020, and also its commitment to the **National Target Program to Respond to Climate Change** (NTP-RCC). The preferred climate change adaptation strategy developed by this pilot project will serve as an important input to the development of the Long an provincial action plan(s) under above policies.

Furthermore, there are close links with the development of the **Mekong Delta Plan**. While the Mekong Delta plan provides a long-term strategic vision for the Delta as a whole, ultimately it will need to be further developed and implemented by local authorities and stakeholders at provincial, district and commune level. The strategy for the Lower Vam Co Basin developed in this pilot project is a prime example of how local authorities and stakeholders can achieve this.

As stated by Simon van der Burg (Consul General of the Royal Netherlands embassy): *“Although the Mekong Delta plan is a long term vision with long term objectives it should guide the provincial plans towards more sustainable and integrated adaptation strategy and land use. Both plans should be coherent and contributing to the same objectives. Especially the participative approach applied in this pilot project is the key to success for a broad based and accepted adaptation strategy.”*

Participative planning process

The **participative planning process** being implemented in this pilot project involved local actors to ensure that their priorities and the challenges they face in reducing climate risks are effectively addressed. We take the view that all stakeholders have relevant experience, knowledge and information that ultimately will inform and improve the quality of the planning process as well as any actions that (may) result. Hence, the process brought relevant stakeholders or those who have a ‘stake’ in a given issue or decision, into contact with one another. As a direct result we managed to enhance levels of trust between the different actors, to share information and knowledge, and to generate solutions and relevant good practices. Moreover, local experiences are key to developing a **tailor-made adaptation strategy**, tuned to the specific features of local geography, hydrology, ecology, economy and culture. As a result, the alternative strategies are based on problems and solutions identified by an extensive group of stakeholders within the pilot area, and have been developed on the basis of expert judgement and advanced decision support modelling tools.

This is one of the first projects in Vietnam which has introduced a **comprehensive approach for full-scale and meaningful participation** of relevant stakeholders at different levels (province, district, commune level) for developing a climate change adaptation strategy. With a combination of innovative participation methods and advanced decision support tools the pilot project demonstrated the added value of applying a participative planning process for the integration of different interests and spatial challenges into one single strategy. This is also unique since the participative planning process covers such a complex array of problems and multiple spatial challenges in one area.

With local actors we mean governmental authorities at provincial, district and village level, but also persons, groups and organizations with an interest or “stake” in climate adaptation, either because they will be directly affected by climate change, or because they may have a stake in proposed adaptation measures. Stakeholders include individual citizens and companies, economic and public

interest groups, such as non-governmental organizations, representatives of local communities, women's union and farmer associations.

Some statistics on the participative planning process:

- **120** persons participated in local questionnaire interviews > 5 per village in 6 villages in every of the 4 districts
- **250** persons participated in 4 District meetings
- **140** persons participated in 2 Provincial meetings
- In total **56** different stakeholders participated (including governmental authorities, civil society organisations, academia and private sector)

The project conducted an extensive **monitoring and evaluation procedure** on the participative planning process, amongst others based on the evaluation forms during the multi-stakeholder dialogues at provincial and district level, feedback from participants during the Midterm and Final Conference and feedback from the External Advisory Committee. Overall, participants indicated that they appreciated the integrated approach and the way how their own ideas were incorporated in a structured way. During the final conference we have received positive responses from the people living in our pilot area, i.e. that they could recognize the input they delivered during the participation process, and they confirmed that their ideas and solutions were incorporated in the final strategy.

Tools and methods

Decision support tools:

- o Hydrological models based on SOBEK
- o GIS-based damage module for pilot area
- o Multi-criteria analysis based on DEFINITE

Participation methods:

- o Extensive Stakeholder Analysis (as point of departure)
- o Questionnaire interviews (local level)
- o Multi-stakeholder dialogues (provincial and district level)
- o Individual cognitive mapping
- o Group model building

Results

The **key result** of this pilot project, as presented in this report, is a consensus-based ranking of preferred strategies for climate change adaptation in the pilot area. Each strategy includes a package of adaptation measures for the selected strategies. The preferred strategy is based on the following:

- Assessment of present and future climatic impacts in the local context, leading towards an assessment of associated risks and vulnerabilities in the pilot area;

- Broad and horizontal participation of stakeholders at provincial, district, commune and village level;
- Participation resulted in a consensus-based portfolio of different adaptation measures and solutions;
- Evaluation of the impact of different adaptation measures on potential flood from the river and from the sea and the related risks and saltwater damages;
- Set of alternative strategy components developed by experts and stakeholders;
- Consensus-based ranking of preferred strategies for the pilot area.

The first important output of the planning process was a joint problem definition. This output was based on an advanced facilitation methodology called group model building and resulted in a holistic and summarized overview of the perspectives from all stakeholders in the pilot area. At the same time, the joint problem definition was used to identify targeted policy recommendations, also based on participative assessment. The overview below provides a **summarized priority list of adaptation measures** (with high-low ranking), based on the outputs (i.e. priority lists) from multi-stakeholder workshops in each district:

- Upgrading and reinforcing dyke systems
- Forest protection and reforestation
- Water supply and demand side measures
- Training, education and awareness raising
- Information supply and sharing
- Upgrade and improve irrigation and drainage system
- Land use change from agriculture to aquaculture
- Improved policy coordination and integration
- Financial support, funding and investment
- Environmental pollution control
- Water treatment
- Attracting clean, sustainable and water-saving industries

Based on the problems and solutions identified above the project developed **five optional strategy components** in order to support the design sessions during the provincial multi-stakeholder dialogue on 23-24 May 2012 in Tan An, Long An Province. Details and feasibility of the following five strategy components were discussed by the participants during the design sessions:

1. Completing dyke system and upgrading dykes;
2. Semi-permeable barrier at river mouth + sluices to stop saltwater intrusion at high tide;
3. More room for rivers and nature: retention areas, wetland restoration, dyke replacements, combined with reforestation;
4. External freshwater supply;
5. Self-sufficiency in freshwater supply

Chapter 6 presents the results of the **multi-criteria analysis**, in which the outputs of SOBEK modelling together with expert judgment of Vietnamese and Dutch experts are used to evaluate the 5 strategy components using the 8 criteria groups that are identified during the Multi-Stakeholder Dialogue on

24 May 2012. This has been done for different scenarios: for dry and wet season, and for three sea level situations (current level, +12 cm sea level rise (SLR) and +33cm SLR).

Based on the evaluation of these five strategy components in chapter 6 the project developed **three integrated strategies** focusing on continuing current land-use and economic activities:

1. No-Regret Strategy
2. Tidal Barrier + Sluices
3. Import Freshwater

Chapter 7 presents these integrated strategies, including a package of measures for each strategy and intervention sheets for each measure. Each intervention sheet specifies the type of intervention, location, objective, responsibility, impact, investment costs, etc). The three integrated strategies are based on the five optional strategy components presented and discussed during the conference in Tan An on 23-24 May 2012 (see chapter 5). Table A shows an overview of the integrated strategies, in which strategy 2 and 3 are additions to the no-regret strategy (strategy 1).

Table A – Overview of strategies

Strategy 0	Strategy 1	Strategy 2	Strategy 3
no measures	No regret	No regret	No regret
		Tidal barrier + sluices	Import of freshwater

Table B shows an overview of strategy components, interventions sheets and type of intervention for each strategy. There are three general categories of intervention types: 1) physical intervention, 2) governance intervention, and 3) feasibility study. In total, table B shows six physical interventions, six governance interventions, and eleven feasibility studies.

Table B - Overview of strategy components, interventions sheets and type of intervention for different strategies

Strategy	Strategy component	Intervention	Type of intervention
1. No regret	Upgrading existing dyke system	1a. Upgrading existing dyke system	Physical intervention
		1b. Construction of 12 sluices	Physical intervention
	Optimizing water supply and water demand measures	1c. Rainwater harvesting	Physical intervention
		1d. Surface water extraction	Feasibility study
		1e. Development of sustainable groundwater management policy	Governance intervention
		1f. Water transfers within pilot area	Feasibility study
		1g. Desalination	Feasibility study
		1h. Point-of-use conservation	Physical intervention
		1i. Water saving technologies in irrigation	Physical intervention
	Upgrading natural water capacity	1j. Land use change from agriculture to aquaculture	Governance intervention
		1k. Water recycling and re-use	Physical intervention
		1l. Dyke replacements	Feasibility study
2. Tidal barrier at Vam Co mouth	Upgrading natural water capacity	1m. Increasing retention capacity	Feasibility study
		1n. Wetlands development and/or restoration	Governance intervention
		1o. Economic and financial measures	Governance intervention
	Improving governance tools	1p. Communication and education measures	Governance intervention
		1q. Regulatory measures	Governance intervention
	Construction of infrastructure	2a. Construction of tidal barrier	Feasibility study
3. Import of fresh water	Import of fresh water from own river basin	3a. Import of fresh water from upstream groundwater	Feasibility study
		3b. Import of fresh water from upstream surface water	Feasibility study
	Import of fresh water from other river basins	3c. Import of fresh water from adjacent river basins	Feasibility study

The **final preferred strategy, which is called a “No-Regret Strategy”, offers a consensus-based mixture of measures**, based on the priority lists and evaluations provided by the stakeholders and based on feedback from Dutch and Vietnamese experts. The strategy aims at completing and upgrading the dyke systems and creating more room for rivers (e.g. dyke replacements and retention areas) and protection of nature areas such as mangroves and swamps. More room for rivers and nature will increase the resilience and the water discharge capacity of the Vam Co River Basin as a whole. The no-regret strategy also provides a variety of measures for optimising water supplies and demand management, including rain-water collection, sustainable groundwater exploitation, water saving technology in irrigation, improved use of water resources (3 Rs: re-use, reduce, recycle) and sewage and wastewater treatment. These measures can be implemented safely without compromising the development of wider water management plans, such as the Mekong Delta Plan or the HCMC Flood Management Program, for which reason this is named a No-Regret Strategy. This optimal mix of measures will reduce the chance of flooding by the sea and by the river, and will also reduce demand for freshwater and should lead to better allocation of available freshwater resources in the districts. Additionally, strategy 1 includes a number of governance tools, including: a) economic and financial measures, b) communication and education measures, and c) regulatory measures.

Within the context of increasing the water discharge capacity for the basin as whole, it is important to consider **transboundary issues**, in particular the fact that the Vam Co Basin is squeezed in between two major river basins (i.e. the Saigon-Dong Nai basin and the Mekong Basin). This means that the Vam Co Basin is affected by developments in these basins, such as water resources development projects in the Mekong, or infrastructure and urban development projects by Ho Chi Minh city. One example is a planned measure to divert water, during peak discharges, from the Saigon River (north from HCMC) to the Vam Co Basin, in order to protect HCMC against flooding. This will have major consequences for the Lower Vam Co River Basin, since it may divert 2500 m³/s of water from the Saigon into the Vam Co Basin, which will substantially increase the risk of flooding in the Vam Co. However, it can also be used to provide the Vam Co area with freshwater during the dry season if the peak discharge diverted from Saigon River can be (partly) stored in the upstream areas of the Vam Co Basin, e.g. by means of ecosystem water storage and/or retention areas. This would be a potential win-win situation, although further study on its feasibility is required.

A second strategy adds **tidal barriers and sluices** to the “No-Regret Strategy” in order to drastically reduce seawater intrusion into the pilot area. These measures will only be necessary when the no-regret strategy does not succeed in providing sufficient fresh water for current land uses. Important note: realization of a tidal barrier will have significant and non-reversible impacts on water management in the wider region, and can therefore not be considered as a non-regret measure. Also the construction of sluices is considered highly controversial, since it will shut certain areas off from their surroundings, which may lead to severe **negative environmental consequences** for the affected ecosystems.

In any case, it is strongly recommended to await the final decision about a **sea dyke in Soai Rap estuary**, to be constructed in order to protect Greater Ho Chi Minh City from sea level rise. A sea dyke in Soai Rap would make a tidal barrier in the mouth of the Vam Co river redundant. Furthermore, a tidal barrier may influence the flooding depth of the land behind the barrier, and will therefore have implications for the height of the dyke rings in the pilot area. Overall, the construction of a tidal barrier has major influence on daily activities and economy of local people, and it might have negative impacts on navigation, thus further study is required.

A third alternative strategy adds measures - on top of the “No- Regret Strategy” – for **importing additional surface or groundwater water** from outside the pilot area into the four coastal districts of Long An Province. For example, water can be imported from upstream areas adjacent to the pilot area or from storage reservoirs in the Saigon and/or Mekong river basin. The aim of this import is to overcome water shortages within the pilot area during the dry season, as has been noticed regularly in the past. This strategy will only be necessary when the no-regret strategy does not succeed in providing sufficient fresh water to current land and water users in the pilot area. However, its feasibility is highly controversial and would require further study.

Conclusions and recommendations

As evaluated by the External Advisory Committee, and based on the panel discussions during the Midterm and Final Conference, the existing Vietnamese demand for adaptive and participatory approaches to water management and water governance has been served well by the project, and provides a good basis and reference for further dissemination and upscaling. The Chairman of Long An Provincial People’s Committee stated during the Final Conference on 28 February 2013: “The participative planning process and resulting strategy is highly appreciated, and we need a roadmap for further roll-out”.

With a combination of innovative participation methods and advanced decision support tools the pilot project demonstrated the added value of applying a participative planning process for the integration of different interests and spatial challenges into one single strategy. **The pilot project shows that participative planning methods, such as Group Model Building and highly-interactive forms of learning, are possible, if properly embedded, initiated and facilitated.** The group model building in this pilot project improved group understanding about the water management system, its problems and possible solutions, which will directly or indirectly lead to better management decisions. Not only is the model itself a product of the process, but also the generation of common understanding among the stakeholders during the process is an important product of the process.

Moreover, an effective planning process is achieved by providing **adequate information and inviting key stakeholders at the right moment** during the process of strategy development. Adequate information supply was made possible thanks to a variety of decision support tools, such as the SOBEK modelling, a GIS-based damage module for the pilot area and DEFINITE for the multi-criteria analysis.

Based on the feedback from participants the participatory planning process led to **positive outcomes** compared to a ‘business-as-usual’ approach in Vietnam:

- More knowledge generation and sharing
- More mutual trust
- Development of consensus-based solutions
- Identification of relevant good practices
- Greater learning ability of the persons and organizations involved with water and climate issues

Given the **Vietnamese culture and context**, a participative planning process could not be done in the same way as in the Netherlands or other western cultures. Eventually the project was able to find a way that connected with the Vietnamese participation tradition and in 6 meetings, more than 400 representatives of organizations at province, district and commune level contributed to a joint Group Model of problems, solutions and components for strategy development.

For implementing a participative planning process in Vietnam several **important lessons** can be drawn:

- Characteristics of the Vietnamese society, such as conflict resolution by negotiation, open attitude to new technologies and innovations, and the high level of participation in voluntary mass organizations, constitute a good basis for participation in decision-making and planning;
- An effective approach for participative planning in Vietnam seems the active involvement of mass organizations and NGOs through which citizens' interests are represented. Mass organizations play an important role in organising people at local levels (district, commune) and the grass-roots level, amongst others since the number of people belonging to organisations is very high in Vietnam compared with countries like Singapore and China, which have comparable types of governance. The five mass organisations (or socio-political organisations) in Vietnam include the Women's Union, the trade unions, the Youth Union, the Farmers' Association and the Association of Veterans. The Fatherland Front, which is the umbrella organisation of the mass organisation and other organisations, is also counted as a mass organization;
- On the lowest government level (grass root level), the village head plays a crucial role.
- The economic conversion of the country marks a change in its mentality: whereas the state used to be the only mobiliser of resources, society as a whole has now become a driving force (Le Viet Thai, 2007);
- The reform policy (*doi moi*) since 1986 and the recent development in Grassroots Democracy policy lay a good foundation for a participatory planning approach in Vietnam

The project has followed a **multi-level governance approach** for supporting integration between different levels and for establishing liaisons and opportunities for upscaling the project results. While the pilot project has organized multi-stakeholder dialogues at three different levels (province-district-commune), the External Advisory Committee, additionally, has supported interaction and collaboration with higher levels, including the regional, national and international level. The member constitution of the EAC was specifically selected to allow for upscaling and streamlining of the project results.

The preferred strategy includes a **wide range of policy recommendations** for Vietnamese authorities to enable a sustainable and climate-resilient development of the pilot area. Together, we need to improve cross-sectoral cooperation & harmonize sectoral policies, mainstream climate adaptation, set-up mechanisms for knowledge, data- and information exchange & good communication, improve participatory planning approaches, ensure equity and social fairness. Besides, **more focus is needed on non-structural measures**, sustainable groundwater management policy, shift to green technology and green living: improved use of natural resources (3 Rs: re-use, reduce, recycle), possibilities for renewable energy: wind, solar, water, salt/fresh exchange potential, etc. Further investigation is needed on the potential for ecosystem water storage, viz. diversion from Saigon river to alleviate HCMC floods, development of innovative disaster risk management, delegation of responsibility to the lowest possible level (subsidiarity), and **capitalizing on the unique location of Long An**. Finally, we need to **build capacity** and prepare human resources management (HRM) for the future by training, awareness raising and consensus-building.

Chapter 1 - Introduction

1.1 Objectives

The **objective** of this pilot project is to develop an integrated and community-based climate change adaptation strategy for the Lower Vam Co River Basin in Vietnam. The strategy development is done by a participative planning process at different levels (i.e. provincial, district and local level), supported by advanced decision support techniques. By doing so the pilot project demonstrates the added value of applying a participative planning process for the integration of different interests and spatial challenges into one single strategy. The pilot project includes a **strong capacity building component**, to ensure that the participative planning process can be reproduced by the authorities and people from Long An Province, and that the methods, lessons learned and results of the project can be used for similar projects in the Mekong Delta or other regions in Vietnam and SE Asia.

The project is being executed in the period from 1 November 2011 until 31 December 2012. The current document is the **Preferred Climate Change Adaptation Strategy** (presented as Deliverable 3 & Synthesis report) under this project.

The **participative planning process** involves local actors to ensure that their priorities and the challenges they face in reducing climate risks are effectively addressed. Local experiences are key to developing a tailor-made adaptation strategy. With local actors we mean governmental authorities at provincial, district and village level, but also persons, groups and organizations with an interest or “stake” in climate adaptation, either because they will be directly affected by climate change, or because they may have a stake in proposed adaptation measures. Stakeholders include individual citizens and companies, economic and public interest groups, such as non-governmental organizations, representatives of local communities, women’s union and farmer associations.

With a tailor-made climate change adaptation strategy Long An Province will comply with, and partly implement in its own unique way the policy targets of the *National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020*, and also its commitment to the *National Target Program to Respond to Climate Change (NTP-RCC)*. The preferred climate change adaptation strategy developed by this pilot project will serve as an important input to the development of the Long an provincial action plan(s) under above policies.

The current document presents the preferred² climate change adaptation strategy as a result of the pilot project. It does not fully cover all separate building blocks and outputs of the project, since other Work Package reports have been developed and published separately. This report is presented as Deliverable 3 & Synthesis Report.

² Preferred means based on the preference of stakeholders participating in this pilot project, combining the results of the participative assessment of problems and solutions (see section 2.4 and 4.1), development of priority lists by the stakeholders (section 4.2) and the results of the participatory approach to multi-criteria analysis (section 6.1).

1.2 Consortium

Within the bilateral collaboration between the Dutch and Vietnamese Governments, the consortium of Water Partner Foundation (lead), Deltares and the Institute for Environmental Studies (IVM) from the Netherlands and the Southern Institute of Water Resources Research (SIWRR) in Vietnam are working together with Long An Province to implement this pilot project: “Participation in climate change adaptation for the lower Vam Co river basin – Long An Province”

1.3 Funding of the pilot project

The project is financed from three sources: The Netherlands Government (represented by *Partners for Water*) with 79% of the total fund for the project, while 19% will be covered by the reciprocal fund of Long An Province (from provincial fund for science research in 2012), and 2% will be covered by the International Water Governance Centre in the Netherlands.

The funding is allocated as followed:

Funding from the Netherlands Government (79%)

- Remuneration for Water Partner Foundation, Deltares, IVM and CESTE
- Travel, visa and DSA for Dutch staff
- Data collection (2500 Euro)
- Auditing (5000 Euro)

Funding from Long An Province (19%)

- Organizing workshops & meetings
- Stakeholder dialogue workshops in 4 districts
- Questionnaire surveys in 4 districts
- Website, newsletter, brochure
- Meetings of External Advisory Committee (2500 Euro)

Funding from the Netherlands Water Governance Center (2%)

- External Advisory Committee (7500 Euro)

1.4 Pilot area

Under this project preferred climate change adaptation strategies have been developed for the downstream part of the Vam Co river basin in Long An Province (see figure below). The pilot area covers an area of 686 km². The boundary of the study area is demarcated by four districts: Can Duoc District, Can Giuoc District, Tan Tru District and Chau Thanh District. These districts are characterized as follows:

- **Can Duoc** is a district (huyện) in the south of Long An. Can Duoc is famous for its Nang Thom Cho Dao Rice. As of 2010 the district had a population of approximately 170.000. The population density is around 779 people/km². The district covers an area of 218 km². The district capital lies at Can Duoc.

- **Can Giuoc** is a district (huyện) of Long An Province. As of 2010 the district had a population of approximately 170,000. The district covers an area of 211 km². The district capital lies at Can Giuoc
- **Tan Tru** is a rural district (huyện) of Long An province. As of 2010 the district had a population of approximately 61,000. The district covers an area of 107 km². The district capital lies at Tan Tru.
- **Châu Thành** is a rural district (huyện) of Long An province. As of 2010 the district had a population of approximately 98,000. The district covers an area of 151 km². The district capital lies at Tam Vu.

Vam Co River is influenced by two (2) big river networks: (i) SaiGon – Dong Nai via Vam Co Dong River and (ii) Mekong via Vam Co Tay River. The pilot area is located southeast of National Highway no. 1a, which is running directly through Tan An (provincial capital), and connects Ho Chi Minh City (HCMC) with the provinces of the Lower Mekong delta Basin. The pilot area is located in the triangle of three cities: Ho Chi Minh City, My Tho and Tan An, including the confluence point of Vam Co Dong (East Vam Co river) and Vam Co Tay (West Vam Co river). At this point the two rivers are merged as one (now called: Vam Co river). From this point the Vam Co River is 35 km long, 400 m wide on average, flowing through Soai Rap river mouth into the East Sea. The pilot area mainly includes the rural agricultural areas located east from Tan An (provincial capital) and some semi-industrial/domestic urban areas southwest of HCMC. For supporting the strategy development we used hydrological models for the whole river basin (from upstream to downstream).

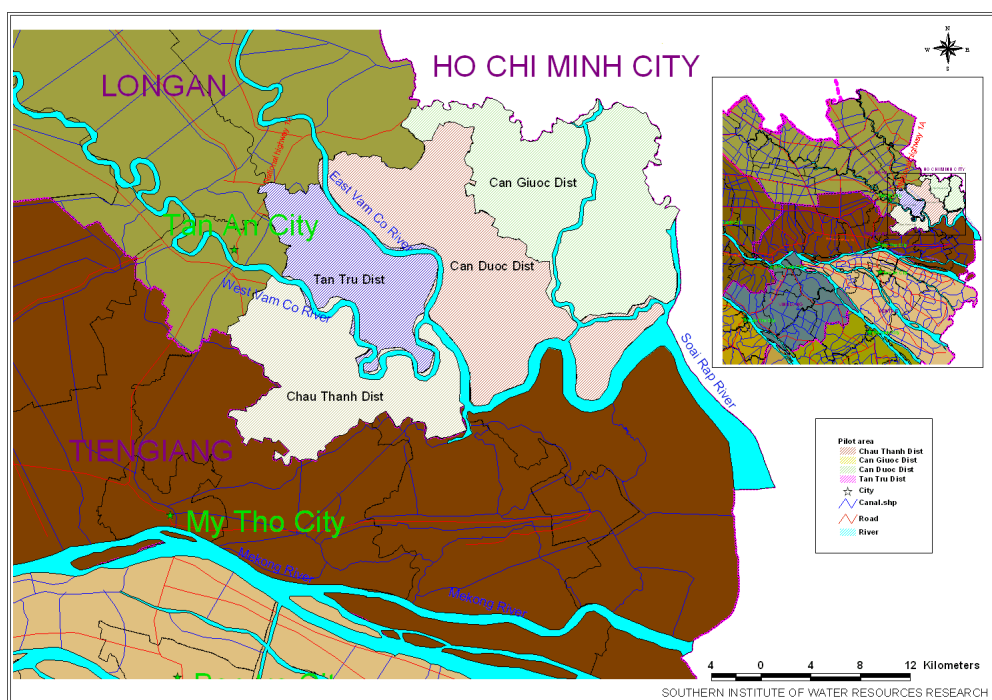


Figure 2 – Pilot Project Area

1.5 Methodology

As part of the participative planning process the following key techniques, tools and methods have been used in this pilot project:

- **Stakeholder analysis**: see section 3.4 below;
- **SWOT-analysis**: re-evaluation of, and learning from, earlier IWRM and participative planning-projects in Vietnam by looking at the Strengths, Weaknesses, Opportunities, and Threats of these projects;
- **Group Model Building** at provincial level and district level: Group Model Building (GMB) is a method for facilitating 'deep involvement' of a group of individuals/stakeholders in the building of a model of a particular management system, in order to improve group understanding about that system, its problems and possible solutions, which will directly or indirectly lead to better management decisions. Not only is the model itself a product of the process, but also the generation of common understanding among the stakeholders during the process is an important product of the process of group model building. Results of this method can be found in Chapter 2 and Section 3.5;
- **Questionnaire interviews** at the local level (see Section 3.6);
- **SOBEK 1D-2D**: a model that gives a two-dimensional representation of the flooding conditions over time in for instance a polder, a town, a diversion zone, etc. This tool has been used together with a hydrologic and statistical analysis of discharge conditions in the Vam Co River, which will enable an assessment of the actual Flood Risk ($\text{Risk} = \text{Probability} * \text{Potential Damage}$). With the SOBEK model not only floods from the Vam Co River have been simulated, but also scenarios with a water-level rise at the sea boundary (storm and sea-level rise). Apart from that it was possible, by using a 'fraction-simulation' approach, to simulate the salt intrusion. This approach simulated how the concentration of a fraction (salt) released at the sea boundary, is intruding the model.
- Decision support tool for conducting **multi-criteria analysis (MCA)**, called Definite: this is a simple interface in which multiple measures or strategies have been evaluated and ranked. The multi-criteria analysis (MCA) has been implemented in cooperation with representatives of stakeholder groups and with local experts. The purpose of the MCA was twofold: first, to enable a ranking of proposed measures. Secondly to stimulate discussion on the measures between stakeholders and to help coming to an agreement on the future plans. More details on the multi-criteria analysis have been provided in Section 5.1;
- **Multi-stakeholder dialogues** at provincial and district level: the multi-stakeholder dialogues in our pilot project aimed to bring relevant stakeholders or those who have a 'stake' in a given issue or decision, into contact with one another. The key objective was to enhance levels of trust and understanding between the different actors, to share information and institutional knowledge, and to generate solutions and relevant good practices. The process takes the view that all stakeholders have relevant experience, knowledge and information that ultimately will inform and improve the quality of the decision-making process as well as any actions that (may) result.

1.6 Results

The key result of this project, as presented in this report, is a consensus-based ranking of preferred strategies for climate change adaptation in the pilot area. Each strategy includes a package of adaptation measures for the selected strategies. The preferred strategy is based on the following:

- Assessment of present and future climatic impacts in the local context, leading towards an assessment of associated risks and vulnerabilities in the pilot area;
- Participation of stakeholders at provincial, district, commune and village level;
- Participation resulted in a consensus-based portfolio of different adaptation measures and solutions;
- Evaluation of the impact of different adaptation measures on potential flood from the river and from the sea and the related risks and saltwater damages;
- Set of alternative strategies developed by experts and stakeholders;
- Consensus-based ranking of preferred strategies for the pilot area.

1.7 Definitions

Definitions of key terms used in this report are listed below in alphabetical order:

Adaptation to climate change is defined by Adger et al. (2005, p.78) as: “An adjustment in ecological, social or economic systems in response to observed or expected changes in climatic stimuli and their effects and impacts in order to alleviate adverse impacts of change or take advantage of new opportunities. Adaptation can involve both building adaptive capacity thereby increasing the ability of individuals, groups, or organisations to adapt to changes, and implementing adaptation decisions, i.e. transforming that capacity into action. Both dimensions of adaptation can be implemented in preparation for or in response to impacts generated by a changing climate.”

Climate Change Scenario: A coherent and internally-consistent description of the change in climate by a certain time in the future, using a specific modelling technique and under specific assumptions about the growth of greenhouse gas and other emissions and about other factors that may influence climate in the future (UKCIP, 2003). Scenarios are generally external and cannot be influenced, in contradiction to strategies.

Climate impacts: Consequences of climate change on natural and human systems. Depending on the consideration of adaptation, one can distinguish between potential impacts and residual impacts (IPCC TAR, 2001):

- Potential Impacts--All impacts that may occur given a projected change in climate, without considering adaptation.
- Residual Impacts--The impacts of climate change that would occur after adaptation.

Risk (climate-related): Is the result of interaction of physically defined hazards with the properties of the exposed systems – i.e., their sensitivity or (social) vulnerability. Risk can also be considered as the

combination of an event, its likelihood, and its consequences – i.e., risk equals the probability of climate hazard multiplied by a given system's vulnerability (UNDP, 2005).

Strategy: Refers to a broad plan of action that is implemented through policies and measures. A climate change adaptation strategy refers to a general plan of action for addressing the impacts of climate change, including climate variability and extremes. It may include a mix of policies and measures, selected to meet the overarching objective of reducing the vulnerability of a certain area (UNDP, 2005).

1.8 Rationale of this report

The presented climate adaptation strategy aims to provide the decision makers of Long An province with a clear overview of alternative strategies for adaptation of the pilot area to climate change related threats. The alternative strategies are based on problems and solutions identified by an extensive group of stakeholders within the pilot area, and have been developed on the basis of expert judgement and decision support modelling tools.

The preferred strategy has been selected with the use of Multi Criteria Analysis (MCA). The evaluation criteria within the MCA were identified by the stakeholders, and have been weighed in terms of importance in consultation with the stakeholders as well.

It is the responsibility of the Province of Long An to eventually decide to what extent the proposed strategy will indeed be adopted, and how the results and recommendations presented for this pilot area will be used to further develop a Climate Adaption Strategy for the Province of Long An at large.

It is the wish and hope of all Vietnamese and Netherlands partners in the current pilot project, that the methodologies, tools and results of this pilot project will provide clear directions to the Province of Long An and other provinces and river basin authorities on how to address climate change related challenges.

Chapter 2 – The necessity of developing a climate change adaptation strategy

This chapter provides an overview of climate related problems in Vietnam and the pilot area in particular (section 2.1), as identified by the stakeholders (including authorities and experts). Moreover, under this pilot project an elaborate assessment of present and future climatic impacts in the local context has been undertaken by means of decision support modeling techniques, leading towards an assessment of associated risks and vulnerabilities in the pilot area. Section 2.2 provides some key results of this risk assessment, while more details can be found in annex 4 (Outputs Decision Support Track).

2.1 Vietnam and climate change

In the past decades, climate change has already caused more frequent and a higher intensity of natural disasters, especially flood, drought, salinity intrusion are causing more difficulties to the Mekong Delta. Hence, by the end of 2010 Vietnamese Government has initiated the National Target Programme to Respond to Climate Change (NTP-RCC). For formulation of this programme different climate change scenarios, in particular for sea level rise, have been developed for the period of 2010 to 2100. Under the NTP, each province needs to develop actions plans to respond to climate change including adaptation to the effects of climate change and sea level rise.

According to the climate change scenario from ICEM (2007), 10 provinces in the Mekong delta will be flooded if sea level increases with 1.0m, Long An will be the province affected the most: 49.4% of the whole province area will be inundated. In particular, the cities and villages in the lower part of Vam Co river basin are extremely vulnerable to impacts of climate change and sea level rise. For this pilot project we will use the official MONRE data and climate change scenarios.³

Every year flood converges firstly to the Northern districts in Dong Thap Muoi, starting from the beginning or mid-August and lasting to November. For the southern coastal districts, i.e. Can Duoc, Can Giuoc, Chau Thanh and Tan Tru, flood from upstream combined with high tide from East Sea (via Soai Rap estuary) may lead to severe inundation. In addition, drought and salinity intrusion especially in the dry season are already causing serious problems for fresh water supply for domestic, agricultural and industrial uses in the pilot area.

Under present conditions climate variability is already important to successful management of water in the area. The impacts of climate change enlarge the existing complexities of achieving just socio-economic and sustainable development which involves multiple uses of water among growing numbers of users.

In particular, an increased intensity and frequency of floods and droughts will have severe negative consequences for food production and human health in the area (based on climate change scenarios developed by Can Tho University, 2009). Also other sectors might be severely affected, including

³ Source: 'Climate change in the Mekong Delta, Vietnam-Netherlands Mekong Delta Master plan project, Climate scenario's, sea level rise, other effects, HCMC 2010'

industry, transportation, and tourism. On top of that, it is expected that sea level rise will cause more and more saline water intrusion in the downstream parts of the Vam Co river. Even worse, without precaution the lower part of Vam Co river basin in Long An Province, under specific circumstances (i.e. daily tidal movements and spring tides combined with storms), will be almost completely inundated if the sea level would rise with 1 meter (Source: The International Centre for Environmental Management, 2007). See also figure 2 below.

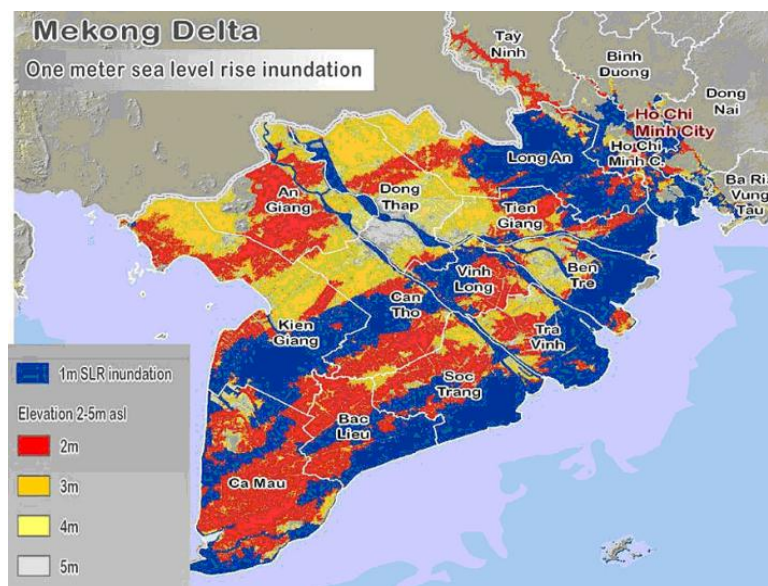


Figure 3 - The pilot area in Long An Province (southeast of Ho Chi Minh City) is confronted with serious risks of inundation with a sea level rise of 1 meter (Source: The International Centre for Environmental Management (ICEM, 2007))

Agriculture is certainly one of the most vulnerable sectors to climate change. Next to the devastating effects on crops by floods, droughts and salt water intrusion, the change in surface air temperature and rainfall patterns can affect the soil conditions and thereby the growth of crops. Especially the livelihoods of the poor who already live on the margin, can be adversely affected by climate-related extreme events. Failure of crops due to floods, drought, salt water intrusion or rise in temperature can seriously reduce their limited income even further.

In vulnerable deltas, such as in Vietnam and the Netherlands, it is increasingly recognized that we need to be planning to adapt to the challenges and opportunities that a changing climate will bring. Managers and policy makers responsible for water and environment related issues are under pressure to respond to the unprecedented impacts of climate change.

2.2 Climate change scenarios (adopted from IPCC)

The SRES scenarios (Special Report on Emissions Scenarios) were constructed to explore future developments in the global environment with special reference to the production of greenhouse gases and aerosol predecessor emissions. These concentrations are the major factors determining the degree of climate change. Four narrative storylines were defined, describing the relationships between the forces driving greenhouse gas and aerosol emissions and their evolution during the 21st century for large world regions and globally. Each storyline represents different demographic, social,

economic, technological, and environmental developments that diverge in increasingly irreversible ways.

The four storylines combine two sets of divergent tendencies: one set varying between strong economic values and strong environmental values, the other set between increasing globalization and increasing regionalization. The storylines are summarized as follows (Nakicenovic et al., 2000):

- A1 storyline and scenario family: a future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and rapid introduction of new and more efficient technologies. The A1b scenario assumes a rise of CO₂ levels to ca. 703 p.p.m. by 2100.
- A2 storyline and scenario family: a very heterogeneous world with continuously increasing global population and regionally oriented economic growth that is more fragmented and slower than in other storylines. A relatively little technological innovation is achieved resulting in a Green Hous Gas (GHG) concentration of 836 p.p.m. by 2100.
- B1 storyline and scenario family: a convergent world with the same global population as in the A1 storyline but with rapid changes in economic structures toward a service and information economy, with reductions in material intensity, and the introduction of clean and resource-efficient technologies. The B1 scenario assumes an increase of CO₂ to ca. 540 ppm by 2100 and is therefore the scenario with smallest rise in GHGs
- B2 storyline and scenario family: a world in which the emphasis is on local solutions to economic, social, and environmental sustainability. It is a world with continuously increasing global population at a rate lower than A2, intermediate levels of economic development, and less rapid and more diverse technological change than in the B1 and A1 storylines. While the scenario is also oriented toward environmental protection and social equity, it focuses on local and regional levels. It assumes an increase in CO₂ to ca 600 p.p.m. by 2100.

The scenario background mentioned above forms the basis for the scenarios of the MONRE report (2010) as mentioned earlier in this report. In the next paragraph the application of the MONRE scenarios is discussed.

2.3 Risk assessment of the pilot area

Under this project an elaborate assessment of present and future climatic impacts in the local context has been undertaken, leading towards an assessment of associated risks and vulnerabilities in the pilot area. Some key results of this risk assessment are presented in this section. More details can be found in annex 4 (Outputs Decision Support Track).

The hydrological model, SOBEK 1D/2D has been used to dynamically simulate the following:

- Water flows in the streams, rivers and canals of the Vam Co river basin (1D)
- Water levels in the streams, rivers and canals of the Vam Co river basin (1D)
- Salinity levels in the streams, rivers and canals of the Vam Co river basin (1D)
- Maximum water depths and maximum flooding extent in the rural and urban areas in case of flooding (2D)

For screening of the effects of climate change, the scenarios of the MONRE report (2010) are used. These scenarios are based upon different green house gas emission levels associated with different future socio-economic development pathways. Relevant inputs for the SOBEK model are the change in rivers flows, governed by change in precipitation, and the expected sea level rise. For the assessment of the effects of climate change two scenarios of the above mentioned MONRE report have been applied:

- The scenario with medium emission level, Scenario B2, target year 2020; and,
- The scenario with the highest emission level, Scenario A2, target year 2050.

For the assessment of the effects of climate change scenarios we looked at the effects both in the dry season as well as in the wet season. As representative hydrological reference periods we used March 1998 for the dry season and October 2000 for the wet season.

Based on the results of the SOBEK modeling three specific climatic impacts pose serious problems to the pilot area:

- Salinity intrusion and fresh water shortage in the dry season, due to a combination of sea level rise, higher evaporation rates and insufficient discharge from the rivers;
- Salinity intrusion in the wet season, mainly due to sea level rise; and,
- Flood hazard in the wet season from river branches and from high tidal levels at sea.

To show the outputs of the SOBEK model we have selected a number of model output locations presented on the map below. A number of these locations are situated in the Vam Co river branches. For those locations longitudinal profiles are presented with both minimum and maximum water levels as well as minimum and maximum salinity levels. Also a number of output locations have been selected within Can Giuoc and Can Duoc districts. Due to choices made in the SOBEK model schematization there are no output locations available within Tan Tru and Chau Thanh districts. For the sea boundary salinity concentration we assumed a salinity level at Soai Rap of 32 gr/l in both dry and wet season.

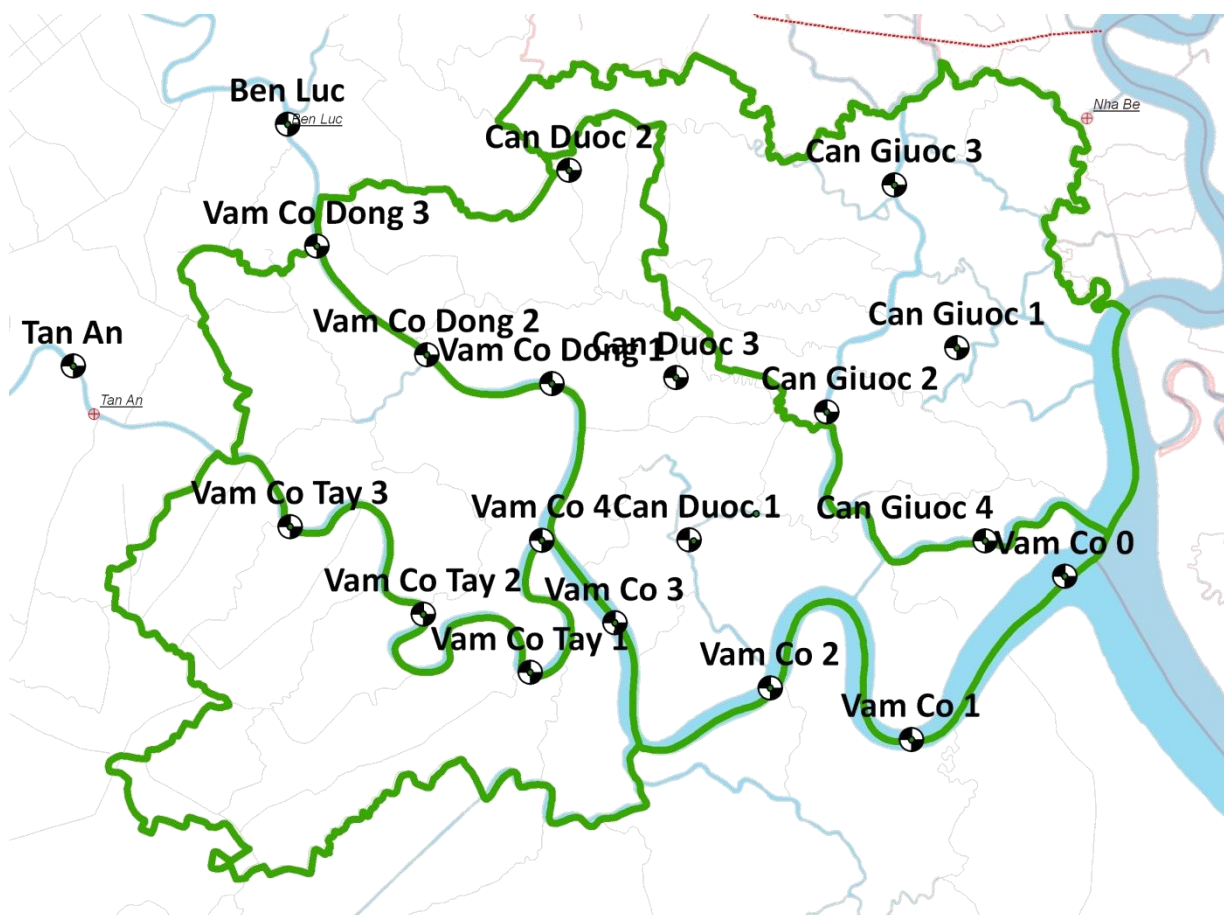


Figure 3 - Overview of SOBEK output locations in the pilot area

In the next paragraphs we will discuss the observations we made reviewing the model results. We use outputs from the Excel dashboard that comprises simulation results of all SOBEK model calculations performed for this study.

Climate impacts during dry season

Salinity intrusion increases dramatically

The longitudinal effects on the Vam Co river are significant. In Figure 2 the salinity intrusion in the dry season is shown in the present situation (reference year: March 1998) compared with the salinity intrusion in 2020 under the B2 scenario, along the Vam Co Tay and Vam Co river branches. Note that stations Moc Hoa and Go Dau Ha are not on the map in Figure 3 because of their upstream location. For readable purposes the zoom level in Figure 3 is limited to the pilot area.

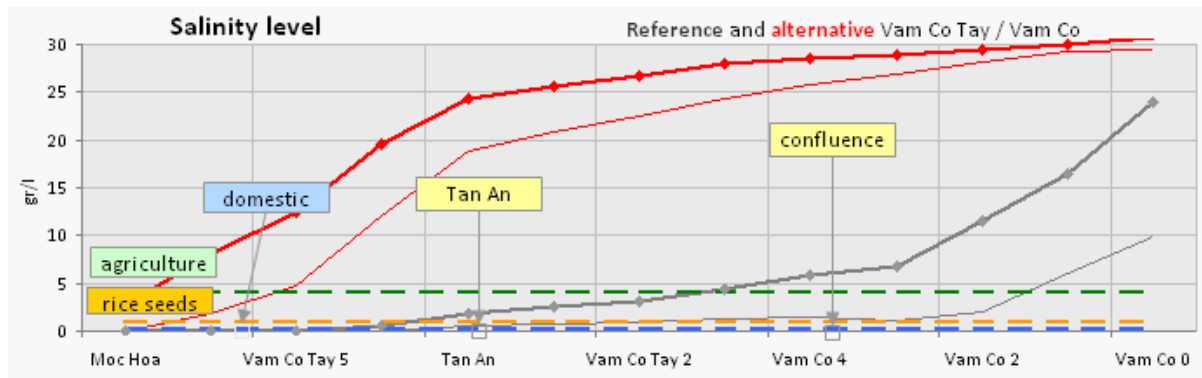


Figure 4a - Maximum salinity level in the Vam Co Tay river and Vam Co in dry season, both for the current situation as for the B2 scenario for 2020 (see legend)

Legend for Figure 4a and 4b:

- ◆ maximum salinity level scenario B2
- minimum salinity level scenario B2
- ◆ maximum salinity level current situation
- minimum salinity level current situation
- - - threshold salinity level agriculture
- - - threshold salinity level rice seeds
- - - threshold salinity level domestic use

The same longitudinal profile is shown in Figure 4b for the Vam Co Dong river branch, see below.

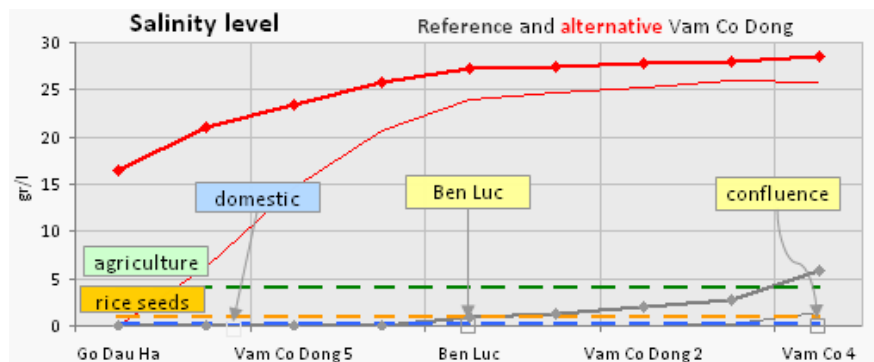


Figure 4b - Maximum salinity level in the Vam Co Dong river in dry season, both for the current situation as for the B2 scenario for 2020 (see legend above)

Together with the computed outputs, also the threshold values for different water uses are shown. The assumed threshold values are: Agriculture = 4 gr/l, Rice seeds = 1 gr/l and domestic use = 0.25 gr/l. As can be seen, the difference in the maximum salinity levels is significant. The sea level rise of 12 cm for the medium scenario already means a dramatic increase of the salinity intrusion.

Let us now focus on the salinity distribution in the districts. In the figure below an overview is given of the salinity level in the districts. Left in Figure 2 the salinity intrusion in the dry season is shown in the present situation (reference year: March 1998) compared with the salinity intrusion in 2020 under the B2 scenario. On the right the salinity intrusion in the dry season is shown in the present situation (reference year: March 1998) compared with the salinity intrusion in 2050 under the A2 scenario. Both simulation maps show the impacts of climate change if no measures are being taken

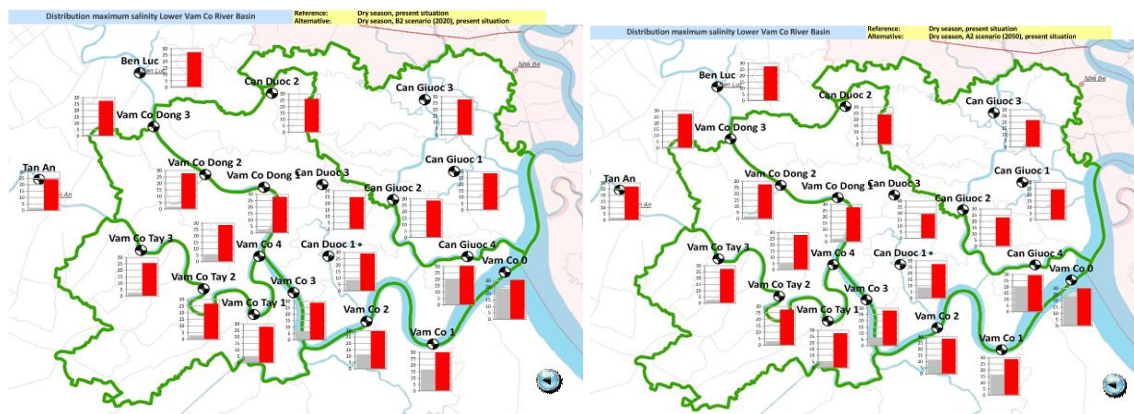


Figure 5 - Maximum salinity levels in dry season for B2 scenario for 2020 (left) and A2 scenario for 2050 (right)

Additionally, the % time with exceedance of salinity thresholds for different uses is shown below. The selected output location is Vam Co Dong 2, which is reasonably centrally located in the pilot area.

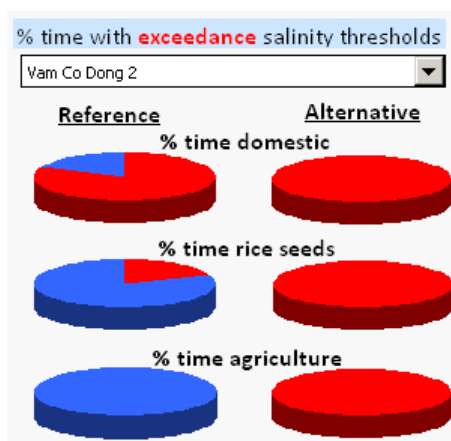


Figure 6 - Percentage of time when salinity thresholds are exceeded. B2 Scenario vs. current situation (=reference)

For scenario A2 the same results are presented as in Figure 4 for scenario B2. This means that for the three water uses no fresh water can be used during 100 % of the time in dry season.

Climate impacts during wet season

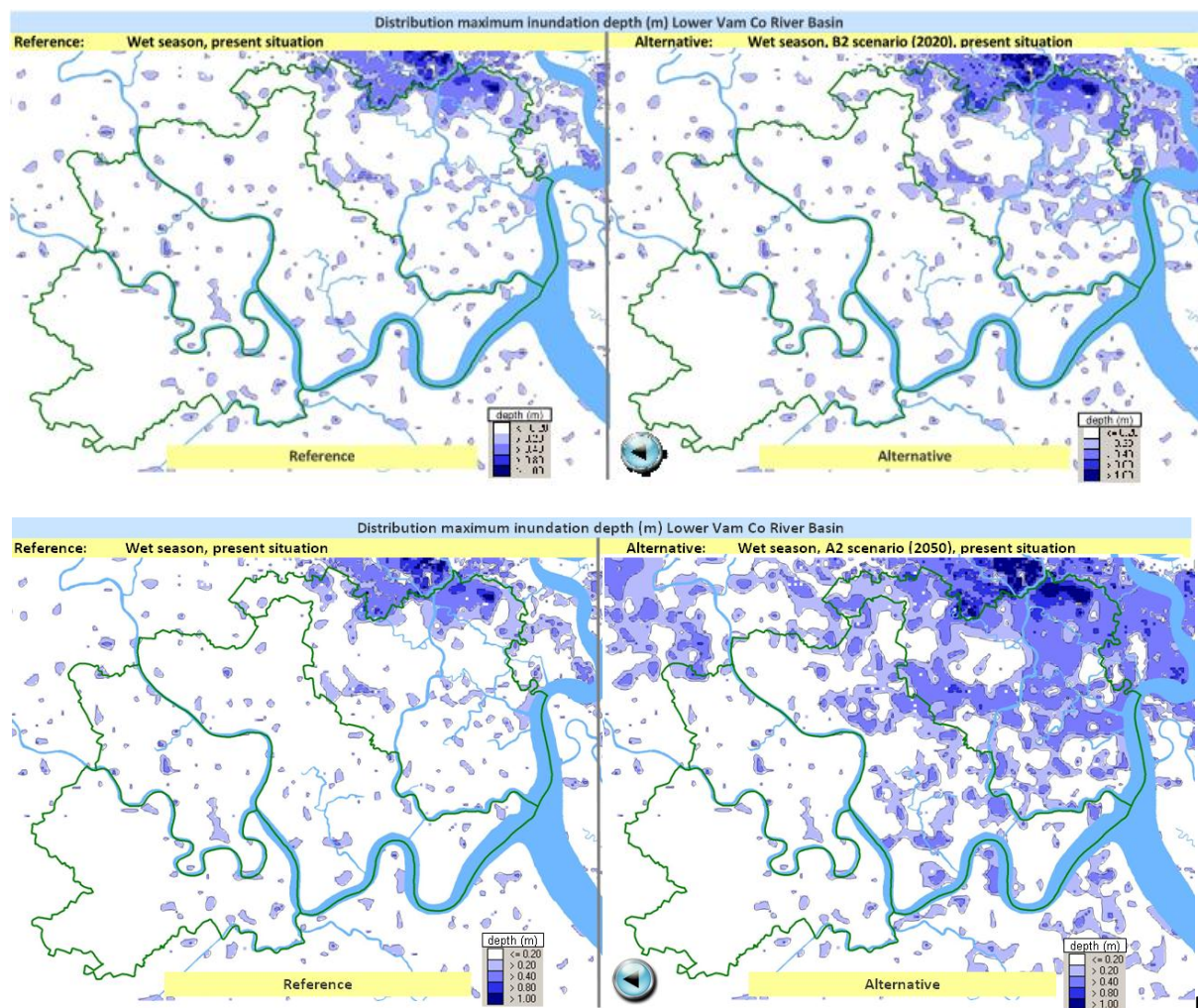


Figure 7 - Flood maps of the pilot area with maximum inundation depth. B2 Scenario vs. current situation (=reference) above and A2 Scenario vs. current situation (=reference) below.

In figure 7 the flood maps are presented for the wet season in the current situation and with the B2 scenario (above) and with the A2 scenario (below). The flood maps show various inundation spots in the pilot area in both situations. These are the result of the heavy rainfall during the simulation period. In Can Giuoc district also flooding due to high tide coming from Saigon river is calculated. The latter increases in case of the B2 scenario. With scenario A2 also Can Duoc district is affected. In Table 1 we see the computed damages based on the land use map from DONRE of 2010.

Flood damage at selected land use (%)			Flood damage at selected land use (1000 USD)		
	Reference	Alternative		Reference	Alternative
Can Giuoc	6.9%	12.7%	Can Giuoc	2048.9	3760.4
Can Duoc	1.6%	2.1%	Can Duoc	464.7	587.6
Chau Thanh	1.0%	1.0%	Chau Thanh	212.4	212.4
Tan Tru	1.9%	1.9%	Tan Tru	264.7	271.3

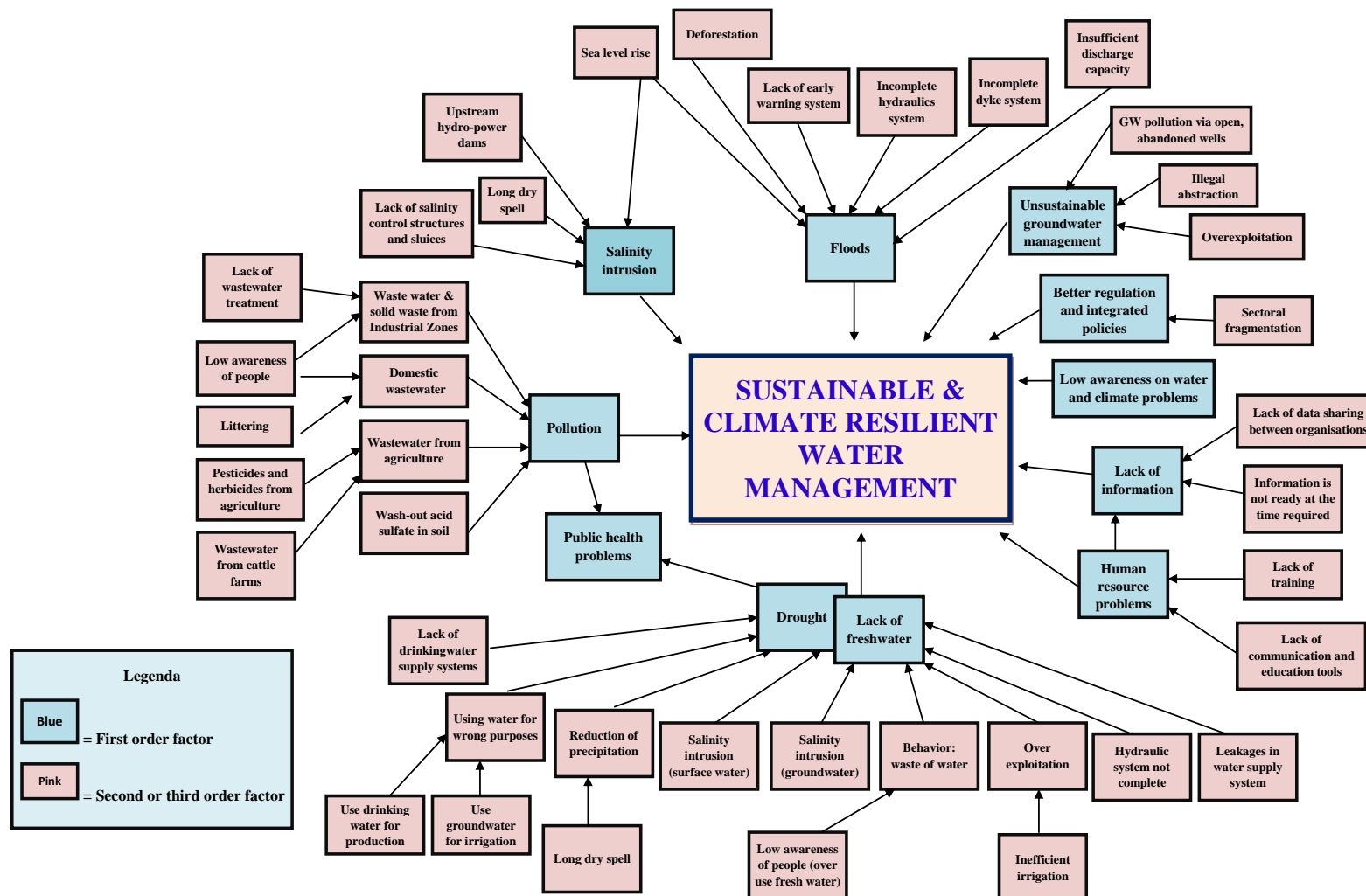
Flood damage at selected land use (%)			Flood damage at selected land use (1000 USD)		
	Reference	Alternative		Reference	Alternative
Can Giuoc	6.9%	24.3%	Can Giuoc	2048.9	7233.9
Can Duoc	1.6%	10.6%	Can Duoc	464.7	3035.3
Chau Thanh	1.0%	1.0%	Chau Thanh	212.4	212.4
Tan Tru	1.9%	2.6%	Tan Tru	264.7	361.7

Table 1 - Flood damage at maximum inundation depth. B2 Scenario vs. current situation above, A2 Scenario vs. current situation below (=reference), Both in % (left) and in 1000 USD (right)

In Table 1 at the right values are given in USD. These are just an indication. Actual price levels may give a somewhat different outcome. For comparison purposes, the values used are sufficient.

2.4 Joint problem definition

Below figure shows a synthesized group model of problems related to sustainable and climate-resilient water management in the Lower Vam Co basin in Long An Province. The synthesis is based on the results of 18 group models developed in the provincial and district meetings in March and April 2012. The group model shows a holistic and summarized overview of the perspectives from all stakeholders in the pilot area.



2.5 Governance challenges

Governance—the operation of rules, instruments and organizations that can align stakeholder behavior and actual outcomes with policy objectives—has to respond to these serious problems. Climate change adaptation requires adaptive approaches to water management and water governance, with implications for the institutional set up, participation processes, collective choice arrangements, and ways of assessing the future. In many instances, new, more effective governance is essential to respond to the challenges outlined. This section provides an overview of key challenges related to the governance of climate adaptation in Vietnam, and the pilot area in particular. This section is based on recent research on water governance and stakeholder participation in Vietnam (Huntjens, 2011, Ottow et al., 2012) and on empirical results from the multi-stakeholder dialogues in this pilot project.

Governance has to be adapted to the context and to capacity, and be tailored to the size and nature of the problem as well as to the objective targeted. The challenge is increased by the local specificity of water resources given that each area has its own physical, geographical and socioeconomic characteristics. Governance also has to adapt to the state of development and to the problems that past assertion of rights and abstraction behavior have produced. In some cases the problem is over-abstraction and depletion of water resources, in other cases water needed by fast growing towns is “locked in” to lower yielding agricultural uses, and in yet other cases the challenge may be problems related to water quality or water recharge. Usually, these problems do not occur in isolation, but in combination at the same time. All these features need to be taken into account when assessing governance options, which have to be adapted to the context and to capacity, and be appropriate to the problem at hand and the policy objectives targeted.

Water resources are used as an input to several sectors and, as a result, are affected by several sectoral strategies. Yet, there often are **no mechanisms for alignment of strategies** in pursuit of an integrated approach to water resources management.

The pilot area presents many examples of sectors with competing interests, such as agriculture, industry, navigation and domestic water supply and health or conflicting claims regarding the supply of drinking water, water for irrigation, industrial supply, and minimum flows for sustaining ecosystems. Development and implementation of management strategies often remain a problem because of poor cooperation between different ministries, poor cooperation across administrative boundaries, and also the protection of vested interests of important individuals in government, industry or the scientific world. Thus, the process of formulating climate adaptation strategies should involve not only representatives of the different sectors that depend directly on water resources (such as agriculture or industry), but also sectors that indirectly affect water resources (such as urban development and rural planning). A major challenge to the governance of climate adaptation is cross-sectoral cooperation. If successful, cooperation between policy fields and sectors provides tremendous opportunities in terms of cost efficiency.

Delegating to local governance structures can produce good results, and a framework for encouraging subsidiarity should be in place. In principle, subsidiarity (that is, delegating

management to the lowest possible level) is attractive because it comes closest to the actual decision makers: the water users. In some cases, collective management approaches at the local level have demonstrated good outcomes, often in partnership between stakeholders and local public agencies or projects.

Information, knowledge sharing and communications are insufficient to support management or to foster good governance. Even where information exists, information asymmetry often constrains its exchange between different stakeholders. For example, information is typically not in a form that is easily accessible to decision makers or the public. In cases where relevant information *is* available, there is often ineffective exchange of that information between stakeholders. This is often related to the fact that Departments or other organizations have to pay for obtaining the information, even between departments in the same province or in the same ministry. Although basic information on hydrogeology or water resources in general is available, it is often insufficient for detailed planning and management, especially for groundwater management. For example in the pilot area, knowledge of aquifer characteristics and exploitation is weak, and this certainly undermines capacity to manage the resource.

Improving “participatory planning” approaches that integrate public and stakeholder input in decision-making. Empirical evidence suggests that participation and local collective management can be effective approaches to good water governance. Participation appears to be effective in improving outcomes because it increases stakeholder ownership and because stakeholders often have access to information and can devise solutions better than or complementary to those delivered from the top down. Perhaps the most important aspect of participation is that it can align government objectives with those of local people. This gives the local stakeholders incentives to manage the water resources well, and can empower them by giving them influence over outcomes during the implementation process. This current pilot project aimed specifically at addressing this need for participatory planning.

The level of participation will depend on the local context. The need for skilled support is increasing as local collective self-management is strengthened. Local stakeholders (e.g. irrigation farmers and well owners) are already managing most of the water resources and in several cases might take on more responsibilities, guided by authorities at different levels.

Despite this potential there are many impediments to participation and local collective management. Frequently, the legal and institutional provisions do not empower collective management institutions. For example, water user associations may be consulted over basin plans, but they rarely have any power to participate in decisions. At the local level, there is usually much more experience in collective management of surface water, and stakeholders are often very slow to adapt to the quite different demands of groundwater. The current pilot project particularly emphasized the importance of local stakeholder participation.

There is a risk that participatory approaches may reflect existing inequalities. The more powerful stakeholders may either dominate participatory deliberations or not participate at all. A further aspect of this asymmetry of power is that most people do not ‘own’ any land and/or water, but they are nevertheless stakeholders. Ways to include and empower these people are often hard to

negotiate, especially when there are social or cultural barriers. An equal challenge is how to get the participation of those who are not directly benefitting from the resource but who may be polluting, or are vulnerable to the impacts of climate change. The current pilot project provided a wide representation of stakeholders, including those directly, but also indirectly, benefiting from the proposed strategy.

Experience yields some do's and don'ts: build on existing social capital, promote equity and inclusion, start in areas of good potential, go step-by-step, and learn lessons and adapt. It seems that costs are less and outcomes better where participatory approaches build on existing social capital, and so interventions should be adapted to take advantage of it. Principles of equity and social fairness demand that the voices of the less powerful should also be heard, and this is something that public agencies can advocate. Interventions could start in areas with potential for success and where intervention costs are lower, in the expectation of spontaneous replication.

Groundwater is particularly challenging for governance in the pilot area, because a large number of well owners have direct economic reasons for using groundwater, without taking into account the common interest of active groundwater management and preservation. This can only be improved if appropriate and integrated groundwater policies are developed by the responsible authorities, including regulations, pricing and enforcement for groundwater abstraction. Governance is further challenged by the fact that groundwater is part of a complex hydrological cycle, which is only understood by a limited number of specialized water scientists. Moreover, policy makers prefer high-profile surface water investments to the long and politically costly struggle to impose order on a largely ungoverned groundwater sector.

Adjusting the incentives structure is a possible mechanism for supporting climate adaptation at the local level, but adjustments are politically difficult and can have negative or unintended consequences. **Positive and negative incentives** are very powerful determinants of behavior and, in the case of groundwater, governments are usually able to adjust them easily. Thus, they are attractive mechanisms, especially in an area with limited administrative capacity. Options include adjusting input prices like energy or output prices like farm produce; providing subsidies to encourage specific behaviors; or imposing bans on crops or on irrigation methods, for example. However, all these approaches have also big disadvantages. Adjusting prices often produces unintended consequences and can be politically damaging. Subsidies are expensive and lend themselves to corruption. Bans often run counter to economic efficiency.

Chapter 3 - Participative planning process

The preferred strategy presented in this report is the result of a participative planning process at different levels (i.e. provincial, district and local level), supported by advanced stakeholder participation techniques and decision support methods. By doing so the project demonstrates the added value of applying a participative planning process for the integration of different interests and spatial challenges into one single strategy. This chapter presents the rationale, methodology, overview of steps during the process and important elements of the participative planning process conducted in this project.

3.1 Participation in Viet Nam

In Vietnam, even though many things are centrally regulated, for a long time there has been the notion of participation:

- **Dân biết:** people know
- **Dân bàn:** people discuss
- **Dân làm:** people do
- **Dân kiểm tra:** people monitor

Public participation in Vietnam has been regulated in the Grassroots Democracy Decrees: Decree 29/1998/ND-CP + Decree 79/2003/ND-CP. These Decrees aim at reinforcing the rights of the people at the commune and village levels to participate in local government affairs on:

- Work to be informed
- Work to be directly discussed
- Work to be consulted
- Work to monitor or inspect

The development of an integrated and community-based climate change adaptation strategy in the Lower Vam Co River Basin is a project that affects many people and therefore qualifies as a work for the people to be informed about, to be directly discussed and to be consulted about.

The participative planning process in **this pilot project involved local actors to ensure that their priorities and the challenges they face in reducing climate risks are effectively addressed.** Participation is effective in improving outcomes because it increases stakeholder ownership and because stakeholders often have access to information and can devise solutions better than or complementary to those delivered from the top down. Perhaps the most important aspect of participation is that it can align government objectives with those of local people. This gives the local stakeholders incentives to manage the water resources well, and can empower them by giving them influence over outcomes during the implementation process. Hence, broad stakeholder participation is a prerequisite for setting climate change adaptation into operation. Moreover, for this pilot project local experiences are key to developing a tailor-made adaptation strategy.

With local actors we mean the authorities at provincial, district and commune level, but also persons, groups and organizations with an interest or “stake” in climate adaptation, either because they will be directly affected by climate change, or because they may have a stake in proposed adaptation measures. Stakeholders include individual citizens and companies, economic and public interest groups, such as non-governmental organizations, representatives of local communities, women’s union and farmer associations.

3.2 Stakeholder analysis

As a first important first step in facilitating and supporting a participative planning process the project conducted an assessment of relevant stakeholders. This assessment included for each stakeholder a description of interests, mandates, planning goals, policy objectives and resources. One of the key functions of the stakeholder analysis was to identify which stakeholders should be invited for which activity, i.e. decision support activities, and/or dialogue track at provincial level, district level and/or commune level. Annex 1 provides a more detailed overview of the stakeholder analysis. Note: Annex 1 will be included in the 2nd draft in July 2012.

The following key categories of stakeholders have been identified:

1. Representatives of the community: Provincial Fatherland Front, Fatherland Front of the districts of: Can Duoc District, Can Giuoc District, Tan Tru District and Chau Thanh District;
2. People's Committees of districts and communes in the 4 above mentioned pilot districts;
3. At provincial level: The departments of Science and Technology (DOST), Agriculture and Rural Development (DARD), Natural Resources and Environment (DONRE); Finance (DoF), Industry and Trade (DIT), Planning and Investment (DPI), Construction (DOC), Transportation (DOT); Health (DOH); Education (DOE);
4. The district offices: Finance, Economics - Infrastructure, Natural Resources and Environment, Agriculture, Health, Education;
5. The mass organizations of provincial and district levels: Youth Union, Women’s Union, Farmer Association (also called Farmer’s Union), provincial Labor Federation;
6. Affected private sectors: Director of industrial zones/clusters or companies in the project areas, e.g. Management Board of Industrial Zones;
7. Local and international NGOs, e.g. Red Cross International, IUCN, CODE (local NGO).

For each stakeholder the following items have been specified:

- **Description of Interest** (e.g. to protect the environment, to protect against flooding, to promote industrial development, etc). More than one interest is possible.
- How is this stakeholder **affected by impacts of climate change** (e.g. loss of arable land due to salt water intrusion)
- **Mandate** (e.g. Law on Water Resources) and/or **Entitlements** (e.g. land ownership / property rights by shrimp farmers)
- **Planning goals** and **policy objectives** for 2015, 2020, 2025, ... (e.g. to develop 200 ha. of intensive shrimp farming in 2015 in *(name of village)*)
- **Resources** (i.e. number of employees, available budget for research and/or for policy development and implementation, information, knowledge and data availability)

3.3 Steps in the participative planning process

Below diagram provides an overview of important steps taken in the participative planning process.

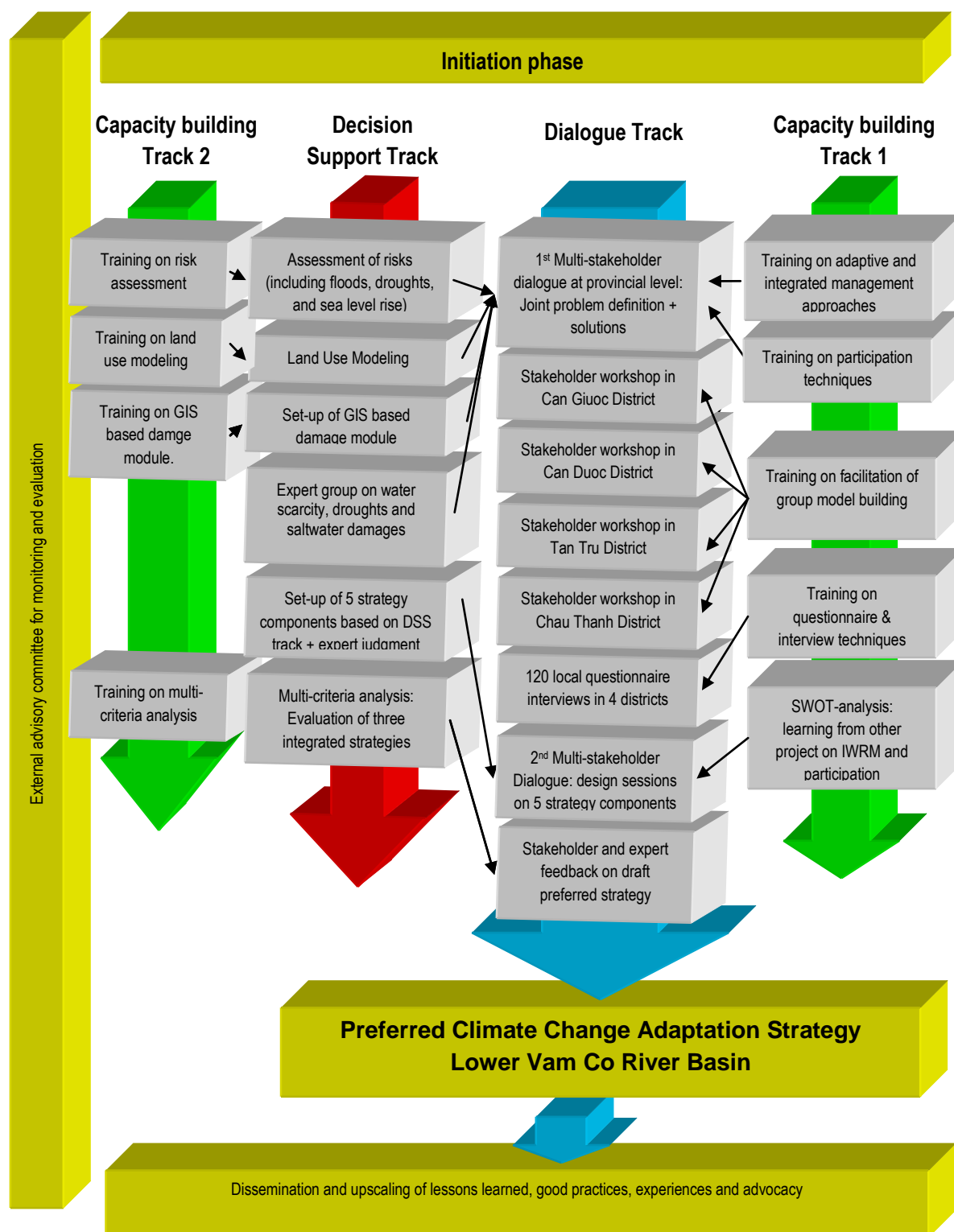


Figure 9 – Steps in participatory planning process

3.4 Evaluation of the participative planning process

Based on the results of the evaluation forms during the multi-stakeholder dialogues at provincial and district level, feedback from participants during the Midterm and Final Conference and feedback from the External Advisory Committee the project team has conducted an extensive evaluation of the participative planning process. The evaluation has been published as a peer-reviewed article about the participatory planning process being deployed in this pilot project. The article by Bouke Ottow (Deltares), Patrick Huntjens (Water Partner Foundation) and Ralph Lasage (IVM) has been published in the Water Governance Magazine in the Netherlands (Issue 05/2012, page 32-37). The key results of this evaluation are provided below.

As evaluated by the External Advisory Committee, and the panel discussions during the Midterm and Final Conference, the existing Vietnamese demand for adaptive and participatory approaches to water management and water governance has been served well by the project, and provides a good basis and reference for further dissemination and upscaling.

With a combination of innovative participation methods and advanced decision support tools the pilot project demonstrated the added value of applying a participative planning process for the integration of different interests and spatial challenges into one single strategy. The pilot project shows that participative planning methods, such as Group Model Building and highly-interactive forms of learning, are possible, if properly embedded, initiated and facilitated. The group model building in this pilot project improved group understanding about the water management system, its problems and possible solutions, which will directly or indirectly lead to better management decisions. Not only is the model itself a product of the process, but also the generation of common understanding among the stakeholders during the process is an important product of the process.

Moreover, an effective planning process is achieved by providing adequate information and inviting key stakeholders at the right moment during the process of strategy development. Adequate information supply at the right moment was made possible thanks to a variety of decision support tools, such as the SOBEK modelling, a GIS-based damage module for the pilot area and DEFINITE for the multi-criteria analysis.

Based on the feedback from participants the participatory planning process led to **positive results** compared to a 'business-as-usual' approach in Vietnam:

- More knowledge generation and sharing
- More mutual trust
- Development of consensus-based solutions
- Identification of relevant good practices
- Greater learning ability of the persons and organizations involved with water and climate issues

For implementing a participative planning process in Vietnam the following **important lessons** are drawn:

- Characteristics of the Vietnamese society, such as conflict resolution by negotiation, open attitude to new technologies and innovations, and the high level of participation in voluntary mass organizations, constitute a good basis for participation in decision-making and planning;
- An effective approach for participative planning in Vietnam seems the active involvement of mass organizations and NGOs through which citizens' interests are represented. Mass organizations play an important role in organising people at local levels (district, commune) and the grass-roots level, amongst others since the number of people belonging to organisations is very high in Vietnam compared with countries like Singapore and China, which have comparable types of governance. The five mass organisations (or socio-political organisations) in Vietnam include the Women's Union, the trade unions, the Youth Union, the Farmers' Association and the Association of Veterans. The Fatherland Front, which is the umbrella organisation of the mass organisation and other organisations, is also counted as a mass organization;
- On the lowest government level (grass root level), the village head plays a crucial role.
- The economic conversion of the country marks a change in its mentality: whereas the state used to be the only mobiliser of resources, society as a whole has now become a driving force (Le Viet Thai, 2007);
- The reform policy (*doi moi*) since 1986 and the recent development in Grassroots Democracy policy lay a good foundation for a participatory planning approach in Vietnam

The project has followed a **multi-level governance approach** for supporting integration between different levels and for establishing liaisons and opportunities for upscaling the project results. While the pilot project has organized multi-stakeholder dialogues at three different levels (province-district-commune), the External Advisory Committee, additionally, has supported interaction and collaboration with higher levels, including the regional, national and international level. The member constitution of the EAC was specifically selected to allow for upscaling and streamlining of the project results.

Chapter 4 - Solutions and priorities

The first steps in the participative planning process (as described in Chapter 3) were intended to produce important building blocks for developing a preferred climate change adaptation strategy.

In Section 2.3 we have already presented a joint problem definition, being developed in the multi-stakeholder dialogues at provincial and district level. In the same dialogues we have also developed two other building blocks: 1) A participative assessment of solutions / adaptation measures, and 2) A synthesized priority list of adaptation measures. These two building blocks are presented in this chapter.

4.1 Participative assessment of solutions

In order to develop targeted policy recommendations the solutions have been assessed adjacent to the joint problem definition (see Section 2.3), also by means of group model building. This means that specific solutions have been linked to specific problems. Figure 10 shows a **synthesized group model** of problems and solutions related to sustainable and climate-resilient water management in the Lower Vam Co basin in Long An Province. The synthesis is based on the results of 18 group models developed in the provincial and district meetings in March and April 2012. The group model shows a holistic and summarized overview of the perspectives from all stakeholders in the pilot area.

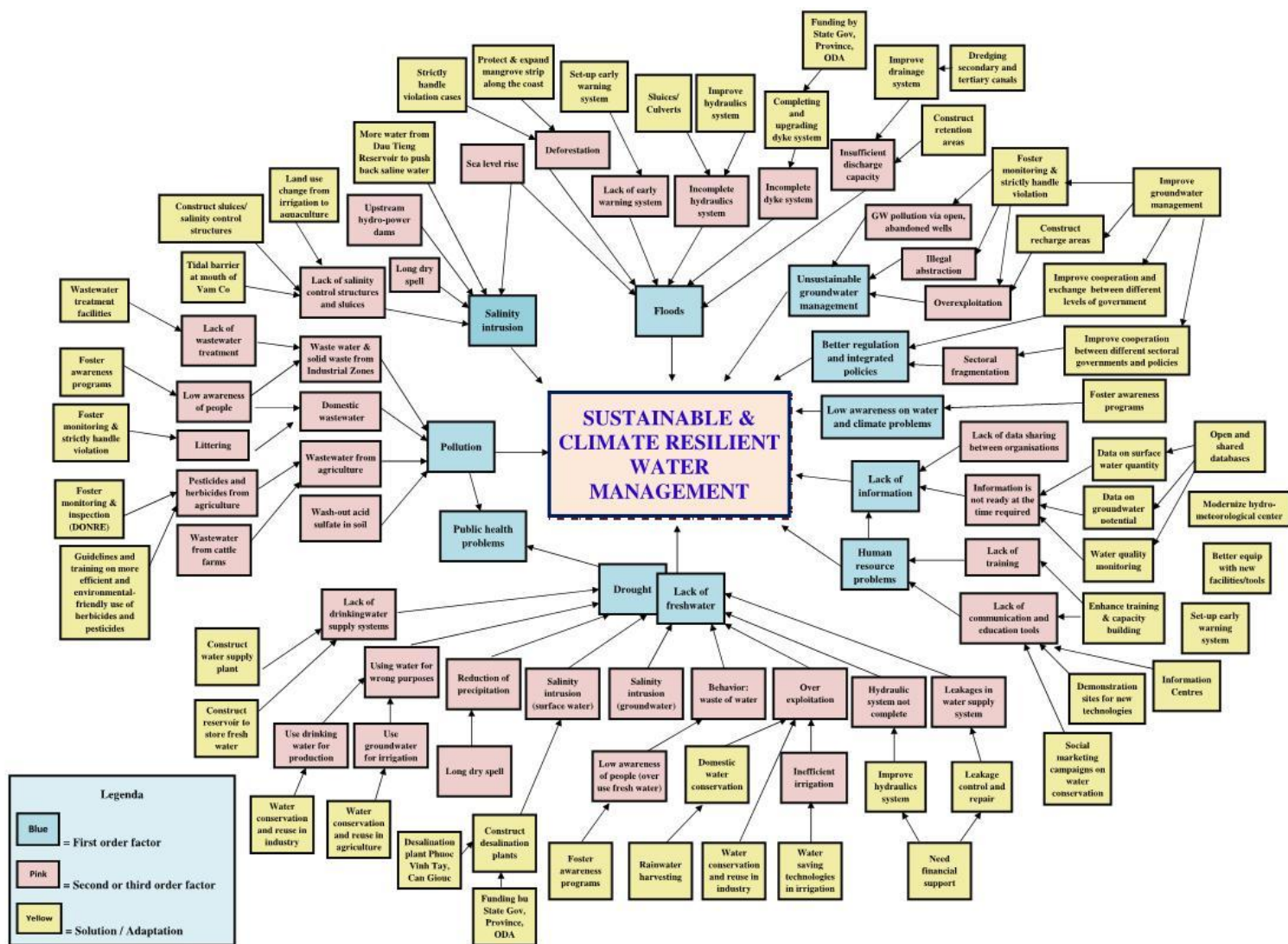


Figure 10 - Synthesized group model of problems and solutions related to sustainable and climate-resilient water management in the Lower Vam Co basin in Long An.

4.2 Synthesized priority list

The overview below provides a synthesized priority list of adaptation measures (with high-low ranking: 1 = high priority, 12 = low priority), based on the outputs (i.e. priority lists) from each district. The summarized priority list for each separate district is provided in Annex 2.

1. Upgrading and reinforcing dyke systems

- Completion of the dyke system & building dams
- Upgrading and reinforcing dykes of the districts:
- Reinforced embankments at either side, increasing the height of the dykes
- Solid dikes to prevent floods and saltwater intrusion
- Regular inspection of dykes and dams
- Reinforcing breakwater along the bank of a river
- Frequent supervision, improvement and maintenance
- Construction flood tide prevention

2. Forest protection and reforestation

- Planting trees/reforestation, for example by:
 - Expanding the area of mangrove forests along the rivers and the sea
 - Stimulating community initiatives to planting trees
- Strengthening protection of (existing) forest, for example by:
 - Strictly handle violations (i.e. enforcement), i.e. cases of illegal deforestation
 - Educating people about the benefits of forest and the harmful effects of deforestation
 - Supporting policy/mandate for forest protection officers
- Good management of forest exploitation, e.g. by developing tailor-made plans for each area of forest exploitation
- State needs to plan rational exploitation of forests
- Changing jobs for people: People assigned to the planting and management of forest

3. Water supply and demand side measures

- Investing funds for new water supply
- Building freshwater supply plants
- Improving the water supply system in all districts
- Centralized water supply
- Construction of freshwater systems (e.g. see land use maps Chau Thanh)
- Introduce, develop and implement water saving methods for farmers, industries and livelihoods, for example by:
 - Rational planning for irrigation
 - Mobilizing people conscious of saving water
 - Good agricultural practices
 - Planting drought tolerant cultivars
 - Changing livestock
- Effective and sustainable groundwater governance and management

- Appropriate legislation on the exploitation and protection of water resources
- Planning for rational groundwater exploitation
- Saving groundwater/ Limiting groundwater extraction, e.g. by licensing system
- Increasing ground water use charges
- State agencies strengthen inspection of the groundwater extraction
- Strictly handle violations (i.e. enforcement), i.e. cases of illegal extraction of groundwater
- Develop surface water treatment replacement for underground water exploitation to prevent groundwater overexploitation
- Improving the efficiency of state management on-demand water usage
- It's necessary to set up the strategic planning of water storage systems
- Inspection of drilling wells indiscriminately

4. Training, education and awareness raising

- Raising people's awareness, for example on:
 - water shortage problems
 - methods to save water
 - water treatment
 - how to avoid water-related diseases
 - environmental protection
- Awareness raising from the commune to village, farmer union, youth union, fatherland front, woman union
- Awareness raising by or via media (i.e. television, radio, newspaper) and politics
- Develop training activities for:
 - Irrigation management
 - Advanced professionals
 - Primary and secondary schools
 - Construction management teams

5. Information supply and sharing

- Building disaster warning system
- Transfer of scientific and technical knowledge
- Modernizing the hydrometeorology sector
- Strengthening the forecast, predictive
- Equipment for means of communications
- Support knowledge for user / more information for water users and stakeholders, timely information
- There are joint documents between branches
- Open and shared databases
- Technical guidelines on aquaculture
- Transferring science and technology for farmers
- Funding for science and technology
- Increasing sharing management information
- Applying science and technology into production methods

6. Upgrade and improve irrigation and drainage system (high score in Tan Tru)

- Completing irrigation system

- Planning the construction of inland canals
- Mechanized irrigation
- Concrete infield canals
- Building a complete system of sewers
- Develop appropriate channel system,
- Check the drain schedule opening and closing
- Fixing broken drains
- Construction of new canals
- Regular dredging of canals to ensure the flow
- Suitable planning for water drainage
- Completing interior canals system

7. Land use change:

- Transition from agriculture to aquaculture
- Mobilizing people to farm shrimps in designated areas
- Changing cropping patterns
- Changing plants and animals to suit the climate
- Agricultural production in the direction of biodiversity
- Residential zoning
- Constructing over retention areas in areas with low topography of the district to deal with rising sea levels and floods every year
- Construction of sustainable and flood proof buildings
- Setting up the centralized residential areas

8. Improved policy coordination and integration

- Coordination between central and local
- Strengthening state management
- Government policies should be optimal uniform
- Clear decentralized administration
- Planning for aquaculture sector

9. Financial support, funding and investment

- Calling for investment
- Financial support
- Diversification of budgets:

10. Environmental pollution control

- Severely sanctioned acts of environmental pollution
- Strengthening the handling of violations
- Check and handling of violations
- Strictly handle violations of environmental protection in industry

11. Water treatment

- Construction of wastewater treatment systems
- The Authorities should inspect the water treatment before being discharged into the environment

- Propagating and awarening education of the people in the water treatment
- Strictly handle enterprises discharging untreated water to the outside

12. Attracting clean, sustainable and water-saving industries

- Using advanced manufacturing technology

Chapter 5 – Five optional strategy components

The five optional strategy components presented in this chapter are intended to sketch the playing field for strategy development. They were developed, based on the priority lists presented in Chapter 4, in order to support the design sessions during the multi-stakeholder dialogue on 23-24 May 2012 in Tan An, Long An Province. Details and feasibility of the five strategy components have been discussed by the participants in the design sessions, being supported by experts.

The following optional strategy components will be briefly described and sketched below:

6. Completing dyke system and upgrading dykes;
7. Semi-permeable barrier at river mouth + sluices to stop saltwater intrusion at high tide;
8. More room for rivers and nature: retention areas, dyke replacements, combined with reforestation;
9. External freshwater supply;
10. Self-sufficiency in freshwater supply

Important notes:

- The final preferred strategy might be a combination of prioritized measures from several strategy components;
- Strategy component 1, 2 and 3 are three different approaches for dealing with floods and salinity intrusion;
- Strategy component 4 and 5 are two different approaches for dealing with water shortages and droughts;
- For developing an integrated strategy for the pilot area, the problem of water shortage, floods, and salinity intrusion need be addressed simultaneously;
- Hence, strategy component 4 and/or 5 (for dealing with water shortage and droughts) will be necessary in combination with one or more approach(es) for dealing with floods and salinity intrusion, as sketched by the first three strategy components.

Strategy component 1 Completing dyke system and upgrading dykes

- Upgrading existing dike system
 - Repair weak spots
 - Increase dike level to +2m mean sea level
- Construction of dike rings
 - Dike rings comprise sluice gates (12 in total)
 - Gates can be closed in case of flood → closed ring
 - Safety level depends on maintenance, type of construction, interface between gates and dike itself
- Relocate dikes in upstream part of pilot area



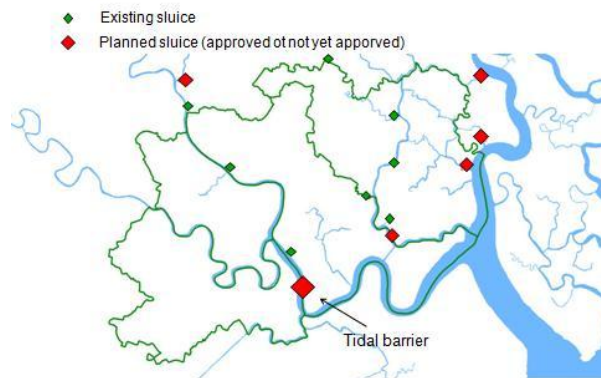
Strategy component 2

Semi-permeable barrier at river mouth + sluices to stop saltwater intrusion at high tide

- All measures of Strategy component 1
- Addition is a tidal barrier in Vam Co river:
 - Shipping problems may arise
 - In dry season already minimized depth
 - Better protection against high water levels of the sea

8

Sketch for Strategy component 2



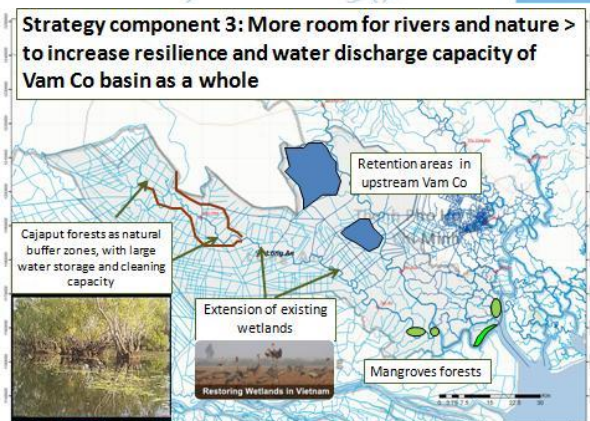
Strategy component 3

More room for rivers and nature

> to increase resilience and water discharge capacity of river system

- Retention areas for mitigating peak discharges in wet season, and storage of water for freshwater supply in dry season
- New areas outside dykes (created by dyke replacements) might be used as wetland areas, mangrove reforestation and/or exploitation (in particular downstream areas), or cajuput forests (in particular upstream areas)
- Extension of existing wetlands

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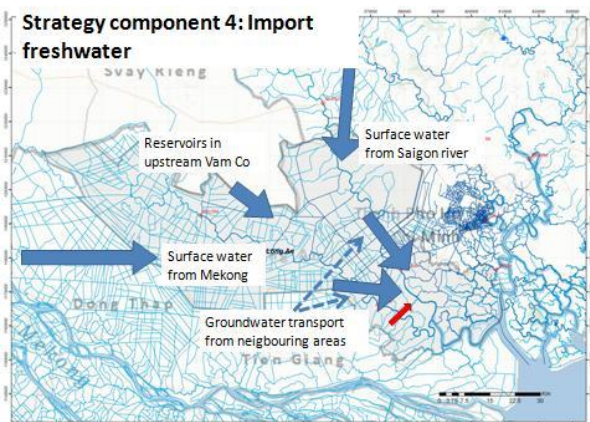


Strategy component 4

Import freshwater:

- Transfer of additional freshwater or groundwater from neighboring districts or provinces > this requires exchange arrangements
- Possible sources:
 - Mekong river
 - Saigon river, via Rach Tra diversion (Dau Tieng Reservoir)
 - Upstream groundwater aquifers

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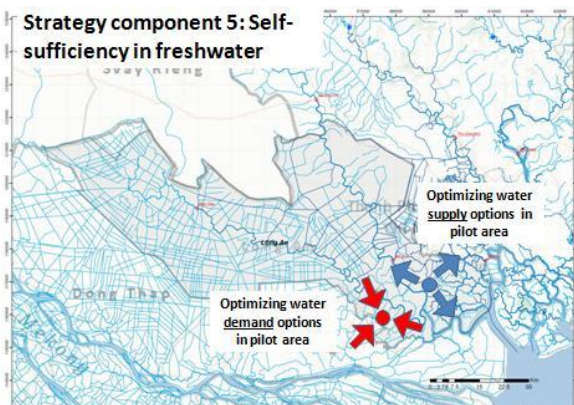


Strategy component 5

Self-sufficiency in fresh water supply

- Optimize supply-side options in pilot area:
 - Rainwater
 - Surface water
 - Groundwater
- Optimize demand-side options in pilot area:
 - Point-of-Use Conservation
 - Efficient irrigation systems
 - Land use changes > from irrigation to aquaculture
 - Water reuse and recycling

11



Chapter 6 - Evaluation of the five strategy components

The outputs of SOBEK modelling together with expert judgment of Vietnamese and Dutch experts are used to evaluate the 5 strategy components using the 8 criteria groups that are identified during the Multi-Stakeholder Dialogue on 24 May 2012. This has been done for different scenarios: for dry and wet season, and for three sea level situations (current level, +12 cm sea level rise (SLR) and +33cm SLR).

6.1 Multi-criteria analysis

To be able to assess the effects of the different strategy components under different climate change scenario's, multiple criteria are used. These criteria enable to get insight in the effects of the strategy components on the livelihoods of the people in Long An province. They link the physical characteristics of the system and the different land uses and sectors in the province (see figure 11). The physical characteristics in this case are: salt concentration, available fresh water, and flooding. For the five strategy components the criteria get a value based on outputs of the SOBEK model and values based on expert judgment from the stakeholders, and the Vietnamese and Dutch experts. These values are summarized in an effect table (see Table 6.2 and 6.3).

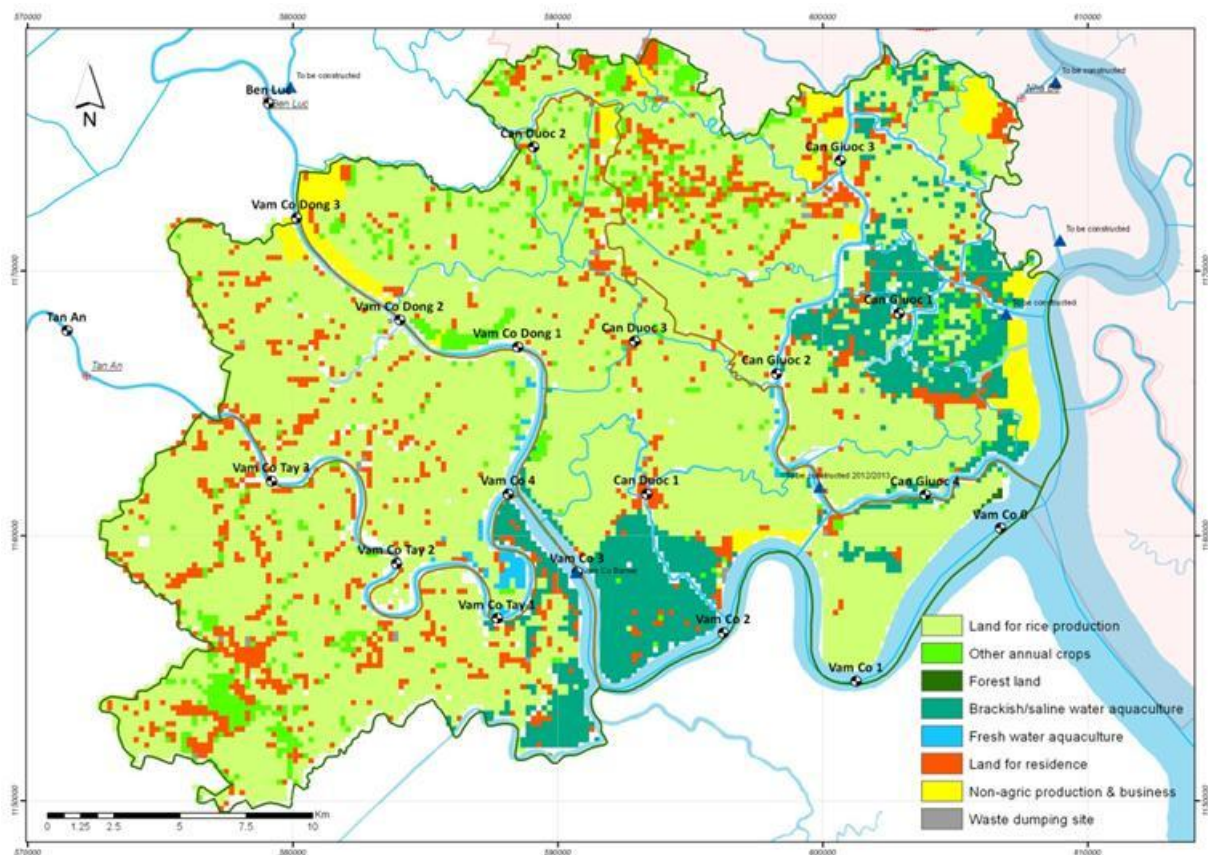


Figure 11 – Map with different land uses in the pilot area

Criteria on which the effects of the measures were evaluated are chosen in cooperation between Vietnamese and Dutch partners. These cover all important sectors and functions of the area, see below for a description of the criteria. A survey carried out during a workshop in Tan An, stakeholders have been asked to indicate the importance of the different criteria. This information is used to calculate the relative importance of the criteria. These weights were checked by Vietnamese experts at several occasions. And during the interactive MCA workshop in February 2013 in Tan An, they have been approved. The weights per criterion used in the MCA are shown in (Table 2).

	C/B	Standardi zation	Minimum Range	Maximum Range	Weight level 1	Weight level 2	Weight
Good economic status					0,42		
Shipping access	---/0	maximum	---	0		0,344	0,144
Dry season agricultural water availability	---/+++	maximum	---	+++		0,328	0,138
wet season agricultural water availability	---/+++	maximum	---	+++		0,328	0,138
Good human status					0,213		
Flood damage	C %	maximum	0	11,66		0,508	0,108
Vector borne diseases	---/0	maximum	---	0		0,492	0,105
Good environmental status					0,123		
Water pollution	---/0	maximum	---	0		0,5	0,062
Area wetlands, incl. mangroves	--/++	maximum	--	++		0,5	0,062
Implementation					0,243		
Compatibility other plans	--/++	maximum	--	++		0,484	0,118
Investment costs	-----/0	maximum	-----	0		0,516	0,126

Table 2: Weight of criteria based on stakeholder survey

Description of criteria

The general assumption is that the Vietnamese government implements policies and projects to improve the livelihoods of the people living in Vietnam. Climate change is posing additional pressure on the livelihoods of the people in Long An province. The strategy components are designed to reduce the negative impacts of climate change, and make use of the positive impacts. Criteria are used to test if the strategy components indeed help to reduce the impacts and to evaluate their effect on the livelihoods of the people living in the Long An province. In this report we first analyse the effect of a measure, and when it is effective. At a later stage, the sequence and timing is addressed. The criteria are described below.

1a. Area Rice

Describing the total area of the province where rice cultivation is possible. This is influenced by the salt concentration in the river in the wet season and dry season. If salt concentration is above 1 g/l, the area is not suitable for rice cultivation. The current area used for rice cultivation is the starting

point, see the map with the different land uses in the province (Figure 11). This criterion is given in hectares.

1b. Area agriculture

Describing the total area of the province where rice agriculture is possible. This is influenced by the salt concentration in the river in the wet season and dry season. If salt concentration is above 4 g/l, the area is not suitable for agriculture. The current area used for agriculture and rice cultivation is the starting point, see the map with the different land uses in the province (Figure 11). This criterion is given in hectares.

2. Area aquaculture

Describing the total area of the province where aquaculture is possible. This is influenced by the salt concentration in the river in the wet season and dry season. If salt concentration is above 2 g/l, the area is not suitable for freshwater aquaculture and if it is above 13 g/l it is not suitable for brackish aquaculture. The current area used for agriculture, rice cultivation and aquaculture is the starting point, see the map with the different land uses in the province (Figure 11). This criterion is given in hectares.

3. Environmental quality

The environmental quality is indicated by the total area where mangroves can grow, the area where swamps are present. These land use types are considered to have a beneficial effect on nature and thus environmental quality. This criterion is based on expert judgment, using the space that is available besides rivers for swamps and mangroves, and the water quality. If it is too salt or too fresh, the mangroves will not grow. This criterion is given in hectares.

4a. Shipping access

This criterion describes if access to the harbors in the province is hampered by a sluice that is closed x number of hours per day. Through expert judgment it is assessed whether the closure of the waterway will have an effect on shipping, this is dependent on the number of boats that sail on the rivers and the depth of the boats.

4b. Industrial water availability

Is the river water of good enough quality for several industrial uses. And is enough water available to provide to these uses. Per industrial use we need water quality norms for salt concentration, and other relevant quality indicators (BOD, etc.). Through expert judgment, on the basis of the salt concentration maps of SOBEK and changes in air temperature, it is assessed how the water quality will change under the different climate scenarios and adaptation strategies.

5. Reduction of flood risk

This criterion is divided in two sub criteria, which are calculated by combining the SOBEK model output with the land use maps. The damage is calculated using a simple relation between flooding and land use. The damage is given as a % of total value present in the province.

Besides this the area flooded is an indication of flood risk. The flooded area is displayed in hectares.

6. Public health

- a. Water borne diseases occur more often when water temperatures increases of the sources of drinking water. The change in temperature induced by climate change is assessed by experts to qualitatively indicate changes in this indicator.
 - b. Vector borne diseases are more widespread when areas with standing water increase, which occur when areas of wetlands increase. Change in salinity of water might also have an influence, but due to budget constraints these are not included in this analysis.
 - c. Water pollution is related to the temperature of the water and the frequency and extent of flooding. In water with higher temperatures bacteria etc. grow and multiply faster. During a flood pollution enters the water, from sewage to rubbish dumps, polluting the water.
 - d. Domestic water focuses on the quantity of water available for domestic uses, like drinking. We assume current sources are the river with additional supply from groundwater.
7. Compatibility with other plans indicates if the strategy component affects, or is affected by impacts of other plans. It indicates whether these plans have a positive or negative effect on each other. This criterion is qualitative.
8. Costs of the optional strategy components are an estimation of the costs based on the intervention sheets of the different measures that are included in the strategy components, this criterion is in Billion Vietnamese Dong.

6.2 Financial assessment

The financial assessment is based on the costs specified in the intervention sheets. The investment costs for each intervention are estimated based on expert judgment by Vietnamese (CESTE) and Dutch (WPF) experts. Below table 3 provides a financial assessment and investment schedule for a time period of 5 years.

Strategy	Strategy component	Type of intervention	yr1	yr2	yr3	yr4	yr5	TOTAL (in Million VND)
No regret	1a. Upgrading existing dyke system	Physical intervention	43.100	193.950	193.950			431.000
	1b. Construction of sluices	Physical intervention		72.000	72.000	648.000	648.000	1.440.000
	1c. Rainwater harvesting	Physical intervention	1.000	5.000				6.000
	1d. Surface water extraction	Feasibility study		1.300	1.300			2.600
	1e. Development of sustainable groundwater management policy	Governance intervention			2.000	1.000		3.000
	1f. Water transfers within pilot area	Feasibility study				2.000	2.000	4.000
	1g. Desalination	Feasibility study	2.000	10.000	1.000	1.000	1.000	15.000
	1h. Public Awareness Raising on Water Saving	Physical intervention	1.700					1.700
	1i. Water saving technologies in irrigation	Physical intervention	1.000	10.000	500	500		12.000
	1j. Land use change from agriculture to aquaculture	Governance intervention		2.000	2.000			4.000
	1k. Water recycle and re-use	Physical intervention			1.000	1.000	1.000	3.000
	1l. Dyke replacements	Feasibility study	1.000	1.000				2.000
	1m. Increasing retention capacity	Feasibility study		500	500			1.000
	1n. Wetlands development and/or restoration	Governance intervention				1.000	1.000	2.000
	1o. Economic and financial measures	Governance intervention	1.000	1.000	500			2.500
	1p. Communication and education measures	Governance intervention	500	500	500	500		2.000
	1q. Regulatory measures	Governance intervention				1.000	1.000	2.000
Tidal barrier + sluices	2a. Construction of tidal barrier	Feasibility study	1.000	1.000				2.000
Import of fresh water	3a. Import of freshwater from upstream groundwater	Feasibility study	1.000					1.000
	3b. Import of freshwater from upstream groundwater	Feasibility study		1.000				1.000
	3c. Import of freshwater from adjacent river basins	Feasibility study			1.000	1.000		2.000
Total per year			53.300	299.250	276.250	657.000	654.000	
Total Preparation / design Cost								226.400
Total Construction Costs								1.709.400
Total Operational Costs								4.000
GRAND TOTAL								1.939.800

Table 3: Financial assessment and investment schedule for a time period of 5 years

6.3 Ranking of preferred strategies

Table 4: Effect table for scenario B2 2020

Combination B2 2020	BAU (measures as present)	12 new sluices	Incremental improvement	Tidal barrier and sluices	import fresh water	self sufficiency freshwater	criterion
1a. Area Rice							
Dry season (ha)	0	0	0	33500	44600	44600	1 g/l
Wet season (ha)	60400	56600	51800	57600	0	0	1 g/l
Water demand (m3)	0	0	0	0	55730000	55730000	
1b. Area agriculture							
Dry season (ha)	0	0	0	33500	input VN	input VN	4 g/l
Wet season (ha)	62400	62400	62400	62400	input VN	input VN	4 g/l
2. Area aquaculture							
Dry season fresh (ha)	0	0	0	33500	input VN	input VN	2 g/l
Dry season brackish (ha)	0	0	0	43100	input VN	input VN	13 g/l
Wet season fresh (ha)	60400	56600	60400	57600	input VN	input VN	2 g/l
Wet season brackish (ha)	62400	62400	62400	62400	input VN	input VN	13 g/l
3. Environmental quality							
Area wetlands, incl mangroves (---/++)	0	0	+	+	0	0	
4a. Shipping access (---/++)	0	0	0	-	0	0	
4b. Industrial water availability							
Cooling (---/++)	0	0	0	0	0	0	Max temp river
Food processing (---/++)	-	-	-	0	+	+	? g/l
Other industrial uses can be added							? g/l
5. Reduction of flood risk							
Damage (% of max)	5.20	5.06	4.04	2.43	5.20	5.20	
Area flooded (ha)	11,216	11,748	9,056	5,576	11,216	11,216	
6. Public health							
Water borne diseases (---/++)	-/0	-/0	-/0	-/0	+	+	temp water
Vector borne diseases (---/++)	0	0	-/0	-/0	0	0	standing water
Water pollution (---/++)	-	-	-	0	-	-	temp water
Domestic water availability (---/++)	0	0	0	0	+	+	0,25g/l
7. Compatibility with other plans (-/+)	+	+(HCMC)	+(HCMC) - sea dike	-(sea dike)	-(Mekong & Saigon)	++	
8. Costs (Billion Dong)							

Table 4 shows the values for the 8 criteria for the 6 alternative strategy components. During the wet season enough irrigation water is available from the rivers. However, in the dry season this water is too saline, only for alternative Tidal barrier and sluices fresh water is available in the river. The alternatives “import fresh water” and “self sufficiency fresh water” show the amount of water necessary to continue to grow rice on the same area as currently.

For the criteria 1b and 2, additional information on water use is necessary.

Criterion 5, reduction in flood risk, still shows damages for the strategies with high dikes and the construction of sluices. The criterion is dependent on the extent of flooded area. This flooding can be the result of overtopping of a dike, but can also be the result of intense precipitation. The first probably has a larger negative effect on damage than the second. However, in this short analysis there was no possibility to differentiate between both sources of flooding. It is thus likely that the damages for the policy alternatives sluices, incremental and barrier are overestimations in comparison to the business as usual.

Table 5 Effect table for scenario A2 2050

Combination A2 2050	BAU (measures as present)	dikes +3m, room for river, 12 sluices	dikes +3m, room for river, 12 sluices, and tidal barrier	dikes +3m	import fresh water)	self sufficiency freshwater	criterion
1a. Area Rice							
Dry season (ha)	0	0	33500	0	44600	44600	
Wet season (ha)	58500	58500	50800	60400	58500	58500	1 g/l
Water demand (m3)	0	0	0	0	55730000	55730000	
1b. Area agriculture							
Dry season (ha)	0	0	33500	0	input VN	input VN	4 g/l
Wet season (ha)	58500	58500	62400	60400	input VN	input VN	4 g/l
2. Area aquaculture							
Dry season fresh (ha)	0	0	33500	0	input VN	input VN	2 g/l
Dry season brackish (ha)	0	0	33500	0	input VN	input VN	13 g/l
Wet season fresh (ha)	58500	58500	50800	60400	input VN	input VN	2 g/l
Wet season brackish (ha)	62400	62400	62400	62400	input VN	input VN	13 g/l
3. Environmental quality							
Area wetlands, incl mangroves (--/++)	0	+	+	0	0	0	
4a. Shipping access (--/++)	0	0	-	0	0	0	
4b. Industrial water availability							
Cooling (--/++)	-	-	-	-	-	-	
Food processing (--/++)	-	-	0	-	+	+	
Other industrial uses can be added							
5. Reduction of flood risk							
Damage (% of max)	11.66	9.16	5.95	9.20	11.66	11.66	
Area flooded (ha)	23,580	19,572	13,436	19,728	23,580	23,580	
6. Public health							
Water borne diseases (--/++)	-	-	-	-	+	+	
Vector borne diseases (--/++)	-	-	-	0	0	0	
Water pollution (--/++)	--	--	-	-	--	--	
Domestic water availability (--/++)	--	--	-	--	+	+	
7. Compatibility with other plans (-/+)	+	+ (HCMC) - sea dike	- (sea dike)	+ (HCMC) - sea dike	- (Mekong & Saigon)	++	
8. Costs (Billion Dong)							

Table 5 shows the values for the criteria for the different policy alternatives.

For the criteria 1b and 2, additional information on water use is necessary.

Criterion 5, reduction in flood risk, still shows damages for the strategies with high dikes and the construction of sluices. The criterion is dependent on the extent of flooded area. This flooding can be the result of overtopping of a dike, but can also be the result of intense precipitation. The first probably has a larger negative effect on damage than the second. However, in this short analysis there was no possibility to differentiate between both sources of flooding. It is thus likely that the damages for the policy alternatives sluices & room for river, barrier and dikes +3 meters are overestimations in comparison to the business as usual.

Results of the MCA

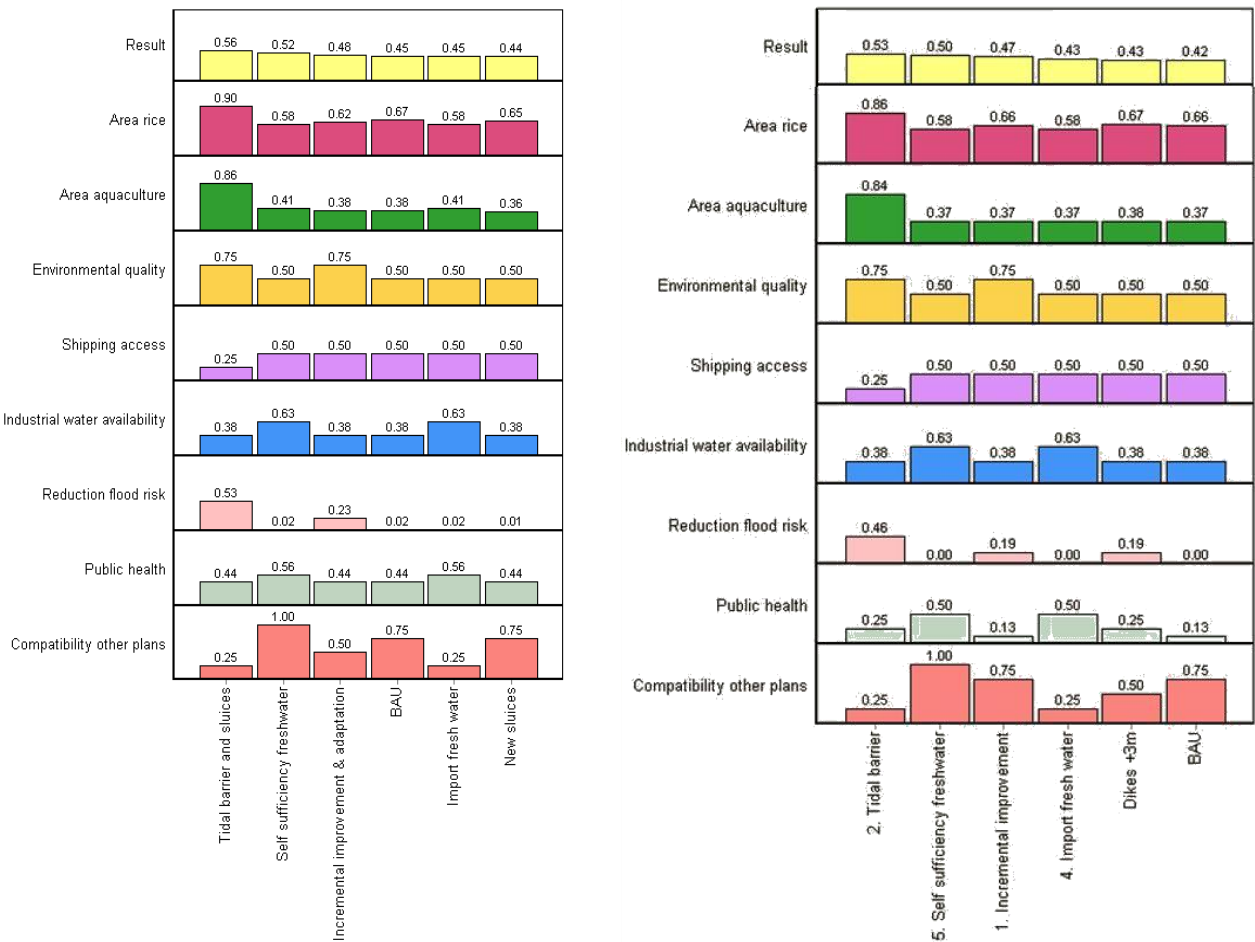


Figure 12: Ranking of policy alternatives for circumstances in 2020 under B2 Scenario (left) and for circumstances in 2050 under A2 Scenario (right)

Strategy component 2, barrier and sluices, is ranked number one using the values of table 4 and the criteria weights as indicated by the workshop participants. Figure 12 shows that self-sufficiency freshwater is second. The other strategy components have values that are close to each other. It should be noted this analysis does not include costs that are made for implementing the alternative.

Sensitivity analysis

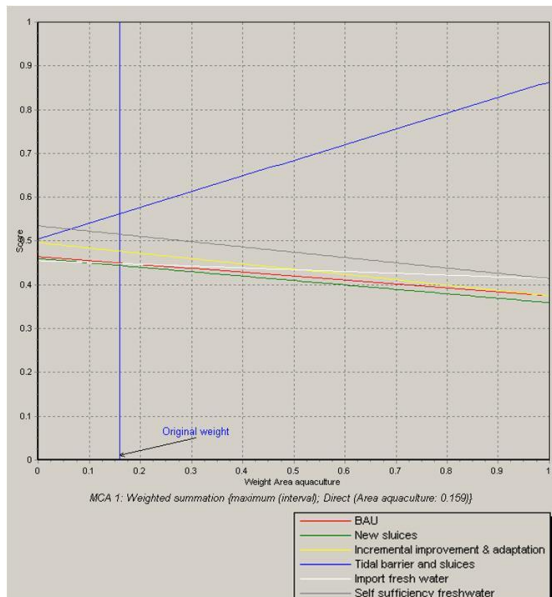


Figure 13: sensitivity analysis for area of aquaculture, 2020 B2.

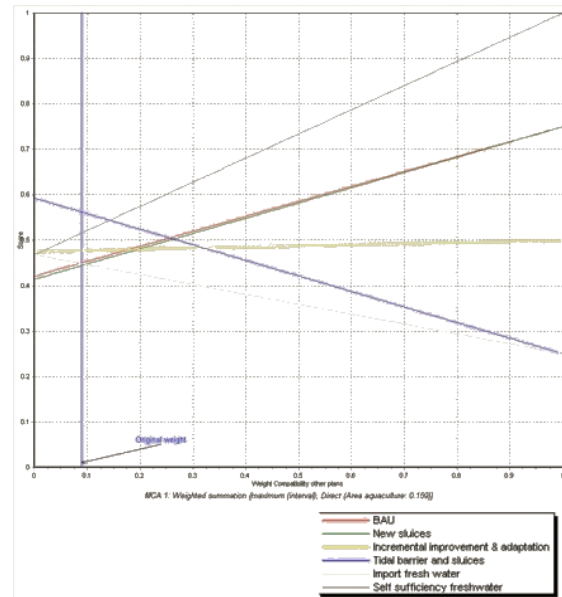


Figure 14: sensitivity analysis for compatibility to other plans, 2020 B2.

Figures 13 and 14 show for the criteria “area aquaculture” and “compatibility to other plans”, the sensitivity of the final ranking for the weight assigned to these criteria. These criteria contribute most the ranking of strategy component two as best alternative (figure 11). If the weight of area aquaculture would be 0.05 instead of 0.159, the strategy component self sufficiency in fresh water would be ranked first. If the weight of compatibility to other plans would be higher than 0.14 the strategy component self sufficiency in fresh water would be ranked first, and if the weight would be higher than 0.26 the strategy component new sluices would also be ranked higher.

The ranking of strategy component two as best for the situation in 2050 with the A2 climate change scenario, is dependent on the score of criteria “area aquaculture” and “reduction in flood risk” (see figure 12). Figures 15 and 16 show the sensitivity for these criteria. If area aquaculture would have a weight of 0.1 instead of 0.159, self sufficiency would be the best alternative. For the criterion reduction in flood risk, the weight needs to be below 0.045 instead of 0.104 to replace this alternative with self sufficiency.

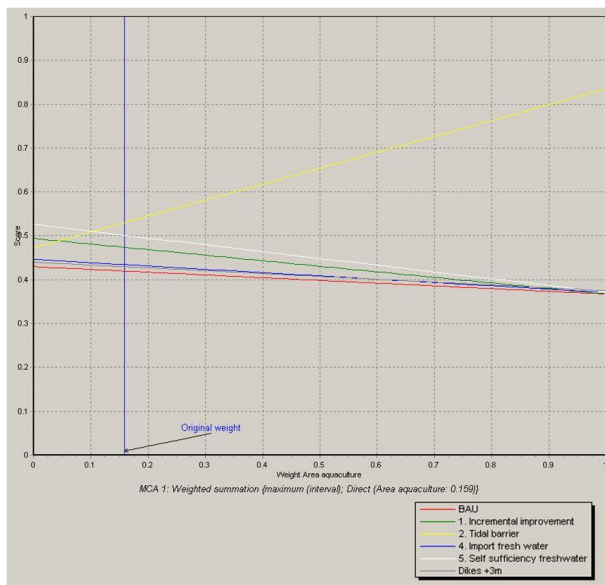


Figure 15: sensitivity analysis for area of aquaculture, 2050 A2.

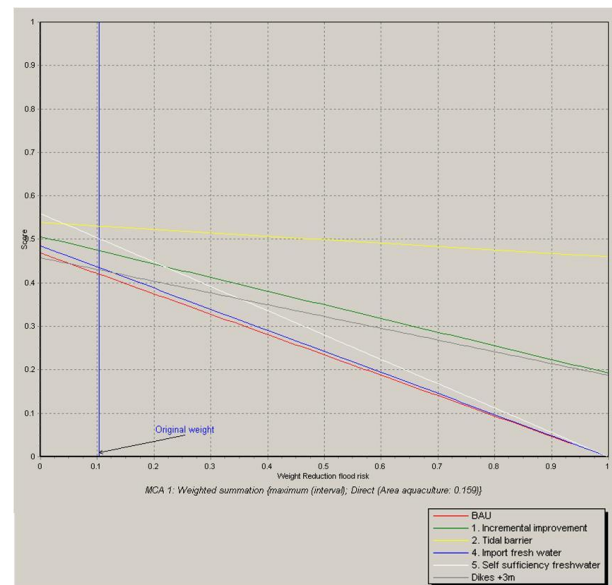


Figure 16: sensitivity analysis for reduction in flood risk, 2050 A2.

Interpretation

In this analysis we included three strategy components which focus on flood safety and water availability, and two strategy components solely aimed on water availability and water demand. In the latter we had to exclude investment costs, as these were not available. The information that was available was included in the model and analysis, together with expert judgment. We have used weights for the criteria based on the perceptions of the involved stakeholders. Overall the strategy component Tidal barrier ranks best, for 2020 and 2050. When focusing on improving water availability the strategy component self sufficiency ranks above importing water. The sensitivity analysis show that this outcome is quite certain, as this strategy component ranks best even when varying the weight of the criterion. Only in some more extreme cases it goes to rank 2 or 3. The analysis was carried out taking into account that current land use should be sustained. Thus the strategy component tidal barrier ranks best, because it supports the largest area for rice and aquaculture. If it is decided that land use might change, the outcomes could change.

The data did not allow for a benefit cost analysis, as important data on the monetary value of benefits, like industrial water availability, area of the province suitable for rice cultivation etc. is not available. On the costs side information is lacking on investment costs that are necessary for implementing the strategy components province wide. If this information becomes available in the future, a more detailed analysis can be made, enabling a more sophisticated evaluation of the options.

Chapter 7 - Three integrated strategies

7.1 Introduction

This chapter presents three integrated strategies, including a package of measures for each strategy and intervention sheets for each measure (name, location, objective, responsibility, impact, etc). The three integrated strategies are based on the five optional strategy components presented and discussed during the conference in Tan An on 23-24 May 2012 (see chapter 5). Based on the evaluation of these five strategy components in chapter 6 the Vamcopart project team developed three integrated strategies focusing on continuing current land-use and economic activities:

1. No-Regret Strategy
2. Tidal Barrier + Sluices
3. Import Freshwater

Table 6 shows an overview of the integrated strategies, in which strategy 2 and 3 are additions to the no-regret strategy (strategy 1).

Table 6 – Overview of strategies

Strategy 0	Strategy 1	Strategy 2	Strategy 3
no measures	No regret	No regret	No regret
		Tidal barrier + sluices	Import of freshwater

In the remaining part of this chapter the following strategies will be presented in more detail, including a package of measures for each strategy and intervention sheets for each measure (table 7). Table 7 shows an overview of strategy components, interventions sheets and type of intervention for each strategy. There are three general categories of intervention types: 1) physical intervention, 2) governance intervention, and 3) feasibility study. In total, table 3 shows six physical interventions, six governance interventions, and eleven feasibility studies.

Table 7 - Overview of strategy components, interventions sheets and type of intervention for different strategies

Strategy	Strategy component	Intervention	Type of intervention
1. No regret	Upgrading existing dyke system	1a. Upgrading existing dyke system	Physical intervention
		1b. Construction of 12 sluices	Physical intervention
	Optimizing water supply and water demand measures	1c. Rainwater harvesting	Physical intervention
		1d. Surface water extraction	Feasibility study
		1e. Development of sustainable groundwater management policy	Governance intervention
		1f. Water transfers within pilot area	Feasibility study
		1g. Desalination	Feasibility study
		1h. Point-of-use conservation	Physical intervention
		1i. Water saving technologies in irrigation	Physical intervention
		1j. Land use change from agriculture to aquaculture	Governance intervention
		1k. Water recycling and re-use	Physical intervention
	Upgrading natural water capacity	1l. Dyke replacements	Feasibility study
		1m. Increasing retention capacity	Feasibility study
		1n. Wetlands development and/or restoration	Governance intervention
	Improving governance tools	1o. Economic and financial measures	Governance intervention
		1p. Communication and education measures	Governance intervention
		1q. Regulatory measures	Governance intervention
2. Tidal barrier at Vam Co mouth	Construction of infrastructure	2a. Construction of tidal barrier	Feasibility study
3. Import of fresh water	Import of fresh water from own river basin	3a. Import of fresh water from upstream groundwater	Feasibility study
		3b. Import of fresh water from upstream surface water	Feasibility study
	Import of fresh water from other river basins	3c. Import of fresh water from adjacent river basins	Feasibility study

7.2 Strategy 1: No-Regret Strategy

The “No-Regret Strategy” consists of a consensus-based mix of measures, based on the priority lists established by the stakeholders and based on feedback from Dutch and Vietnamese experts. The strategy aims at increasing dike height, creating more room for the river, protection of nature areas (mangrove, swamps, etc), and optimizing local supply and demand management. These measures can be implemented safely without compromising the development of wider water management plans, such as the Mekong Delta Plan or the HCMC Flood Management Program, for which reason this is named a No-Regret Strategy.

The building blocks for this integrated strategy are strategy component 1 (completing and upgrading dyke system), strategy component 3 (room for rivers) and strategy component 5 (self-sufficiency in freshwater) as presented in Chapter 5. This optimal mix of measures will reduce the chance of flooding by the sea and by the river, and will also reduce demand for freshwater and should lead to better allocation of available freshwater resources in the districts. Additionally, strategy 1 includes a number of governance tools, including: a) economic and financial measures, b) communication and education measures, and c) regulatory measures.

The rationale of the strategy components of strategy 1 will be briefly described in below section, while the interventions sheets for each strategy component have been included in Annex 4.

Completing dyke system and upgrading dykes

Upgrading existing dike system:

- repair weak spots
- At some places: Increase dike level with 0.5 m
- At some place: Increase dike level with 1.0 m

Construction of dike rings:

- Dike rings may comprise gates
- Gates can be closed in case of flood → closed ring

Safety level depends on maintenance, type of construction, interface between gates and dike itself

Optimizing water supply and demand-side options for the pilot area

For this strategy component the key challenge is how to ensure sufficient freshwater supply, of good quality, taking into account factors such as evaporation, precipitation, river discharges, sea level rise and salinity intrusion.

Compared to the strategy components dealing with floods and sea level rise drought management is different on several accounts. First, flood management is determined by safety concerns, while drought management is determined by scarce water resources, its allocation amongst functions and users, and the quality of water. Second, perceptions on the risks of drought and water shortage are

different than perceptions on flood risks, that is, floods are often perceived as more threatening and acute than the threat of droughts, since the latter is spread out over longer time periods and consequences are often felt indirectly. Third, the availability and impact of solutions for drought adaptation is generally more diverse, and sometime more diffuse, than for flood management.

In general, adaptation to water shortage and droughts depends on the availability of water resources and the economic condition of the households, farmers and industries as well as the type of pollution affecting the water resources.

Key principles for this strategy component:

- 1) It should allow both demand-side and supply-side management options
- 2) Demand-side measures influence the social and economic aspects of groundwater use (through for example pricing, restrictions and formation of groundwater user collectives)
- 3) Supply-side measures affect the production system (through, for example, managed aquifer recharge, conjunctive use strategies, and re-use).
- 4) Good water policy should not include incentives which encourage over-use of the resource, e.g. drilling subsidies
- 5) Optimize possibilities for self-sufficiency in freshwater at households, agriculture and industries

At the supply-side a variety of options for optimization have been identified. Annex 4 provides **intervention sheets** for optimizing the following water supply-side measures:

1. **Rainwater harvesting** at households, irrigations farms and industries, including appropriate water harvesting technologies (Interventions sheet 1b);
2. **Surface water extraction** for drinking water supply, irrigation and industries, including measures such as artificial reservoirs (i.e. water lagoons) (Interventions sheet 1c);
3. **Sustainable groundwater exploitation**, including recharge areas and measures to avoid overexploitation and pollution (Intervention sheet 1d);
4. **Water transfers within pilot area** > feasibility study needed (Intervention sheet 1e);
5. **Desalination**, in particular for areas confronted with salinity intrusion > also refer to pilot project in project area (Intervention sheet 1f).

At the demand-side there is a largely undiscovered and high potential for reducing the demand for water in the pilot area, and for Long An Province in general. Annex 4 provides the following interventions sheets:

1. **Point-of-Use Conservation**, e.g. in toilets, showers, taps, urinals (Intervention sheet 1g);
2. **Water saving technologies in irrigation** (Interventions sheet 1h):
 - a. Crop diversification, including drought tolerant crops: what kind of and where?
 - b. Efficient irrigation systems, e.g. Flow-return systems
 - c. Leak detection and repair + Line canals or install piping to control seepage
 - d. Improve tillage practices
 - e. Crop rotation > with reference to pilot in project area
3. **Land-use change from agriculture to aquaculture** (Intervention sheet i)

4. **Water recycle and reuse** > in industrial and agricultural sector and potentially in household (Intervention sheet j):
- a. Grey water (e.g. in households)
 - b. Treated sewage (e.g. use of treated municipal waste water for irrigation)
 - c. Industrial water

Room for rivers

This strategy component is based on the understanding that continually increasing the height of the dikes is not feasible. Higher and higher dikes would result in unjustifiable risks in the event of a dike breach. The impact of a potential dike breach substantially increases, as socio-economic developments in the Vam Co Basin gradually continue. In other words, working against nature becomes more and more untenable, while giving the rivers more room would accommodate climate changes and simultaneously increase safety, and thus provides a sustainable alternative. In strategy 1 we consider more room for rivers as a complementary strategy component needed besides upgrading the dyke system.

This strategy component includes recent developments in river basin management that aim to 'green' rivers, including increasing river discharge for flood management, enhancing natural and landscape values, and promoting local or regional economic development. Giving the river more room by, for example, relocating the dikes, removing obstacles, excavating secondary channels and even constructing bypasses would enable the river to handle the increasing volumes of water - and in safety.

This strategy component offers opportunities and synergies, but also risks as it crosses established boundaries and touches on multiple stakeholder interests, which can easily clash. There is no one-size-fits-all prescription to river basin management, meaning that specific options for the Vam Co River Basin as a whole need to be examined, taking into account its own physical, geographical and socioeconomic characteristics.

Interventions under this strategy component include (see annex 4):

- Dyke replacements (Intervention sheet 1k)
- Increasing retention capacity (Intervention sheet 1l)
- Wetlands development and/or restoration (Intervention sheet 1m)

Within the context of increasing the water discharge capacity for the basin as whole, it is important to consider **transboundary issues**, in particular the fact that the Vam Co Basin is squeezed in between two major river basins (i.e. the Saigon-Dong Nai basin and the Mekong Basin). This means that the Vam Co Basin is affected by developments in these basins, such as water resources development projects in the Mekong, or infrastructure and urban development projects by Ho Chi Minh city. One example is a planned measure to divert water, during peak discharges, from the Saigon River (north from HCMC) to the Vam Co Basin, in order to protect HCMC against flooding. This will have major consequences for the Lower Vam Co River Basin, since it may divert 2500 m³/s of water from the Saigon into the Vam Co Basin, which will substantially increase the risk of flooding in the Vam Co. However, it can also be used to provide the Vam Co area with freshwater during the dry season if the peak discharge diverted from Saigon River can be (partly) stored in the upstream areas

of the Vam Co Basin, e.g. by means of ecosystem water storage and/or retention areas. This would be a potential win-win situation, although further study on its feasibility is required.

Governance tools

Governance—the operation of rules, instruments and organizations that can align stakeholder behavior and actual outcomes with policy objectives—is an essential part of each strategy. For strategy 1 annex 4 provides the following governance interventions sheets:

- Economic and financial measures (Intervention sheet 1n)
- Communication and education measures (Intervention sheet 1o)
- Regulatory measures (Intervention sheet 1p)

7.3 Strategy 2: Tidal Barrier + Sluices

This strategy adds tidal barriers and sluices to the “No-Regret Strategy” in order to drastically reduce seawater intrusion into the pilot area. These measures will only be necessary when strategy 1 does not succeed in providing sufficient fresh water for current land uses. Important note: realization of a tidal barrier will have significant and non-reversible impacts on water management in the wider region, and can therefore not be considered as a non-regret measure. Also the construction of sluices is considered highly controversial, since it will shut certain areas off from their surroundings, which may lead to severe **negative environmental consequences** for the ecosystems affected.

In any case, it is strongly recommended to await the final decision about a **sea dyke in Soai Rap estuary**, to be constructed in order to protect Greater Ho Chi Minh City from sea level rise. A sea dyke in Soai Rap would make a tidal barrier in the mouth of the Vam Co river redundant. Furthermore, a tidal barrier may influence the flooding depth of the land behind the barrier, and will therefore have implications for the height of the dyke rings in the pilot area. Overall, the construction of a tidal barrier has major influence on daily activities and economy of local people, and it might have negative impacts on navigation, thus further study is required.

For strategy 2 annex 4 provides the following interventions sheets:

- Construction of tidal barrier (Intervention sheet 2a)
- Construction of 12 sluices (Intervention sheet 2b)

7.4 Strategy 3: Import Freshwater

Strategy 3: “Import Freshwater”: This strategy adds measures - on top of the “No- Regret Strategy” – for importing additional surface or groundwater water from outside the pilot area into the four coastal districts of Long An Province. For example, water can be imported from upstream areas adjacent to the pilot area or from storage reservoirs in the Saigon and/or Mekong river basin. The aim of this import is to overcome water shortages within the pilot area during the dry season, as has been noticed regularly in the past. This strategy will only be necessary when strategy 1 does not succeed in providing sufficient fresh water to current land and water users in the pilot area. However, its feasibility is highly controversial and would require further study.

For the import of freshwater annex 4 provides the following interventions sheets:

- Import of freshwater from upstream groundwater (Intervention sheet 3a)
- Import of freshwater from upstream groundwater (Intervention sheet 3b)
- Import of freshwater from adjacent river basins, i.e. Saigon and Mekong basin (Intervention sheet 3c)

7.5 Investment planning and implementation

One of the next challenges will be how to prepare for financing and implementation. Below section provides a brief overview in terms of investment planning, financing, project preparation and project implementation.

Investment Planning

The aim of an investment plan is to present the projects to be implemented in terms of objective; content; time schedules; disbursement schedules; revenues; environmental and social impacts; and legal and institutional issues. A good investment plan may attract potential financiers and partners, and helps towards good implementation. It could help to raise the following questions during the preparation of an investment plan:

What is the purpose of the investment? The overall objective of the investment, as well as its direct purpose should be well described. The purpose is preferably linked to specific performance indicators, to enable monitoring of the impacts of the investment. The investment might also have some secondary impacts, which are positive and worthwhile to formulate.

Has the investment been designed optimally? A feasibility study will be required for most investments, describing various alternative solutions and their impacts in terms of technical feasibility; environmental and social impacts, institutional setting, legal and institutional requirements and possibly more. Once the preferred alternative has been selected, more detailed feasibility aspects could be elaborated and optimized, for instance through a conceptual design of all project components, prior to preparing the detailed designs and tender documents.

What is the timeframe of the investment? Generally a physical intervention required three types of investment periods: (1) preparation costs; (2) capital expenditures (CAPEX) and, after completion of the construction works: (3) the operational expenditures (OPEX). In some cases the investment could also require closure costs after completion of the operational phase, for instance in case of a sanitary landfill with a limited life span. It is important to make realistic assessment for each, including their timeframes.

What are the revenues of the investment? If the project would generate direct revenues, such as from wastewater fees, it is important to understand to what extend these revenues have been

secured, when and how these revenues will be generated, and how to manage an adequate and reliable collection of these revenues.

What are the investment and financial risks? It is important to make an adequate risk assessment related to the foreseen investment. These risks may relate to external environmental events that could prevent or reduce the foreseen outputs of the investment; to financial or legal risks such as withdrawal or bankruptcy of critical investors; to construction related risks, and to operations / revenues related risks. It is important to understand the size of these risks and their impacts, as well as their potential mitigation measures and related costs.

What is the required cash flow? The difference over time between the expenditures and revenues of the investment determines the cash flow that is needed to prepare, realize and implement the project. Typical expenditures can be: preparation and TA costs; CAPEX; OPEX; taxes; interests on loans, repayment of loans. Incoming cash flows may relate to project revenues; loans; subsidies and grants. The cash flow could be generated from one's own financial resources, and / or through external financiers. External finance could be generated for instance through governmental budgets; private sector (co-)finance; IFI or Donor funds; subsidies or grants; or commercial loans. Generally, commercial loans require a financial viable plan with sufficient revenues and relative low risks levels. Taking account of interest rates and inflation could further optimize and fine tune the required cash flow and financing plan.

Internal Rates of Return

The Internal Rate of Return (IRR) of an investment is defined as the discount rate at which the net present value of costs (negative cash flows) of the investment equals the net present value of the benefits (positive cash flows) of the investment. IRR calculations are commonly used to evaluate the desirability of investments or projects. The higher a project's IRR, the more desirable it is to undertake the project. Assuming all projects require the same amount of up-front investment, the project with the highest IRR would be considered the best and undertaken first.

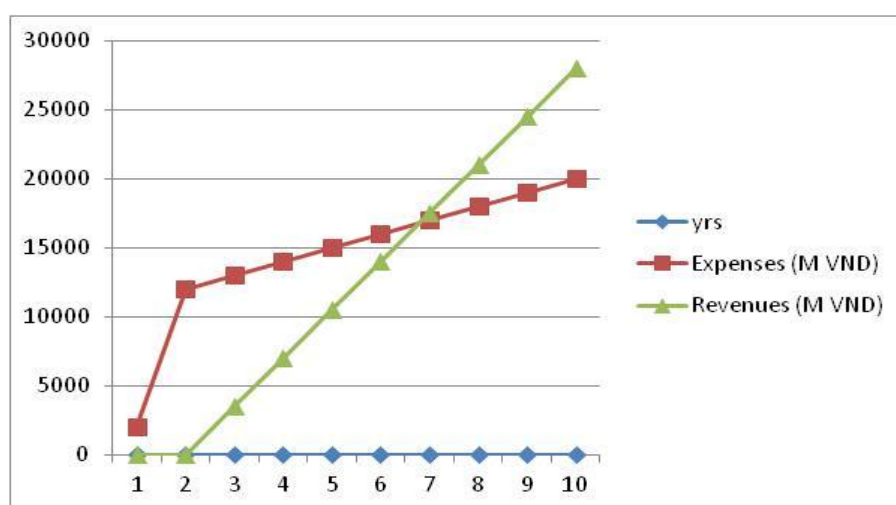


Figure 17 - Positive Internal Rate of Return

Figure 17 provides an example of a project that generates an internal rate of return of 12.4%, which is reflected by the fact that after a certain period of time the cumulative revenues are exceeding the cumulative expenses. In this case the project financing requirement is 12,000 M VND, being the maximum difference between the cumulative expenses and the revenues after year 2.

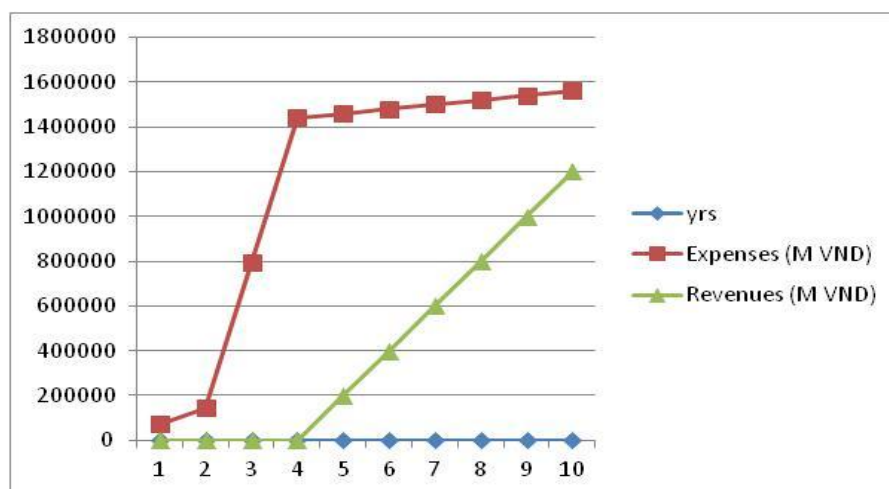


Figure 18 - Negative Internal Rate of Return

Figure 18 provides an example of a project that generates a negative internal rate of return of -6.5%, which is reflected by the fact that the cumulative revenues will not exceed the cumulative expenses during the foreseen project period (10 years in this case). In this project the required finance (negative cash flow) by the end of the project period is 360,000 M VN (year 10), and in addition an amount of 1,080,000 M VND is required to bridge the gap between the cumulative expenses and the revenues after year 4 (totally 1,440,000 M VND).

Public – Private Partnerships

In some cases it might be advisable to set up public-private partnerships for the realization projects, since this could increase efficient and cost effective delivery of the project. It could also provide value for money for the taxpayer through optimal risk transfer and risk management, and create efficiencies from integrating design and construction of public infrastructure with financing, operation and maintenance/upgrading.

PPP's will also create an added value through synergies between public authorities and private sector companies, in particular, through the integration and cross transfer of public and private sector skills, knowledge and expertise. It could also create better competition and greater construction capacity (including the participation of overseas firms, especially in joint ventures and partnering arrangements). Furthermore the delivery of quality public services could be improved through a performance incentive management / regulatory regime, and it could reduce the use of governmental budgets to the benefit of all users of public services.

In short, aspects to consider with PPP's are:

- PPP enables generation of private investments
- PPP enables to mobilize private sector experience
- PPP requires a positive business case (profits)

- PPP creates market discipline if allocation of risks are properly designed (commercial risks should be borne by private partner).
- PPP requires clear responsibilities and commitments, both on public as well as on private side
- PPP cannot represent public interests only
- PPP requires effective dispute resolution schemes

Chapter 8 – Conclusions & recommendations

8.1 Financing

Public-Private Partnerships

One of the main challenges of water governance is finding ways to finance climate change adaptation plans, operations, infrastructure and projects. In the last few decennia, new forms of finance scheme and structures have become available and are now commonly used (Bossert et al., 2006). These modern forms, finance schedules and structures are often known as public-private partnerships (or PPP's). Within the context of climate change adaptation, PPP's might enable the public sector to spread the cost of the investment over the lifetime, in contrast to traditional financing where the public sector is required to provide capital, while the benefits will come much later and are mostly uncertain. For example in the pilot area, the potential of public-private partnerships related to the climate-proofing of the industrial zones and agricultural activities needs further study.

Economic Diversification

In the near future one of the major threats to environmental security in the pilot area will be a transition to industrial shrimp farming, according to the new economic strategy. Most of the villages have concrete and ambitious plans to increase production of shrimps by using intensive methods. A transition to industrial shrimp farming should be carefully considered with regard to environmental impacts, the sustainability of this type of farming, and potential economic alternatives.

The area itself provides the potential for economic more sustainable alternatives which have been underexplored so far, such as ecological shrimp farming.

The pilot area might also explore opportunities for entirely new economic activities in the field of renewable energy, for example solar energy, wind resources, stand-alone desalination units, with or without coupling to food and salt production, including a community based (and decentralized) method to adapt to and mitigate climate change.

Payment for ecosystem services

Ecosystem services such as carbon sequestration, flood protection and protection against soil erosion are directly linked to climate change and healthy ecosystems are an essential defence against some of its most extreme impacts. A comprehensive and integrated approach towards the maintenance and enhancement of ecosystems and the goods and services they provide is therefore needed.

In the forestry area in Vietnam there is already experience and legislation of PFES, Payments for Forest Ecological Services. This experience shows that working with nature's capacity to absorb or control impacts in urban and rural areas can be a more efficient way of adapting than simply focusing on physical infrastructure. Green Infrastructure⁴ can play a crucial role in adaptation by providing essential resources for social and economic purposes under extreme climatic conditions. Examples

⁴ Green Infrastructure is the interconnected network of natural areas including some agricultural land, such as greenways, wetlands, parks, forest preserves and native plant communities, and marine areas that naturally regulate storm flows, temperatures, flooding risk, and water, air and ecosystem quality.

include improving the soil's carbon and water storage capacity, and conserving water in natural systems to alleviate the effect of droughts and to prevent floods, soil erosion and desertification. Hence, it is important to explore the potential for policies and measures to boost ecosystem storage capacity for water in the Vam Co river basin, and more in general the potential for payment of ecosystem services.

8.2 Law

Law revision and enforcement on forest protection

One of the most important threats to sustainable and climate-resilient water management mentioned by stakeholders is the uncontrolled cutting of mangroves for construction materials, firewood and charcoal. This problem runs parallel with the exploitation, selling and using of timber and other forest products with unknown origin. At the same time, stakeholders also mention the difficulties in dealing with this problem, especially since it is normally done by poor people who need to sustain themselves somehow. Stakeholders and law enforcers mentioned the non-custodial reform penalty or imprisonment from six months to 15 years, and fines of five million to 100 million VND which offenders would have to pay. However, it is very rare that people are fined or prosecuted for illegal cutting, since most offenders are poor and law enforcers are reluctant to punish poor people. Since this is the only practical instrument available to current law enforcement the prevention of illegal cutting is rather ineffective.

Poverty alleviation is generally mentioned as key to dealing with this problem, although stakeholders do not mention any specific measures or policies for achieving this poverty alleviation, apart from the Long An socio-economic development plan. A possible alternative to dealing with illegal cutting is payment for ecosystem services (see section 8.1).

Regulations for intensive shrimp farming

The transition to industrial shrimp farming requires guidelines and regulations for avoiding water pollution caused by excessive use of pesticides and fertilizers. Development of guidelines and regulations is therefore recommended.

Regulations for domestic and industrial waste (water) management

In the pilot area, many livelihoods are evenly divided and living near rivers, drainage channels, waterways, and all waste (e.g. plastics, batteries, and organic waste) is thrown directly into the water or buried next to the house. Also the industrial zones in the pilot area (e.g. food processing industry) are major sources of environmental pollution. Hence, effective regulation for domestic and industrial waste (water) management is required.

8.3 Water Governance

Aligning Interests and Harmonizing Sector Policies

Correcting the mismatch or conflict among sectoral policies is one of the biggest challenges for water governance and climate change adaptation. Typically, the political gain and economic incentives weigh in heavily on the side of the water using sectors, particularly the interests of agriculture and

municipal and industrial supply. Within the water sector, the scales are heavily weighted in favor of surface water investment and related management. Further study is needed on what governance mechanism can ensure that sectoral policies and integrated water resources management planning promote good groundwater management?

Set up of inter-sectoral coordination mechanisms

Some approaches to promote inter-sectoral coordination have been proposed during the planning process: (i) confiding a coordination role to a neutral ministry, typically the planning ministry or alternatively the science and technology ministry, to reconcile the interests of the water resource managers with the water using sectors; and (ii) institutional analysts have also proposed multi-level governance as a mechanism to facilitate cross-sectoral harmonization as well as vertical linkages between the center and the local level. Authorities in the pilot area are supportive of confiding a coordination role to a neutral ministry to reconcile the interests of the water resource managers with the water using sectors. By doing this, it is possible to facilitate data and information sharing between sectors.

Groundwater needs to be adequately factored into IWRM planning

Where integrated water resources management planning has been adopted, whether at the level of national master plans or at the local river basin level, specific dedicated human and financial resources should be devoted to groundwater. Some activities, of course, are common between groundwater and surface water, so creation of entrenched “empires” needs to be avoided. Cross-fertilization is also useful. For example, groundwater management can benefit from the experiences in surface water with regard to participatory approaches and collective choice arrangements, which are often more developed for surface water management. Nonetheless, groundwater requires specialized capacity in term of knowledge and resource monitoring and additional efforts for information and communication compared to surface water.

Open access to and exchange of data and information

An important issue regarding the improvement of coordination and cooperation in the water sector is a free exchange of relevant data and information on hydrology, hydraulics and meteorology. It is realized that the collection of such data and information is costly and as such field monitoring is a capital investment. Nevertheless, a mechanism will be necessary for better and free exchange of data between relevant institutions, in order to improve water governance and not to hamper social and economic development. Probably the national government should take the lead in setting up an acceptable system that will be adopted by other government parties as well as research institutions etc.

Various Recommendations regarding Water Governance

- Ensure to delegate decision making regarding local problems and local projects to the appropriate corresponding local level of government (the principle of subsidiarity)
- Improve the participatory decision making and consensus building
- Ensure equity and social fairness between stakeholders and inhabitants, when taking decisions about strategy design/selection and project implementation

8.4 Technical and non-technical Recommendations

Apart from the recommendations on Financing, Law, and Governance as given in the previous paragraphs, the following recommendations can be given regarding potential measures or projects that can be implemented to strengthen the adaptation strategy. The main message in that respect is to try focusing on utilization of the unique location of Long An province and try to capitalize on it:

- Make an assessment of the type of ecosystem services that can be provided viewing the specific location and water resources conditions of Long An province and the marketing tools needed for capitalization of such services.
- Investigate the potential for ecosystem water storage, viz. diversion from Saigon river to alleviate HCMC floods, and at the same time store fresh water for the dry season.
- Investigate more non-structural measures that will improve IWRM and can strengthen the socio-economic conditions (crop diversification, shift to more cash crops, aquaculture, etc.)
- Investigate possibilities for renewable energy: wind, solar, and water, but specifically energy generation from the potential difference of salt/fresh water exchange.
- Shift to green technology and green living: improve the use of natural resources (3 Rs: re-use, reduce, recycle)
- Develop innovative disaster risk management, taking into account the vulnerability and resilience of the local population,
- Install and enforce regulations on waste water management to protect the environment of Long An province.

Chapter 9 - Dissemination & upscaling

One of the objectives of this pilot project is to disseminate the results of the pilot project to a larger audience, and to get adaptive approaches to water management and water governance applied on a larger scale in Vietnam and elsewhere. Hence, the pilot project has implemented a proper outreach of project activities and results at different levels and locations. As evaluated by the External Advisory Committee, the existing Vietnamese demand for adaptive and participatory approaches to water management and water governance has been served well by the project, and provides a good basis and reference for further upscaling.

Key dissemination and upscaling activities include the following:

- A peer-reviewed publication (8 pages) about the participatory planning process being deployed in this pilot project. The article by Bouke Ottow (Deltares), Patrick Huntjens (Water Partner Foundation) and Ralph Lasage (IVM) has been published in the *Water Governance Magazine* in the Netherlands (Issue 05/2012);
- A 3-page publication on the pilot project will be published in the Journal of the *Integrated Assessment Society* in June 2013;
- A peer-reviewed publication about the pilot project, in particular focusing on the combination of innovative participation methods and advanced decision support tools, is currently being developed and is intended to be submitted to the International Scientific Journal *Ecology and Society*;
- Several meetings with the Chief Technical Advisor of the Mekong Delta Plan, Mr. Martijn van de Groep, and Special Advisor to the Mekong Delta Plan, Prof. Stefan Kuks, have been taking place during the pilot project in order to streamline the climate change adaptation strategy developed in this pilot project with the Mekong Delta Plan. This effort has been very successful, since the strategy published by this pilot project in March 2013 shows no major inconsistencies with the soon to be published Mekong Deltaplan, expected to be published in May 2013;
- The participatory planning approach used in this pilot project serves as a reference to the Mekong Delta Plan. The Chief Technical Advisor of the Mekong Delta Plan (Mr. Martijn van de Groep) has declared during the Final Conference of this pilot project to use similar methods, albeit in a less extensive way, for the participation process (i.e. roadshow) of the Mekong Deltaplan at the provincial level. The roadshow of the Mekong Deltaplan is being planned during 2013. Project members of the pilot project have been invited as technical advisors and facilitators to support the stakeholder participation process of the Mekong Delta Plan. Water Partner Foundation submitted a proposal for support to the MDP roadshow;
- Several project presentations at international fora, including the 1) First European Conference on Climate Change Adaptation (ECCA, Hamburg, March 2013); 2) International Workshop of the Centre for Water Management and Climate Change (WACC) in Ho Chi Minh City (February 2013); 3) UNDP Kick-off meeting of the National Adaptation Strategy for Kosovo (Prishtina, March 2013);

- Media coverage: the Midterm conference and Final Conference has been published in about ten local and national newspapers in Vietnam (for more details see Deliverable 6);
- At the Midterm and Final Conference delegations from neighboring Provinces in the Mekong Delta, from Provinces in Central and Northern Vietnam, and delegations from Hanoi and Ho Chi Minh City participated, next to invited international speakers and international organizations such as UNDP, Asian Development Bank, European Commission, Netherlands Government, World Bank, International Union of Nature Conservation (IUCN), Care International, GIZ, and the World Wildlife Fund (WWF);
- Final Conference received laudatory speeches from the Dutch General-Consul Mr. Simon van de Burg and the Chairman of Long An Provincial People's Committee Mr. Dương Quốc Xuân;
- The pilot project has been incorporated as a case-study in the curriculum – i.e. the Water Governance Course (C3) - of the recently established Centre for Water Management and Climate Change (WACC) in Ho Chi Minh City. More specifically, the pilot project serves as a good example in Vietnam of institutional strengthening, capacity building and stakeholder participation in the water sector. It also serves as a prime example of an adaptive and integrated approach to develop a climate change adaptation strategy, based on a innovative participation techniques and advanced decision support tools.
- The project has disseminated 300 Project Brochures;
- The project has established a project website: <http://skhcn.longan.gov.vn/vamcoen>

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Annex 1 – Extensive Stakeholder Analysis

This annex provides a detailed overview of stakeholders, their (perceived) functions, interests and goals related to the development of an integrated and community-based risk management and climate change adaptation strategy in the Lower Vam Co River Basin in Long An Province.

People attending the meetings in Can Duoc, Can Giuoc, Tan Tru and Chau Tanh District were asked to fill in a questionnaire on their organization's function/task/responsibilities; benefit/interest; planning goals and policy objectives.

These forms were collected, translated and grouped into the tables below. In processing the forms, some difficulties were encountered:

- Apparently not everybody had the same understanding of what was being asked, as the answers often indicate. For instance in the column "function of the organization", often answers were given that more indicated the interest of desire of the organization. Often the interest can be found in any of the columns, including in the policy goals
- People's identities also were not always clear, especially at commune/village level. Probably many functions are part-time and a person had, for instance, both the identity of "farmer" and holder of a more public office.
- Respondents also seem not to make much distinction between the benefit for their own organization and the benefit for society in general.
- Translation and the interpretation of the translation was not without difficulties. In several instances, the Vietnamese was not translated as it was not clear what the respondent was trying to say.
- The (translated) answers are not edited. The answers of the columns "goals" and "goals" are lumped together and renamed "goals, wishes, desires", as it was difficult to distinguish between the answers in the two columns and because often the answers seemed more to be wishes than actual goals or plans.

Apart from being grouped together per stakeholder type, the information has not further been analyzed.

The stakeholders have been grouped per province, district and commune level. Per stakeholder the number of respondents is indicated and from which of the four districts the respondents originate.

Province level

Long An Police, (present at Chau Tanh District meeting)

1 respondent

Function/task/responsibilities	<ul style="list-style-type: none">• protection of the environment/natural resources
Benefit/ interest	<ul style="list-style-type: none">• reforestation (protect dyke against erosion)• dyke construction to protect against flood & salinity intrusion• efficient & sustainable use of natural resources
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none">• better spatial & land use planning• improve hydraulic system & infrastructure• policy to protect environment• Advocate local people to protect environment

District level

People's Committee chairman, districts Can Duoc, Can Giuoc, Chau Tanh,

3 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> • Approve plans • Provide guidelines Natural resources & environmental law • Planning for local socio-economic development, increase income of people (in Can Giuoc district)
Benefit/ interest	<ul style="list-style-type: none"> • Land use right • Fulfill assignments from higher level • Socio- economic development • Improve living quality of people • Ensure benefit for all people in the district
Planning goals/ policy objectives / wishes	<p>Land use</p> <ul style="list-style-type: none"> • Intensive farming • Extend area • Ensure agriculture production, higher income <p>Infrastructure</p> <ul style="list-style-type: none"> • Protect from high tide • Higher infrastructures to deal with sea level rise • Strengthening houses, hydraulic structures, roads ... • More investment in infrastructure • Sustainable use of surface & ground water • New structures to minimize impacts of climate change <p>Awareness</p> <ul style="list-style-type: none"> • Increase awareness of people in environment protection • Allocate fund for mitigation campaign

People's Council, district Chau Tanh,

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> • Advocate to local people
Benefit/ interest	<ul style="list-style-type: none"> • Integrate climate change in planning phase
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • protect areas vulnerable to impacts of climate change • 70% of population are farmers

Office of the People's Council, district Tan Tru,

2 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> • Overall management in many fields • Advocate people on climate change and its impacts • Survey
Benefit/ interest	<ul style="list-style-type: none"> • Sustainable economic development • Stabilization of the lives of farmers
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Sustainable agricultural development, shifting cultivation patterns

Fatherland Front Association, districts Can Duoc, Tan Tru,

2 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> • ...
Benefit/ interest	<ul style="list-style-type: none"> • ...
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Agricultural land expansion

Office of the Party Committee, districts Can Duoc, Can Giuoc, Tan Tru , Chau Tanh

4 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> • Monitoring, planning and consulting • Water resources Law • Land use rights • Provide guideline & instruction
Benefit/ interest	<ul style="list-style-type: none"> • Economic & social development • Water resources Law

	<ul style="list-style-type: none"> • Land use rights • Ensure public health
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Economic & social development • Industry, agriculture, trade services • Prevent water pollution • Climate change adaptation & prevention • Mobilize people protect environment • Strictly handling violation cases

Department of Economic Affairs & Infrastructure, districts Can Duoc, Can Giuoc, Tan Tru , Chau Tanh

7 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> • Overall management of trading, services, technology, construction, transportation • Advice PPC on the following issues: construction, transportation, trading, industry and science & technology • Governance on the following issues: construction, transportation, trading, industry ... • Infrastructure management • Reforestation • Construct water storage
Benefit/ interest	<ul style="list-style-type: none"> • Understand the need to have such project like which we are doing for climate change adaptation • Ensure socio-economic development • Finalize plan to “New face for rural areas” in 2012 • Upgrade inter-village/commune roads (concrete, asphalt) • Strengthening dyke, reforestation to deal with climate change
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Trade service planning • Transportation planning, complete local transportation plan • Residential area planning • Planning of new rural areas • Foster trade services development • Step by step reduce temporary resident areas • Can Giuoc become urban area (type 4) in 2015 • Strengthening roads and dykes • Construct, reinforce dyke systems • Investment in infrastructure (Exp: roads to transport agricultural products) • Advocate people to follow law of construction & trading • Improve management • More investment for research • Consult PC in for administration & management (complete roads, upgrade infrastructure) • 100% staff of our dep.have bachelor degree • Annual fund from Government (Province)

Department of Finance and Planning, districts Can Giuoc, Chau Tanh

2 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> • Consulting PC in financial management (allocation budget for socio-economic development, natural disaster mitigation ...) • Auditing
Benefit/ interest	<ul style="list-style-type: none"> • Economic development
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • High priority in natural disaster protection & mitigation • Funding allocation for natural disaster prevention & mitigation • Provide funds for climate change projects

Department of Technology & Infrastructure, district Tan Tru

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> • Ensure the back-up budget to cope with climate change
Benefit/ interest	<ul style="list-style-type: none"> • ...
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Construct dyke system along Vam Co river

Department of Agriculture & Rural Development (DARD), districts Tan Tru, Chau Tanh

5 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> • Overall management of agriculture • Preventing flooding, mitigating natural disasters • Cooperate with local government for planning and implementing dyke systems in order to deal with natural disasters • Planning for climate change adaptation
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Benefit/ interest	<ul style="list-style-type: none"> Income from agricultural production Stabilization of the people's living Economic development, increase income Improved management Fulfill assignments from higher level Ensure environmental quality Minimize impacts of climate change
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Construct hydraulics system (dyke, sluices) Dredging secondary & tertiary canal system High priority to environmental protection projects (biosafety) Support to agriculture models which adapt to climate change (growing salt-tolerant plant, aquaculture) Construct dyke system, dredging secondary & tertiary canal system Allocate fund for climate change mitigation campaign better land use planning water resources management Provide fund for strengthening hydraulic system & land use planning Planning areas for agriculture production base on the typical condition of each commune Making a proposal to shift crop & livestock pattern Complete hydraulic system

Department of Natural Resources & Environment (DONRE), districts Can Duoc, Chau Tanh

2 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Land management Environmental management Motivate people to use natural resources sustainably
Benefit/ interest	<ul style="list-style-type: none"> Benefiting resources, the policy of the state, infrastructure
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Planning for black soil exploitation Industrial planning Planning for groundwater abstraction Environmental protection Industry development Foster state governance to protect environment Land use planning More support (fund, resources) from Government

Department of Water Resources Planning, district Can Giuoc

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> Management & operation of hydraulics structure
Benefit/ interest	<ul style="list-style-type: none"> Interests of the industry is very large
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Store fresh water for production Capacity building for managers Increase efficiency of hydraulic structures

Department of Education & Training, districts Can Giuoc, Tan Tru, Chau Tanh

3 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Education of Can Giuoc Education management Education from kindergarten to secondary school
Benefit/ interest	<ul style="list-style-type: none"> Everyone can have chance to study
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> 50% total number of schools achieve national standard in 2015 Ensure 100% children at the age of 6-10 can go to primary schools in 2015 Ensure 100% children at the age of 11-15 can go to secondary schools in 2020 Saving land for construction of schools at dif. level: kinder garden, primary, secondary & high school 75% of total number of schools achieve the national standard in 2015 100% students finish secondary schools

Department of Public Health, districts Can Duoc, Can Giuoc, Tan Tru

4 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Disease control and prevention Governance & management issues related to public health Advocate local people on issues related to public health
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Benefit/ interest	<ul style="list-style-type: none"> Consult to PC to ensure public health Ensure public health
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Minimum disease in people Food poisoning prevention Prevent spreading of diseases Improve public health Reducing fatal ratio caused by diseases by 10%/year Quickly extinguish disease Increase awareness of people to protect environment

Department of Labour, War Invalids and Social Affairs, districts Can Duoc, Can Giuoc, Tan Tru, Chau Tanh

5 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Land use rights of poor people Organize relief campaign Consulting to PC on labor issues Taking care of issues related to labors & social affairs Propaganda, education, especially for children under 16 For poor people Policy
Benefit/ interest	<ul style="list-style-type: none"> Damages (to agriculture production) are minimized (2x) Reduce poverty Increase income
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Increase in number of rich households Ensure socio welfare to the poor, children (2x) Planning for labor allocation to 2015 & 2020 Production in comply with policy from Government Ensure security & production Making a graveyard plan

Department of Culture & Information, district Tan Tru

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> Make good propaganda about climate change and its impact
Benefit/ interest	<ul style="list-style-type: none"> -
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> -

District police, districts Can Duoc, Tan Tru

2 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Saltwater intrusion, lost of arable land, problem to daily routine & production Consult to executive committee, authorities on climate change mitigation & adaptation strategy Ensure social security
Benefit/ interest	<ul style="list-style-type: none"> Ensure social security
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Higher dyke system to protect agricultural production Preventing environmental violence Economic social and cultural development Effective implementation of the national program NQ09 prevention TP 2010-2015

Armed Forces, district Can Duoc

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> Climate change mitigation strategy is required Provide information about climate change and its impacts
Benefit/ interest	<ul style="list-style-type: none"> Minimize impacts of climate change
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Dyke system planning along Vam Co river Appropriate strategic planning to deal with sea level rise

Former Soldier, district Can Giuoc

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> Advocate people to protect environment, protect mangroves & follow policy/law from government
Benefit/ interest	<ul style="list-style-type: none"> Economic development
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Reforestation Construct dyke system

Women's Union, districts Tan Tru, Chau Tanh

3 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Advocate people on climate change and its impacts Regularly organize training sessions for staff member Advocate people to protect environment & minimize impacts of climate change
Benefit/ interest	<ul style="list-style-type: none"> People have land for production
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Focus on projects which are for the development of economy and agriculture Make plan for propaganda campaigns

Youth Union, districts Can Duoc, Can Giuoc

2 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Cooperate with government, organizations to protect environment Advocate people protect environment Training & educate to youth via group, social activities
Benefit/ interest	<ul style="list-style-type: none"> Land is damaged Reducing agriculture and aquaculture areas Protect & ensure rights of the Youth
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Environmental protection (not littering, solid waste separation at source) Land use planning Increase awareness of the youth about climate change Advocate to all the youth, student ...

Farmers' Union, districts Can Giuoc, Tan Tru, Chau Tanh

3 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Increase awareness of people about climate change & impacts Advocate people to follow government law, policy about natural resources, environment, land Provide information about climate change & adaptation Evacuation
Benefit/ interest	<ul style="list-style-type: none"> Farmers have knowledge about climate change & prepare for adaptation Policy on climate change
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Classify impacted areas to propose suitable measures Set up an efficient agricultural production model (not impact the environment) Minimize impacts of climate change Ensure security & production Provide information

Labor League, district Can Giuoc,

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> Advocate people to prevent water & environment pollution
Benefit/ interest	<ul style="list-style-type: none"> Minimize impacts to environment
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Improve water management Improve management

Red Cross, district Can Giuoc

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> Advocate people to prepare incase of flood, hurricane... (strengthen house, evacuation) Organize relief campaign
Benefit/ interest	<ul style="list-style-type: none"> -
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Minimize damages

NGO PTH, district Chau Tanh,

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> Advocate people to protect forest
Benefit/ interest	<ul style="list-style-type: none"> Flood protection
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Formulate schedule to achieve targets from this month to Dec

CSGMGC Tân Trường Phúc, district Can Giuoc,

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> To stabilize the lives of people in the shortest time
Benefit/ interest	<ul style="list-style-type: none"> Risks are minimized
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Increase awareness of people about climate change Protect environment

Radio, districts Can Giuoc, Tan Tru

2 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Provide information Propagandize government's policies and laws Advocate people on climate change and its impacts Propaganda, prevention and cope with climate change
Benefit/ interest	<ul style="list-style-type: none"> Access to new information Praise for good activities Prevent environmental violence
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Provide information to every people in Can Giuoc Provide up-to-date, adequacy and accuracy information Foster intensive propaganda campaigns

TV, district Chau Tanh

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> Advocate people on climate change and its impacts
Benefit/ interest	<ul style="list-style-type: none"> maintain area for aquaculture
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> strengthen dyke & sluices

Tam Vu Town, district Chau Tanh

2 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Administration management Planning for socio - economic development Relief campaign
Benefit/ interest	<ul style="list-style-type: none"> -
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Develop Tam Vu from district town to city - type 4 (in the national standard of VN) water resources & transportation management

PC of Tan Tru Town, district Tan Tru

3 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Environmental management (2x)
Benefit/ interest	<ul style="list-style-type: none"> Developing local social economy (2x)
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Cultivation, aquaculture Build graveyard Strengthening dyke system (to prevent saltwater intrusion) (2x)

Electricity Company, district Can Giuoc

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> Power supply
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Benefit/ interest	<ul style="list-style-type: none"> Satisfy power demand
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Satisfy power demand in the future Ensuring safety & continuous power supply

Tan Lap Private Enterprise, district Tan Tru

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> Prevent natural disasters caused by climate change
Benefit/ interest	<ul style="list-style-type: none"> Provide fund for climate change mitigation & adaptation
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Formulate strategies for flooding & drought protection

Holland Water Supply Co. Ltd, district Can Giuoc

2 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Right to own & use land
Benefit/ interest	<ul style="list-style-type: none"> -
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Protect against salinity intrusion

Urban Construction joint Stock company, district Can Giuoc

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> Preventing deforestation Protecting water resources Advocate people protect environment
Benefit/ interest	<ul style="list-style-type: none"> Ensure environment & living quality
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Minimize impacts of salinity intrusion Cooperate with local government to protect environment

Tan Kim Industrial zones management board, district Can Giuoc

3 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Increase awareness about climate change Protect forest Tan Kim Industrial Zone Industrial zones & ports
Benefit/ interest	<ul style="list-style-type: none"> Support from State Government Understand climate change & propose suitable measures
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Protect from high tide Construct tidal barriers in Can Giuoc river

Commune level

People's Committee (vice) chairman, communes in all four districts,

42 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Natural resources & environmental law Provide information about climate change, sea level rising Water resources management Production in comply with environmental law Management of socio - economic development Management of environmental sanitation and land Water resources Law Inspect administration regularly Disseminating environmental law to local people Production management & planning Environmental protection Preventing environmental violations Provide information about dyke system, irrigation, agriculture to related sector Appropriate planning Propose to higher level to construct semi-permeable barrier and dyke system Advocate people protect environment (esp. water resources) Administrative formalities. Proposing plans to district level Food production
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	<ul style="list-style-type: none"> • Economic & social development (at village level) • Disseminate policy, decree from State Government • Protection • Administration management • Understand about climate change & propose adaptation plans • Environmental protection legislation and specific drastic sanctions • Consulting to PC of higher level • Overall management of land use, water resources, environment protection & economic development • Environmental management • Propaganda • Advocate people protect environment (2x) • Overcome damages caused by natural disasters • Mobilize people for preventing Uncontrolled forest exploitation • Consult to PC on propaganda campaigns planning for climate change mitigation & adaptation • Climate Change Governance • Advocate/Provide information about climate change and its impacts (4x) • Administrative management in many fields • Advocate people to protect environment • Water law • Advocate people about policy, decree of Government • Organize & Implement relief campaign • Mobilize local people to cooperate with Government • Advocate people to protect environment • Strictly handling violation case • Economic & social development • Management of socio - economic development
Benefit/ interest	<ul style="list-style-type: none"> • Land use rights (4x) • Enough fresh water for domestic use • Water abstraction and usage in comply with environmental laws • Develop agricultural area • Ensure environment & living quality (2x) • Sustainable agricultural development • Ensure environment & living quality • Preventing water pollution • Raise people's voice • Support from Province & District for socio-economic development • Benefits from projects implemented in Long Phung • Ensure quality of living environment • Administrative management in socio-economic issues • Support from district, province to minimize impacts of climate change • Saving certain area for environment protection propose • Ensure human right • Socio-economic development • Increase living quality • Environment protection • Reduce environmental damages • A lot • Contribute to improve local economy • Natural disaster mitigation • Improve living standards, foster local economic development • Help people lessen the affection of climate change • Adapt to climate change • Land use right for farmers • Protect main crop • Suitable plans for climate change adaptation will bring benefit to people at Thuan My • Ensure security & production • Farmers have land to cultivate • Ensure security • Ensure security & economic development • Ensure production & higher income • Support (funding, resources) to implement climate change adaptation plans
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Intensive farming • Extend area • Industrial area planning (cluster) • Develop intensive shrimp farming areas, and produce high quality sticky rice • Support from government to breeding and cultivation • Plan for intensive farming up to 2015 • Support for the development and implementation of project (funds, resource) • Land use planning to 2020 and orientation to 2030 • Land use planning (intensive area, area for cultivating high-quality rice)

	<ul style="list-style-type: none"> • Local industry development planning • Planning of transportation & infrastructure • Better land use planning • Financial support for farmer through business bank loans • Calling for investments in infrastructure • Foster agricultural production • Increase agricultural area to 150 ha in 2020 • Ensure environment & living quality • Develop economic • Improve living quality • Sustainable economic development, environmental protection • Economic & social development • Dyke system planning • Presenting vulnerable area to relative sea level rise • Regularly dredging canal system • Strengthening dyke system • Production areas planning • Land use planning (2x) • Implementing land use planning • Reclaim land damaged by acid sulfate • Maintaining land for shrimp farming and rice production • Manage agricultural land and dyke system • Master planning • Land management • Information about climate change • Environmental protection • Planning for vegetable cultivation • Economic development • Planning for climate change adaption of commune to 2015 & 2020 • More investment for study on climate change adaptation • Formulate "new rural area" • Investment in infrastructure, canal, dyke system • Economic • Land use • Environment protection (2x) • Construct Thu Bo sluice • Reduce water level at high tide • Increase awareness of people to protect environment • Advocate people protect environment • Apply technology in production • Scattered tree planting plan • Keep the pool area to the planned production • Ensure production • Increase income to 50 mil. VND/year • Convert 1,600 ha from agriculture to industrial & resident area • Create more job • Ensure living condition • Agricultural production development • Aquatic organism protection • Managing the uncontrolled exploitation of groundwater, forest • Natural disaster mitigation • Better land use planning to adapt to climate change • Economic & social development • Allocate fund for local socio economic development • Apply advanced science & technology in agricultural production • Water resources protection • Planning for agricultural areas and breeding • Residential planning, Dyke system protection • Policies to support farmers in both production & selling goods • Water resource management plan • Formulate master plan to cope with climate change • Residential areas planning • Construct dyke system • High priority to dyke system development • High priority to environmental protection • Construction & management of hydraulic structure • Crop, livestock • Develop dragon fruit cultivation • Modernize agriculture sector • Expand the area for dragon fruit to 800ha in 2012 • Policies to support famers in both production & selling goods
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	<ul style="list-style-type: none"> • Dyke construction, reforestation • Strengthen dyke system • Dredging canals • Improve spatial planning • Subsidy to local people to build septic tank and biogas unit • Technical guideline on GAP cultivation • Ensure security & production • Ensuring implementation of social welfare policy • Minimize law violation • Capacity building • Industrial & services development • Aquaculture production • Industrial development • Research on the impacts of climate change to lower Vam Co basin • Socio-economic development • Increase awareness of people about climate change and its impacts
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People's Committee, staff Water Resources & Transportation, communes in all four districts

18 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> • Proposing water resource protection plan to PC (2x) • Water resources law • Infrastructure management • Understanding of water resources laws • Agricultural development, dyke system management • Mobilize people to mitigate climate change effects • Advocate people protect flooding • Environmental protection • Proposing plans to district level • Disseminate water & environment law • Propagandize and advocate local people for protecting trees and environmental landscape, and growing tree • Advocate people protect dyke system • Making sure houses do not encroach on canals system • Propaganda widely and do best to protect dykes. • Water resources • Collect information • Natural disaster mitigation • Advocate people to be prepared & alerted to protect against natural disasters
Benefit/ interest	<ul style="list-style-type: none"> • Enough fresh water for domestic use & irrigation, living quality is improved • Land use rights (2x) • Dyke system management • Strategies to mitigate climate change is needed • Benefit of aquaculture • Water drain fast • Human rights • Minimize damages • District & Province invest to construct dyke & sluice
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Develop rural roads and dredging secondary & tertiary canal system • Establish safety vegetable cooperative • Increase 25 billion VND/ha (in 2015-2020-2025) • Budget for scientific research and economic development • Dredging secondary & tertiary canal system (2x) • Appropriate strategic planning to deal with sea level rise • Construct 1.5km rural road • Increase agricultural area to 150 ha in 2020 • Extend road system • Planning for economic development • Develop shrimp farming • Foster natural disaster mitigation program • Environmental protection • Water resource • Manage GW abstraction • Strictly handling violation cases • Land use planning (industrial) to 2015 & 2020 • Develop industry & intensive shrimp farming • Reforestation (2x) • Reduce water level at high tide • Dyke system construction • Dyke system protection • Maintain dyke system, protect forest

	<ul style="list-style-type: none"> • Residential cluster development • Breeding and agricultural production • Changing crop from paddy rice to dragon fruit • More funding for research • Set up freely available database • Water resources & infrastructure planning • Hydraulic structures & water resources management • Increase awareness of people in climate change • construct dyke to prevent salinity intrusion/dredging canals/ increase crop yield
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People's Committee, staff Agriculture development, communes in districts Can Giuoc, Chau Tanh

2 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> • Water law
Benefit/ interest	<ul style="list-style-type: none"> • Land use right • Thanks to dyke system
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Planning to 2015-2020 • Industrial development • 100 ha of intensive shrimp farming • Manage dyke system • Water supply • Dredging canal system to maintain flow capacity

People's Committee, staff Agriculture, Construction, Environment, commune in district Tan Tru

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> • Water law Mobilize people to protect environment (not dispose of untreated waste into environment)
Benefit/ interest	<ul style="list-style-type: none"> • Reduce air pollution and protect environment
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Regional planning

People's Committee, staff Land & Construction, communes in district Chau Tanh

3 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> • Advocate people on climate change and its impacts
Benefit/ interest	<ul style="list-style-type: none"> • Land use right • Local economic development
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Land use planning to 2015 & target 2020 (2) • Shaping a new rural area 2010 - 2015 and target 2020 (2) • Produce high quality sticky rice (100ha) (2) • Strengthening inter-commune roads (2) • Become "new rural area" of Chau Thanh in 2015 (4) • Improve environmental management (4)

People's Committee, staff Economic & Planning, communes in districts Can Duoc, Can Giuoc, Tan Tru

People's Committee, staff Economic Affairs & Infrastructure, commune in district Chau Tanh

5 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> • Consulting to PC on construction dyke system • Forest protection • Land use management • Socio - economic development • Natural resources management • Flood protection • Environmental protection • Manage infrastructure & provide information
Benefit/ interest	<ul style="list-style-type: none"> • Ensure road safety • Better land use planning & management • Land use right • Propagandize widely to people • Dredging canal system • Ensure security and production
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Better land use planning • Maintaining land for shrimp farming and rice production • Improve planning • Improve project planning & management • 50% of area will be used for vegetable cultivation

	<ul style="list-style-type: none"> • Formulate strategies for climate change adaptation: Exp. Flooding & drought protection (Construct dyke & canals system) • Improve dyke management • Formulate strategies for intrusion prevention • Propaganda broadcasts on radio, televisions • Strengthen dyke system • Dredging canals
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People's Committee, staff Land Administration, commune in district Tan Tru

2 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> • Consult to PC on environmental protection measures • Understanding the effects of climate change on people's lives and livelihoods. • Provide information about climate change and its impacts
Benefit/ interest	<ul style="list-style-type: none"> • Minimize damages
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Better land use planning & water resources management • Protect environment: water use efficiency, better land use planning, forest resources protection

People's Committee, staff Land Survey, commune in district Can Giuoc

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> • Increase awareness of local people about climate change & impacts --> propose adaptation plan
Benefit/ interest	<ul style="list-style-type: none"> • Consult to PC to formulate adaptation plans in order to minimize damages
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Construct dyke system • Dredging canal to increase drainage capacity • Better manage hydraulic structures • Increase drainage capacity • Dyke system protection

People's Committee, staff Statistical Office, commune in district Can Giuoc

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> • Administration management
Benefit/ interest	<ul style="list-style-type: none"> • -
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Land use changing (from agriculture to industry & services) • Ensuring production in comply with environmental laws

People's Committee, other/unspecified staff, communes in district Chau Tanh

4 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> • Advocate people on climate change and its impacts • Minimize water pollution • Implementation of climate change information • Provide information about climate change & its impact • Provide fund for mitigation campaign • Mobilize human resources for relief/ mitigation campaign
Benefit/ interest	<ul style="list-style-type: none"> • Upgrade dyke system • Plant tree to protect against erosion • Ensure environment quality • Protect against climate change & support others • Protect dyke system • Ensure security
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> • Adaptation • Sustainable development of breeding sector, solid waste management • Efficient water use • Advocate people to protect environment • Not littering esp. to canals, rivers. • Solid waste treatment • Increase green areas • Protect people from natural disaster • Better management

Fatherland Front, commune in district Can Duoc

1 respondent

Function/task/	<ul style="list-style-type: none"> • Need dyke system
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responsibilities	
Benefit/ interest	<ul style="list-style-type: none"> Dredging canal system
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Dredging canal system, Treating solid waste Foster industry development

Socialist Party, commune in district Chau Tanh

1 respondent

Function/task/ responsibilities	<ul style="list-style-type: none"> -
Benefit/ interest	<ul style="list-style-type: none"> -
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Higher dykes, roads Water resources management

Farmers' Union, communes in districts Can Duoc, Chau Tanh

2 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Proposing authorities to treat solid waste The farmers are very concerned about members' understanding of the agricultural extension
Benefit/ interest	<ul style="list-style-type: none"> Preventing water pollution Provided training, guidelines in breeding
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Establish aquaculture group Aquaculture planning Encourage farmers to formulate production groups Hydraulic structures are incomplete

Farmers, communes in districts Can Duoc, Tan Tru

4 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Forest protection Cultivation, shrimp farming Local authorities Manage and protect environment Develop agriculture and industry
Benefit/ interest	<ul style="list-style-type: none"> Affected by climate change (2x) Maximum limitation of affections caused by climate change
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Policies to support for each regions Support (fund, resources) Waste treatment planning Dyke system planning Pollution prevention Intrusion prevention Natural disaster protection (flooding, droughts, tornado)

unspecified, communes in districts Can Duoc, Can Giuoc

5 respondents

Function/task/ responsibilities	<ul style="list-style-type: none"> Report to authorities about pollution circumstances and its damages Implementation of environmental law Economic & social development (at village level) Mobilized all local sources, evacuation and rescue
Benefit/ interest	<ul style="list-style-type: none"> Impact on public health and production Land use right More support from district & province in climate change adaptation Support from Province & District for socio-economic development Better land use management
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Increase shrimp farming area to 500ha in 2015 Lower water level (at high tide) Economic development Reforestation Strengthening dyke Protect from erosion High priority for natural resources protection & aquaculture production

Thanh Cánh Company, commune in district Tan Tru

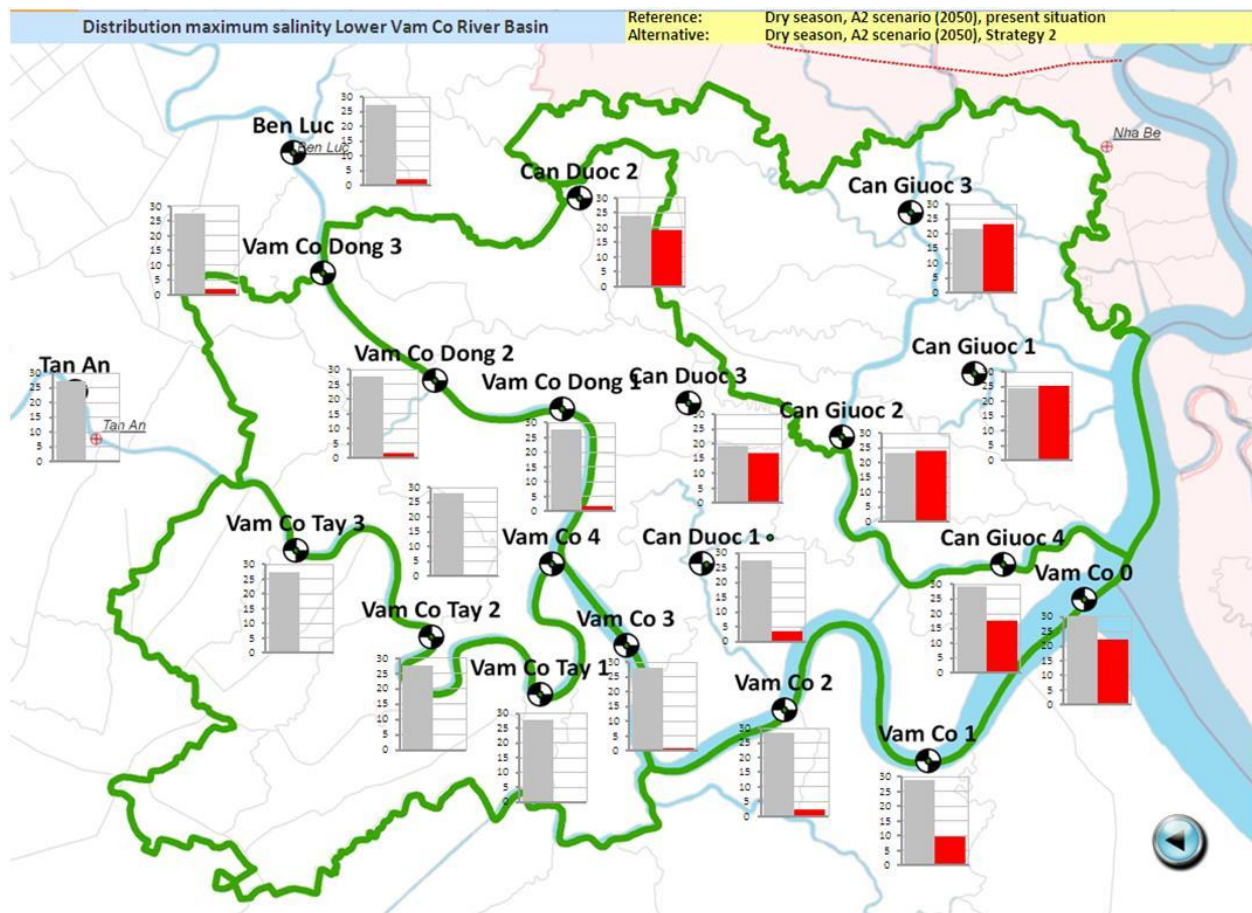
1 respondent

Function/task/	<ul style="list-style-type: none"> -
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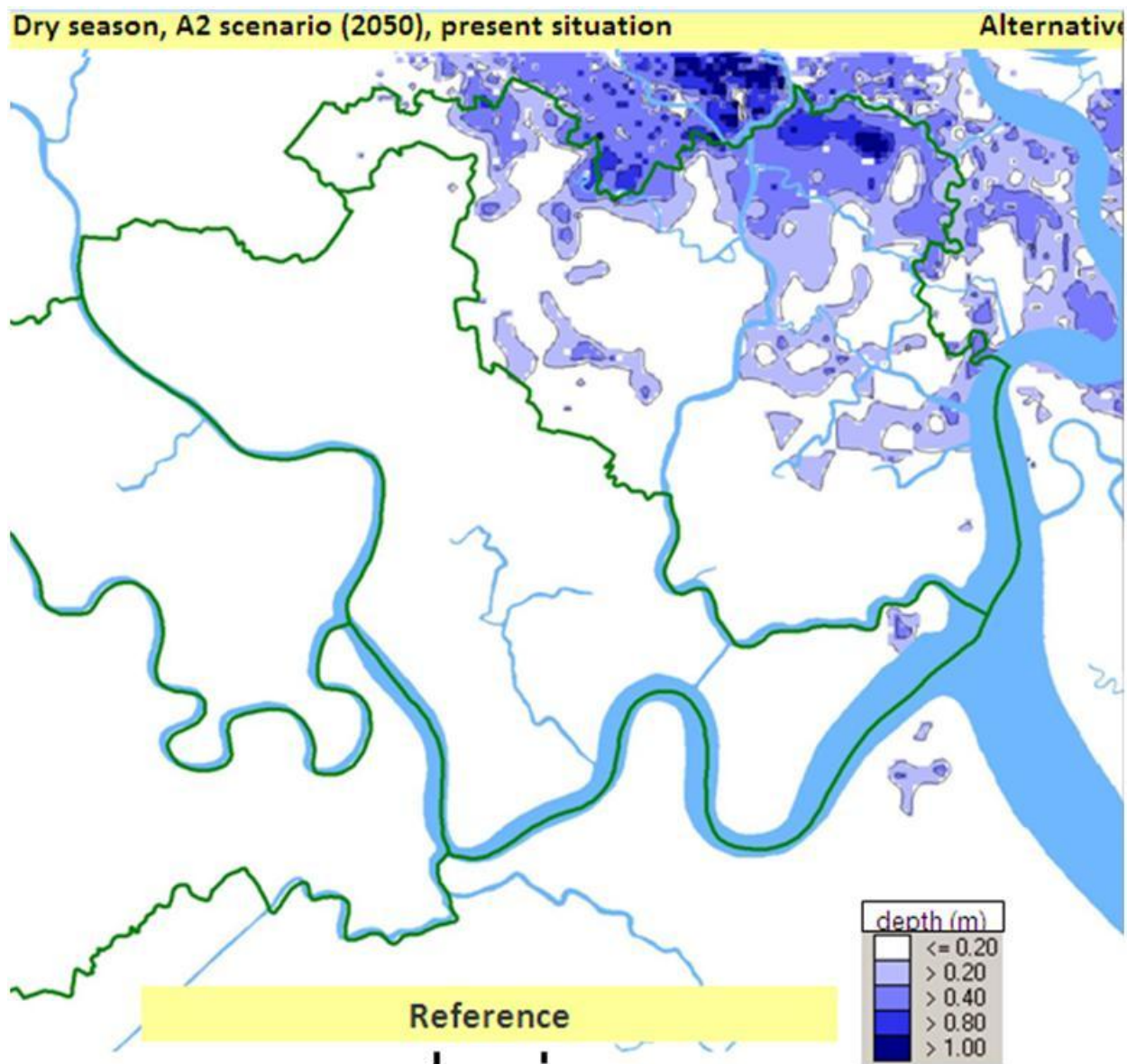
responsibilities	
Benefit/ interest	<ul style="list-style-type: none"> -
Planning goals/ policy objectives / wishes	<ul style="list-style-type: none"> Company: Aims to change technology, equipments Not use HCFC K I G I IS in PVC industry Use cylor peanteane (not affect ozone layer) Follow Montreal Protocol about climate change

Annex 2 – Decision Support Track: Dashboard outputs

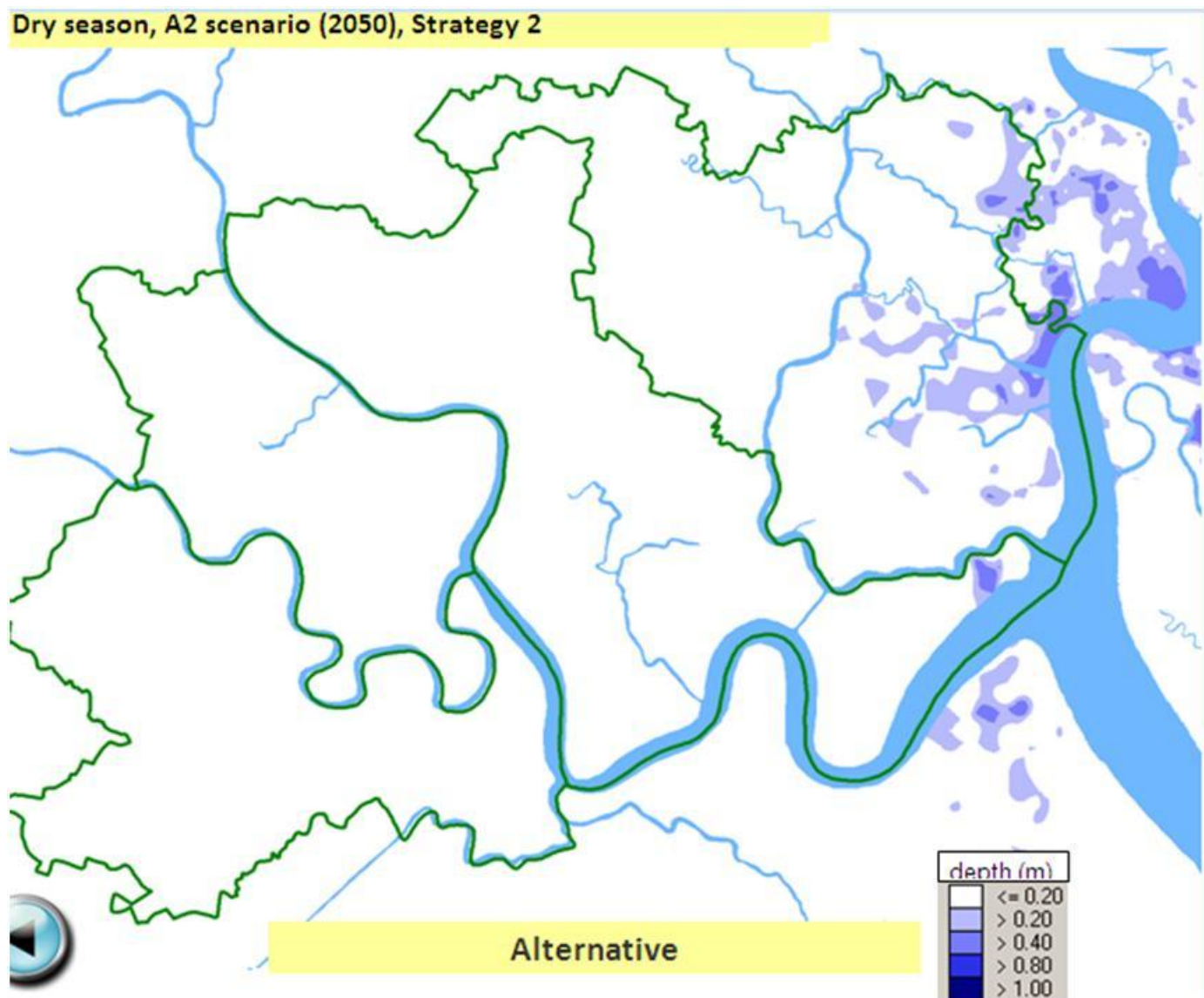
- Present situation = business as usual, dikes at +2m above mean sea level,
- Strategy 1 = Dikes at +2 m above mean sea level, and relocation of dikes to create room for the river, and the implementation of 12 sluices in the Vam Co and Saigon river systems
- Strategy 2 = Strategy 1, added with a barrier in the river
- Dikes at +3 meter = business as usual, but dike elevation is +3m above mean sea level



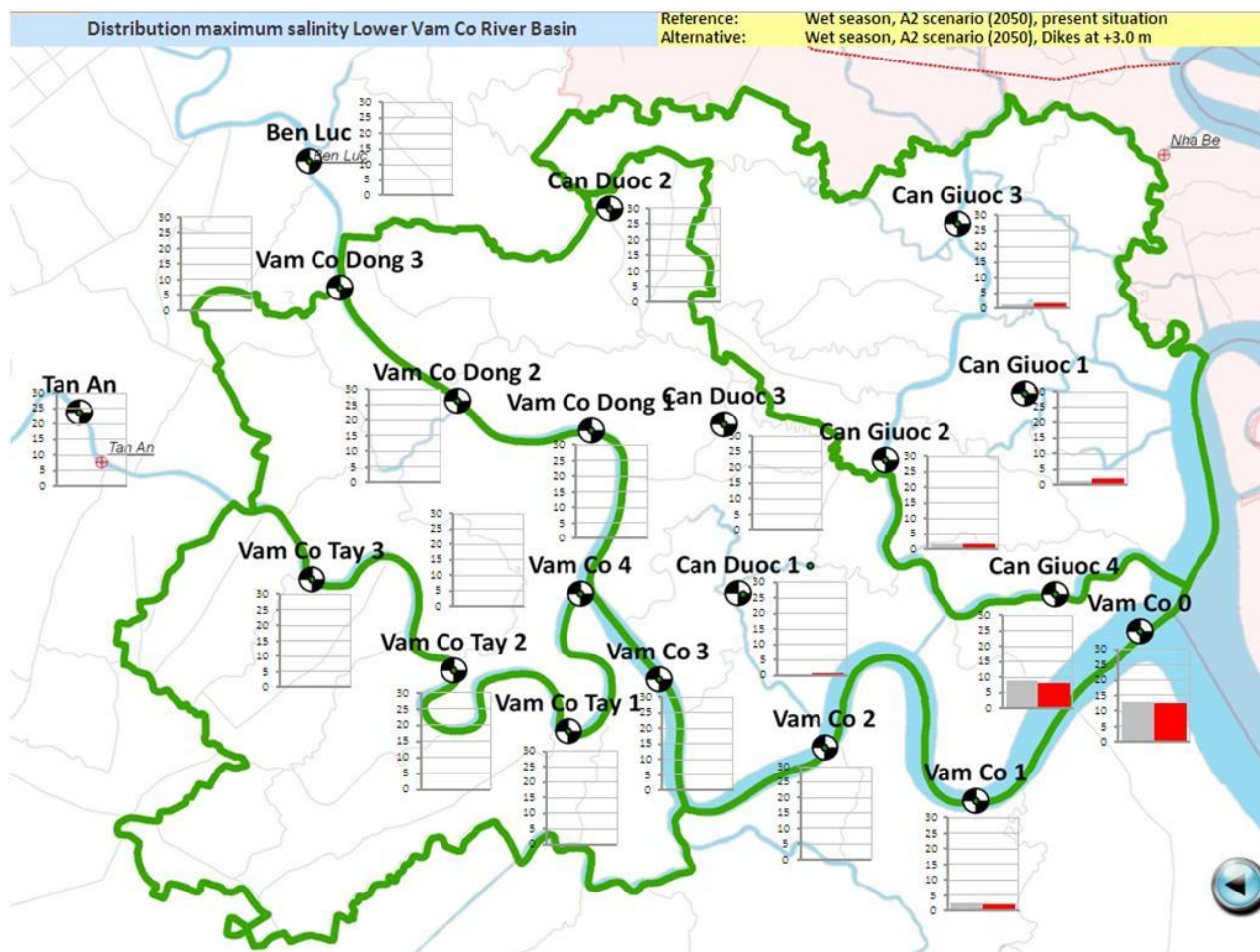
Distribution maximum salinity level (gr/l) lower Vam Co river basin



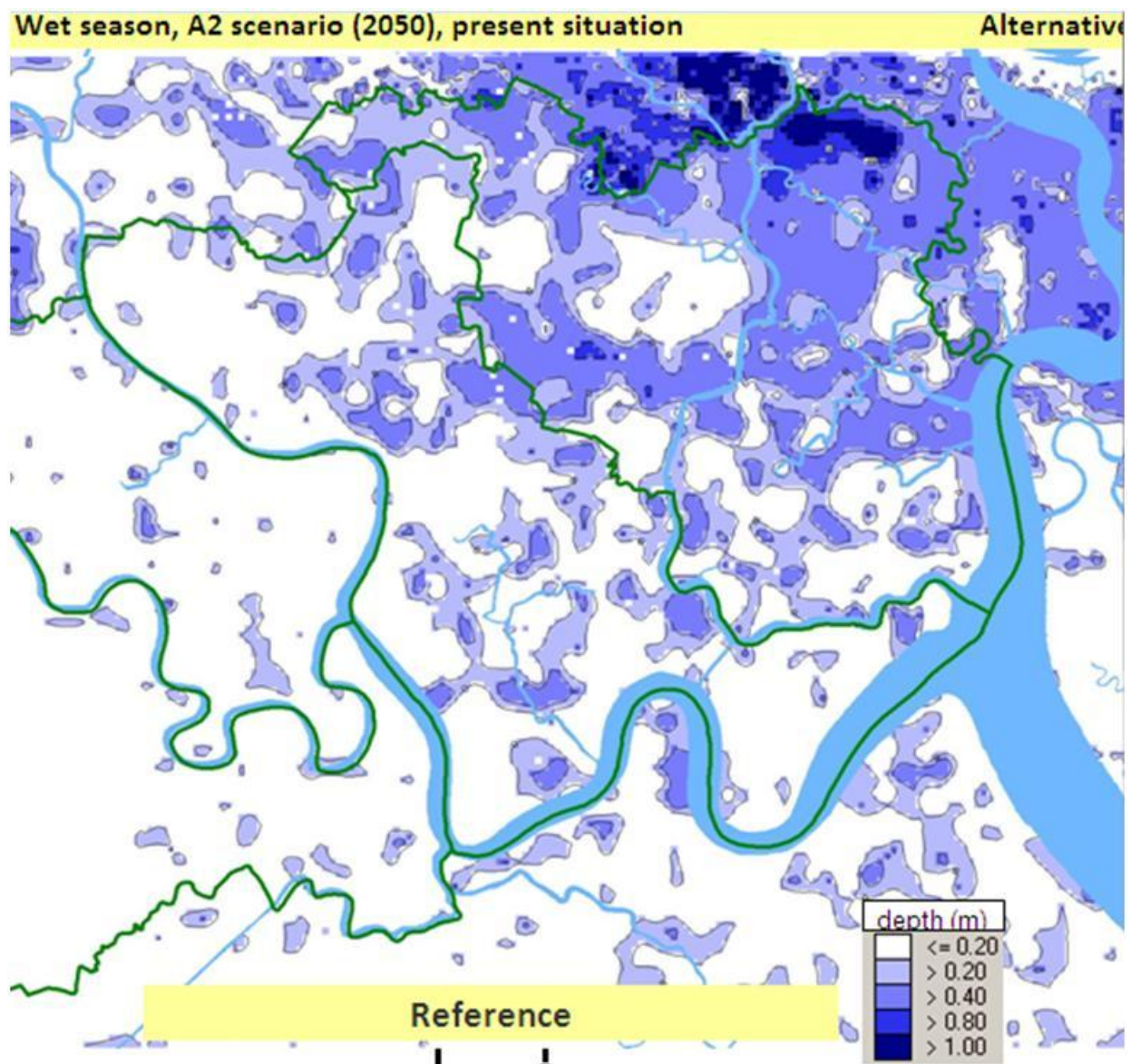
Distribution maximum inundation depth (m) lower Vam Co river basin



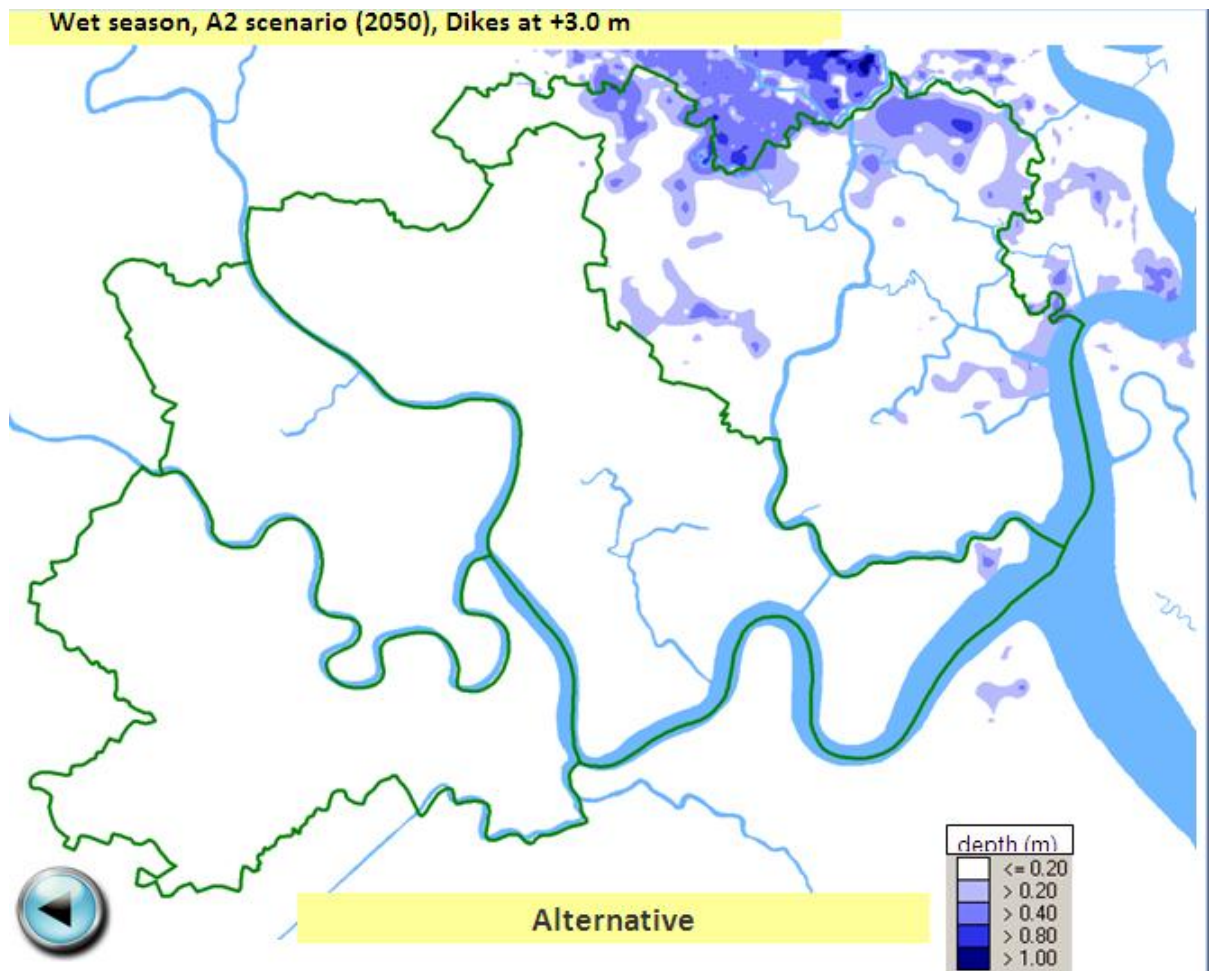
Distribution maximum inundation depth (m) lower Vam Co river basin



Distribution maximum salinity level (gr/l) lower Vam Co river basin



Distribution maximum inundation depth (m) lower Vam Co river basin



Distribution maximum inundation depth (m) lower Vam Co river basin

Annex 3 – Synthesized priority lists from four districts

Synthesized priority list from each district

Synthesis by Dr. P Huntjens, Water Partner Foundation / Translation by CESTE

Can Duoc District

1. Upgrade dike system/Building dyke system / solid dikes to prevent floods and saltwater intrusion

2. Forest protection and reforestation

- Planting trees/**reforestation**
- Educating people about the benefits of **forest**
- Good management of **forest** exploitation
- Support policy for **forest** protection officers
- Strengthening forest protection
- Riparian planting

3. Awareness raising & education

- Awareness raising/ Educating the people/Human consciousness/Propaganda for people

4. Strengthening state management

5. Water saving / demand side measures

- Building **freshwater supply** plants
- Saving water
- Planting **drought** tolerant cultivars
- Changing livestock
- Planning for rational **underground water**

6. Environmental pollution control

- Severely **sanctioned acts** of environmental pollution
- Check and handling of violations

7. Information supply and sharing

- Equipment for means of communications
- Support knowledge for user / Opening more communicate information, timely information.
- There are joint documents between branches
- Technical guidelines on aquaculture

8. Construction waste treatment plants

9. Wastewater treatment system

10. Completing interior canals system

11. Attracting clean industries

Other:

Planning for aquaculture sector
Promulgate appropriate policies to control
Clear decentralized administration
Appropriate population policy
Agricultural planning
Construction of reasonable building project
The rules of law of water resources
Strengthening to use water resources management
Population policy
Rational planning irrigation

<i>Can Giuoc District</i>

1. Forest protection and reforestation

- Reforestation
- Planting protective forests
- Strictly handling cases of deforestation
- There are specific plans for each area of forest exploitation

2. Building dikes sustainable

- Construction flood tide prevention
- Reinforce the dike
- Regular inspection
- Regularly checking regularly reinforced dam
- Reinforcing breakwater along the bank of a river
- Frequent supervision, improvement and maintenance

3. Raising people's awareness

4. Water supply and demand management

- Developing surface water treatment system
- Centralized water supply
- Saving water
- Mobilizing people conscious of saving water
- Good agricultural practices

5. Groundwater protection

- Saving underground water/ Limiting groundwater extraction license
- Increasing ground water use charges
- Strict management of underground water

6. Improve drainage system

- Maintenance of the drainage/ improving drainage system
- Drainage canal dredging
- Suitable planning for water drainage

7. Information supply and sharing

- Transferring science and technology to farmers
- Funding for science and technology
- Increasing share management information
- Need plan on solid waste treatment

8. Sanctioning

- Severely sanctioned acts of environmental pollution
- Strengthening the handling of violations
- Check and handling of violations

Other:

There is an annual funding plan

Planning a regional for aquaculture

Good management of irrigation systems/ Constructing irrigation projects

Solving employment

Changing jobs for people

People assigned to the planting and management forest

Transferring the structure of cultivated plants and domestic animals

Construction of water treatment plant/ The factories have wastewater treatment system

Construction of water treatment plants alum

Strengthening management test

New technology to save energy/ Limited use of fossil energy

Limiting population growth

Investment in construction of furnace waste treatment

Construction of waste treatment system standards

Completing legal system

Limiting waste in agriculture, forestry and fisheries

Mitigation of sand exploitation

Using additives for livestock breeding

Additional dyke and sewer systems

Distribution of effective use of funds

Ensure the planning

Strengthening prediction

Chau Thanh District

1. Forest protection, exploitation and reforestation

- State need to plan rational exploitation of forests
- Planting watershed and mangrove forest
- Forest management and protection
- Reforestation
- Strictly handle the indiscriminate exploitation of forests; promoting reforestation
- Expanding the area of mangrove forests along the rivers and the sea

2. Training, education and awareness raising

- Raising people's awareness
- Propagating people saving water
- Training in irrigation management
- Improve the training of specialized people
- Propagating to the people and raising awareness of environmental protection
- Improve the training of advanced professional
- Propaganda from the commune to village, farmer union, youth union, fatherland front, woman union
- Propagating media and politics

3. Building dikes

- Solidification infrastructure
- Building dams

4. Saving water/ prevent overexploitation

- Saving water
- Propagating people saving water
- The legislation on the exploitation and protection of water resources
- People is not indiscriminate exploitation of water resources

5. Information supply and sharing

- Building disaster warning system
- Transfer of scientific and technical knowledge
- Modernizing the hydrometeorology sector
- Strengthening the forecast, predictive

6. Completing irrigation system

7. Policy coordination and integration

- Coordination between central and local governments
- Strengthening state management
- Government policies should be optimal uniform

8. Sanctioning of violations

- Strictly handle violations
- Strengthening the handling of violations

Other:

Determination of salt water filtration system

Dredging of the canal system

Rational planning system

Production planning suited to each region

Limiting the discharge of industrial waste causes the greenhouse effect

Using advanced manufacturing technology

Conversion of plants and animals

Residential zoning

1. Upgrading and reinforcing dyke system

- Construction and completion of the dyke system
- Upgrading and reinforcing dykes of district: now inadequate for dealing with sea level rise
- Constructing new dikes
- Reinforced embankments either side, increasing the height of the dykes
- Upgrading works connected embankments, culverts dam, Vam Co Tay River from the town to the Duc Tan commune

2. Upgrade and improve irrigation and drainage system

- Planning the construction of inland canals
- Mechanized irrigation
- Concrete infield canals
- Building a complete system of sewers
- Develop appropriate channel system, the minimum distance between two channels is 600 meters and connecting link between the channel side
- Check the drain schedule: opening and closing
- There should be unified direction and open drain alarms widely to people actively exploit water resources
- Fixing broken drains
- Construction of new canals
- Regular dredging of canals to ensure the flow

3. Water supply and demand side measures

- Investing funds for new water supply
- Develop surface water treatment replacement for underground water exploitation to prevent groundwater
- Improving the efficiency of state management on-demand water usage
- It's necessary to set up the strategic planning of water storage systems
- Inspection of drilling wells indiscriminately
- Construction of freshwater supply from Chau Thanh district
- Improving the water supply system
- Promoting the rational use of groundwater
- State agencies strengthen inspection of the groundwater extraction
- There are plans for a reasonable exploitation of underground water
- Handling cases of illegal extraction of groundwater
- Limited small-scale water extraction, construction water plant concentration to water resources management

4. Awareness raising

- Raising activities propagation through television, radio
- Propagating people saving water
- Strengthening the propagation width and depth
- Open the club in the community
- Propagating to the people and raising awareness of environmental protection
- Propagating, awareness and education of the people in the water treatment

5. Reforestation

- There is currently no forest area in Tan Tru, but might be considered for establishing protective areas outside existing dyke rings
- Planting trees
- Propagating of forest protection
- Propaganda for people to understand the harmful effects of deforestation

6. Land use change: different crops, livestock, and transition to shrimp farming

- Mobilizing people to farm shrimps in designated areas
- Transferring the structure of cultivated plants and domestic animals
- Changing plants and animals to suit the climate
- Agricultural production in the direction of biosecurity
- Applying science and technology into production
- Planning for specific aquaculture

7. Water treatment

- Need a wastewater treatment system
- The Authorities should inspect the water treatment before being discharged into the environment
- Propagating, awareness and education of the people in the water treatment
- Strictly handle enterprises discharging untreated water to the outside
- Construction of wastewater treatment systems

8. Waste treatment

- Constructing the district waste treatment
- Develop environmental standards technology
- Treating waste in breeding

9. Financial support, funding and investment

- Calling for investment
- Financial support

10. Retention areas

- Constructing sub-region in areas with low topography of the district to avoid rising sea levels and floods every year

Other:

Strictly handle violations of environmental protection in industry (see also 7 and 8)

Promulgating legal documents guidance to exploit resources on each specific area such as land, water resources

Constructing industries near groundwater

Training construction management team with appropriate qualifications

Setting up the centralized residential areas

Building bridges over water from Vam Co River to Tien Giang

Annex 4 – Intervention sheets

Overview of interventions sheets

Intervention	Type of intervention
1a. Upgrading existing dyke system	Physical intervention
1b. Rainwater harvesting	Physical intervention
1c. Surface water extraction	Feasibility study
1d. Development of sustainable groundwater management policy	Governance intervention
1e. Water transfers within pilot area	Feasibility study
1f. Desalination	Feasibility study
1g. Point-of-use conservation	Physical intervention
1h. Water saving technologies in irrigation	Physical intervention
1i. Land use change from agriculture to aquaculture	Governance intervention
1j. Water recycling and re-use	Physical intervention
1k. Dyke replacements	Feasibility study
1l. Increasing retention capacity	Feasibility study
1m. Wetlands development and/or restoration	Governance intervention
1n. Economic and financial measures	Governance intervention
1o. Communication and education measures	Governance intervention
1p. Regulatory measures	Governance intervention
2a. Construction of tidal barrier	Feasibility study
2b. Construction of 12 sluices	Physical intervention
3a. Import of fresh water from upstream groundwater	Feasibility study
3b. Import of fresh water from upstream surface water	Feasibility study
3c. Import of fresh water from adjacent river basins	Feasibility study

Intervention Sheet 1a - Upgrading existing dyke system

Name: Upgrading existing dyke system	Location: 4 districts	Type of intervention: Physical measure																								
Objectives: Upgrading existing dike system: <ul style="list-style-type: none"> – repair weak spots – At some places: Increase dike level with 0.5 m – At some place: Increase dike level with 1.0 m Construction of dike rings: <ul style="list-style-type: none"> – Dike rings may comprise gates – Gates can be closed in case of flood → closed ring – Safety level depends on maintenance, type of construction, interface between gates and dike itself 																										
Intervention: <u>Can Giuoc:</u> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 30%;">- Ong Hieu dyke L : 14 km/ H: 2.5/ W: 3.0</td> <td style="width: 40%;">upgrade: H = 3.0 / W = 6.0</td> <td style="width: 30%;">140 billion VND</td> </tr> <tr> <td>- Truong Long dyke L: 8.5 km/ H: 2.5, W: 3.0</td> <td>upgrade: H = 3.0 / W = 6.0</td> <td>85 billion VND</td> </tr> <tr> <td>Chau Thanh District: Vam Co dyke L: 35 km, W = 3.0, H = 2.5</td> <td>- construct new: 5.0 km & upgrade: 30 km (W: 4.5 / H : 3.0)</td> <td>- For upgrading dyke system: 30 billion VND - For constructing new dyke: 10billion VND/5km</td> </tr> </table> <u>Can Duoc:</u> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 30%;">- Vam Co dyke (along Vam Co river)</td> <td style="width: 40%;">- Existing height: +2m => increase to 2.5m - Existing width: + 3m=> keep the same</td> <td style="width: 30%;">15 billion VND for 15km</td> </tr> <tr> <td>- Dyke along Vam Co Dong</td> <td>L: 25 km</td> <td>25 billion VND</td> </tr> <tr> <td>- Rach Cat Dyke</td> <td>- L: 8km - Build new dyke : L : 5km</td> <td>8 billion VND 10 billion VND</td> </tr> </table> <u>Chau Thanh:</u> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 30%;">Vam Co dyke L: 35 km, W = 3.0, H = 2.5</td> <td style="width: 40%;">- construct new: 5.0 km & upgrade: 30 km (W: 4.5 / H : 3.0)</td> <td style="width: 30%;">- For upgrading dyke system: 30 billion VND - For constructing new dyke :10billion VND/5km</td> </tr> </table> <u>Tan Tru:</u> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 30%;">Vam Co dyke H= 2.5m, W= 3-4m, L=35km</td> <td style="width: 40%;">- Dykes to be constructed in Tan Tru: 11 km Dykes to be upgraded Tan Tru: 24 km</td> <td style="width: 30%;">For constructing new: 22 Billion VND For upgrading: 46 Billion VND</td> </tr> </table>			- Ong Hieu dyke L : 14 km/ H: 2.5/ W: 3.0	upgrade: H = 3.0 / W = 6.0	140 billion VND	- Truong Long dyke L: 8.5 km/ H: 2.5, W: 3.0	upgrade: H = 3.0 / W = 6.0	85 billion VND	Chau Thanh District: Vam Co dyke L: 35 km, W = 3.0, H = 2.5	- construct new: 5.0 km & upgrade: 30 km (W: 4.5 / H : 3.0)	- For upgrading dyke system: 30 billion VND - For constructing new dyke: 10billion VND/5km	- Vam Co dyke (along Vam Co river)	- Existing height: +2m => increase to 2.5m - Existing width: + 3m=> keep the same	15 billion VND for 15km	- Dyke along Vam Co Dong	L: 25 km	25 billion VND	- Rach Cat Dyke	- L: 8km - Build new dyke : L : 5km	8 billion VND 10 billion VND	Vam Co dyke L: 35 km, W = 3.0, H = 2.5	- construct new: 5.0 km & upgrade: 30 km (W: 4.5 / H : 3.0)	- For upgrading dyke system: 30 billion VND - For constructing new dyke :10billion VND/5km	Vam Co dyke H= 2.5m, W= 3-4m, L=35km	- Dykes to be constructed in Tan Tru: 11 km Dykes to be upgraded Tan Tru: 24 km	For constructing new: 22 Billion VND For upgrading: 46 Billion VND
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Results / Impacts:																										


Substantial flood damage reduction: 50 Billion VND for the pilot area (rough estimation) in case of A2 scenario 2050 (based on the SOBEK damage assessment in this project)	
Responsibilities: Department of Agriculture and Rural Development (DARD) People's committee of district Investor: Provincial People's Committee of Long An	
Investment Cost: Can Giuoc District: 265 Billion VND Can Duoc District: 58 Billion VND Chau Thanh District: 40 Billion VND Tan Tru District: 86 Billion VND Note: These are very rough estimations, detailed study is required. Total for pilot area: 431 Billion VND	Investment period: 3 years

Intervention Sheet 1b - Rainwater harvesting

Name: Pilot Project Rainwater Harvesting	Location: 4 districts	Type of intervention: Physical intervention
Objectives: Increasing supply of fresh water by harvesting rainwater at households, irrigations farms and industries, including appropriate water harvesting technologies.		
Intervention: <i>Storage</i> Rainwater can be stored in different ways. On a small scale, you can think of terracotta jars or cement-brick tanks. On a large scale, it can be stored in containers or large-scale subterranean cement-brick tanks. This can be applied at resident areas (include collection system & storage early in the planning & design phase).		
<div style="display: flex; justify-content: space-around;">   </div> <p style="text-align: center;"><i>Usage</i></p> Harvested rainwater can be used in agriculture, industry or at households. If treated, rainwater can be used for different household purposes, including drinking and cooking. Even untreated, rainwater can be used for many purposes: to flush toilet, to wash laundry in washing machine, to water the garden and vegetables and to wash car, motorbike, etc. This accounts for 60% to 80% of total water		


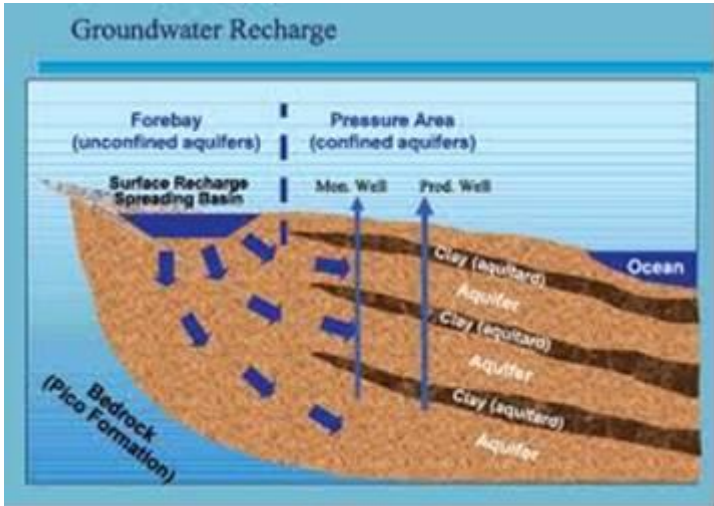
usage in the average household.	
<p><i>Treatment</i></p> <p>If used for drinking water, the water should be collected and handled under sanitary conditions. If this is not the case, there are a number of relatively simple treatment methods, including boiling, porous filter equipment, or one can apply UV sterilization.</p>	
<p>Results / Impacts: Survey data are required</p> <p><i>Agriculture</i></p> <p>X liter of water stored, suitable for the irrigation of X hectares of farm land. Survey data are required</p> <p><i>Industry</i></p> <p>X liter of water stored. Survey data are required</p> <p><i>Households</i></p> <p>X households with water storage capabilities. X liter of water stored per household. Survey data are required</p> <p><i>Advantages</i></p> <p>Very cheap water source, covers a wide area, easily available in the rainy season, easy to collect , accessible for many people, especially the poor</p> <p><i>Constraints</i></p> <p>Unreliability in the dry season, low affordability for buying the containers, it takes time to treat, it can result in different types of pollution, acidity, air-dust and other pollutants deposited on house-roofs.</p>	
<p>Responsibilities:</p> <p>DOST, Institutes, Universities</p> <p>People's Committee of district</p> <p>Communication agencies</p> <p>Government agencies at District & Provincial level)</p>	
<p>Investment Cost:</p> <p>Cost of feasibility study on appropriate water harvesting technologies for different user groups = 1 research project = 1 Billion VND (2 years project)</p> <p>Cost of installing rainwater harvesting system (including small-scale water tank) = tank of 10m³ = 30 million VND /household</p> <p>Additionally, it requires design and construction of collection & treatment system to ensure water quality for domestic use = 20 million VND/household</p> <p>Pilot project in one commune (100 households x 50 Million VND/household) = 5 Billion VND</p> <p>Note: Investment might take place via PPP-construct, meaning that part of the costs will be covered by households themselves, while feasibility study, awareness campaign, information supply (e.g. design and construction of collection & treatment system) will be covered by public authorities</p> <p>Total for pilot area: 6 Billion VND</p>	<p>Investment period:</p> <p>2 years</p>

Intervention Sheet 1c – Optimizing surface water extraction

Name: Research Project Surface water extraction	Location: 4 districts	Type of intervention: Feasibility study
Objectives: <p>Optimize and improve efficiency of fresh water supply by extracting surface water from different natural sources like streams, rivers, lakes and wetlands, including measures such as artificial reservoirs (i.e. water lagoons).</p> <p>The fresh water can be used for drinking water, irrigation and industries</p>		
Intervention: <p><i>Collection</i></p> <p>Surface water can be collected in different ways. On a small scale, you can think of cement or brick containers near small streams or lakes. On a large scale, water from rivers, lakes and wetlands can be stored in water lagoons. These lagoons are artificial hydraulic structures located near the source of surface water and are totally or partially closed by a retention dyke. This differentiates these lagoons from dams, which can be very harmful for the ecosystem and hydrology.</p>  <p><i>Usage</i></p> <p>Fresh water collected from surface water can be used for agriculture, industry or for households. If collected on a large scale, water can be stored in water supply plants before being distributed. For most agricultural and industrial purposes, the water can be used untreated. Even for households, grey water can be used untreated (see intervention sheet 1b). If used for drinking water or hygienic purposes, household water should be treated first before being used.</p> <p><i>Treatment</i></p> <p>Generally, surface water cannot be consumed without treatment. The pollution can be for example suspended solids, bacterial contamination, salinity or toxic chemicals. Surface water can be treated in different ways, like with aluminium sulphate or chloric disinfectant, or through slow sand infiltration. Additionally, treatment measures for pesticide and high concentration of $Al_2(SO_4)_3$ and $Fe_2(SO_4)_3$ in surface water are required.</p> <p>On a small scale, boiling, porous filter equipment, or UV sterilization can make the water suitable for drinking.</p> <p>Surface water (from rivers, lakes, etc.)</p> <ul style="list-style-type: none"> Advantages: 		

<ul style="list-style-type: none"> – Cheap water source – Easily available, except in areas confronted with saltwater intrusion, acid sulphate or areas with high concentration of pesticide <ul style="list-style-type: none"> • Constraints: <ul style="list-style-type: none"> – Time consuming to collect – High pollution in the dry season – High cost to remove pollutants – Only full removal of bacterial contamination with advanced treatment techniques 	
<p>Results / Impacts:</p> <p>Detailed study required to specify X (see below)</p> <p><i>Agriculture</i></p> <p>X m3 of water extracted from source Y and/or Z, suitable for the irrigation of X hectares of farm land.</p> <p><i>Industry</i></p> <p>X m3 of water stored from source Y and/or Z.</p> <p><i>Households</i></p> <p>X m3 of water stored from source Y and/or Z. X liter of water available per household.</p> <p><i>Advantages</i></p> <p>Very cheap water source, easily and widely available in many lowland areas.</p> <p><i>Constraints</i></p> <p>Time consuming to collect, high level of pollution in dry season, high costs to remove pollutants, full removal of bacterial contamination can only be achieved with advanced treatment techniques.</p>	
<p>Responsibilities:</p> <p>Department of Science and Technology (DOST)</p> <p>Department of Natural Resources and Environment (DONRE)</p> <p>Department of Agriculture and Rural Development (DARD)</p> <p>Department of Industry and Trade (DIT)</p>	
<p>Investment Cost:</p> <p>Cost of feasibility study to optimize freshwater supply = one research project (Ministerial or provincial project) = approx. 2.6 Billion VND</p>	<p>Investment period:</p> <p>2 years</p>

Intervention Sheet 1d – Development of sustainable groundwater management policy

Name: Development of sustainable groundwater management policy	Location: 4 districts	Type of intervention: Governance intervention
Objectives: Increasing and sustaining the supply of fresh water of high quality extracted from the groundwater, including recharge areas and measures to avoid overexploitation and pollution.		
Intervention: <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><i>Collection</i></p> <p>In the Lower Vam Co basin, only a fraction of clean water comes from groundwater. Currently, groundwater is mostly extracted from shallow tube-wells at the household level and ground water plants that are installed by the government via a rural development program. On a large scale, the best method to supply groundwater is through groundwater supply units (GSUs), which extract water from a geological level where it is less polluted.</p> </div> <div style="width: 45%; text-align: center;">  </div> </div> <p><i>Usage</i></p> <p>Extracted groundwater can be used in agriculture, industry or at households. In some cases, depending on the quality, it has to be treated if used for drinking or hygienic purposes. Extracted groundwater supply through GSU's encourages water conservation, because users have to pay a fee for the water they use.</p> <p><i>Treatment</i></p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">  </div> <div style="width: 45%;"> <p>for private tube-wells are sand and/or carbonate filtration and for GSUs filtration, aeration by water diffusing trays and other advanced treatment techniques.</p> </div> </div> <p><i>Regulations</i></p> <p>If groundwater extraction will be increased, regulations have to be implemented to sustain the supply. An overview of the availability can be created by conducting an integrated groundwater resources assessment study, including the identification of opportunities for recharge areas and measures to avoid</p>		

overexploitation and pollution. Based on this study, groundwater extraction regulations can be developed, including monitoring, pricing and enforcement.	
Results / Impacts: <i>Agriculture</i> X m3 of water collected, suitable for the irrigation of X hectares of farm land. <i>Industry</i> X m3 of water collected. <i>Households</i> X m3 of water available for usage in households. <i>Advantages</i> Groundwater is cleaner than surface water, groundwater systems are more naturally buffered against seasonal and inter-annual variability in rainfall and changes in surface temperatures, suitable for remote areas, reasonable costs, usage can be controlled by market prices. <i>Constraints</i> Not accessible for the poorest because water is priced, if over-exploited, this will result in falling water tables (resulting in land subsidence and salinity intrusion), abandoned wells can pollute the groundwater,	
Responsibilities: Department of Natural Resources and Environment (DONRE) PC of Can Duoc, Can Giuoc, Chau Thanh, Tan Tru	
Investment Cost: Investigating the groundwater potential and availability in Long An Province = research project = 2 Billion VND Cost of developing a sustainable groundwater management policy > 1 pilot project in one commune = 1 Billion VND	Investment period: 2 years

Intervention Sheet 1e – Water transfers within pilot area

Name: Water transfers within pilot area	Location: 4 districts	Type of intervention: Feasibility study
Objectives: Optimizing usage of available water by exchanging water volumes within and between the 4 districts of the pilot area.		
Intervention: This intervention allows to transferring excess water from one district to districts that face water shortages. It requires careful evaluation of annual water availabilities and water demands for the different districts and optimization of the required conveyance and storage facilities. <i>Monitoring of supply and demand</i> Optimizing usage of available water starts with sound monitoring of supply and demand of water in all districts. One has to register the actual and potential water supply of all different freshwater sources, like rainwater, surface water and groundwater. Furthermore, one should register the actual		

and future demand of water. This can be divided into agricultural, industrial and household demand. Also the demanded quality of the water has to be registered (saline or freshwater, drinking water or no drinking water quality, quality for rice cultivation and aquaculture).

Regulating water transfers

Once the demand and supply is known for the whole region, agreements can be made about the transfer of water within and between the districts. Within these agreements it is important to consider whether the amounts of transferred water are fixed or flexible, in order to avoid ambiguity during dry periods. Furthermore, the agreements have to discuss whether the price of the water is fixed or flexible. Over time, the agreements can be evaluated and improved.

Enforcing regulations

The institutions that are concerned with water issues have to be equipped to enforce the agreements about water transfers. Only enforcement can guarantee sound compliance with the agreements in times of financial pressure or decreasing supplies.

Results / Impacts:

If based on decent monitoring of supply and demand, agreements about water transfers certainly lead to better distribution of the available water over the pilot area.

The exact amount of extra water available is impossible to predict without further assessments. Therefore, a feasibility study is needed to consider whether water transfers are a useful intervention in this area.

Advantages

All districts can profit from a surplus of water in a certain area, areas with water surplus can earn extra money by selling their surplus, water transfers can be controlled by agreements about pricing.

Constraints

Periods of decreased water supply can lead to frictions between districts, composition and enforcement of regulations will be complex and time consuming, infrastructure is needed to transport water from one area to another.

Responsibilities:

People's Committee of Long An province
Department of Natural Resources and Environment (DONRE)
Department of Agriculture and Rural Development (DARD)
Department of Industry and Trade (DIT)
PC of Can Duoc, Can Giuoc, Chau Thanh, Tan Tru

Investment Cost:

Cost of Monitoring and Evaluation (M&E) programme and water supply and demand study: 1 project = 2 Billion VND
Cost of feasibility study, including design of pilot water conveyance system 2 Billion VND (at provincial level)

Investment period:


2 years

Intervention Sheet 1f - Desalination

Name: Desalination	Location: 4 districts	Type of intervention: Feasibility study
Objectives: Increasing supply of fresh water by extracting salt from brackish water.		
Intervention: The project includes investigations and construction of a pilot desalination plant in the study area to further investigate the feasibility of expanding desalination at a larger scale in the project area, specifically in the brackish coastal zones.		
<i>Treatment</i> There are various desalination methods, which are mostly only cost-effective when applied on a large scale. The best method and associated costs depend on the demanded quality of the fresh water. Traditional methods are vacuum distillation, which is used for 85% of the world wide production, and the less energy demanding process of reverse osmosis. Currently, new methods are developed to further drop the production costs, like membrane filtration using solar, geothermal or traditional energy sources.		
<i>Usage</i> Since desalination is costly and executed on a large scale, obvious purposes are industry and urban water supply. In most cases desalinated water is too expensive to be used for agricultural purposes.		
Results / Impacts:		
<i>Supply</i> The amount of water that can be desalinated is almost unlimited. As long as the process of desalination is cost-effective, this is an appropriate intervention. Whether the process of desalination is cost-effective for the different purposes of water usage, has to be investigated in a feasibility study.		
<i>Advantages</i> Not dependant on rainfall, almost unlimited availability, particularly applicable in lowland areas adjacent to the sea, degree of salt extraction can be adjusted to purpose, intervention can be executed by private parties.		
<i>Constraints</i> Desalination relies on expensive facilities, the process uses large amounts of energy, it produces brine (high concentration salt water) which needs to be discharged safely.		
Response from DONRE, Can Duoc District: Desalinating water for water supply purpose is an infeasible measure because investment cost of desalination system is very high. Besides, at local level, it is difficult to operate the system due to lack of experience. In general, benefit from this intervention is very small compared to investment cost.		

Responsibilities: Department of Science and Technology (DOST) Department of Industry and Trade (DIT)	
Investment Cost: <ul style="list-style-type: none"> • Cost of feasibility study= 2 Billion VND • Construction of Pilot Desalination Plant of 75 m3/day= 10 Billion VND • Operation of Pilot Plant during pilot period = 1 Billion VND / yr 	Investment period: 1 yr 1 yr 3 yrs

Intervention Sheet 1g – Public Awareness Raising on Water Saving

Name: Public Awareness – Water Saving	Location: 4 districts	Type of intervention: Physical intervention
Objectives: To increase awareness of the public on the possibilities for saving water at individual water usage points		
Intervention: <i>Fields of application</i> Water conservation theoretically can be applied on every water usage point, whether in agriculture (referred to in intervention 1h), industry or on household level, on a small scale and on a large scale and as stand-alone application or in an integrated water management approach.		
<i>Methods of application</i> Households have a lot of water usage points. Therefore, point-of-use conservation can be applied in many ways. One can think of dual flush devices, ultra low flush devices or even waterless applications for toilets and urinals, displacement bags, low flow showers or taps, shut-off valves or valve retrofit, leak detection and repair for the entire water infrastructure. For industry purposes, recirculation systems, cooling tower conductivity controllers and water saving steam sterilisers are among the mostly used application methods.		
Results / Impacts: <i>Industry</i> Combination of different point-of-use conservation methods can save up to X percent of water usage in industry. This means a saving of X liter water per X amount of time.		
<i>Households</i> Combination of different point-of-use conservation methods can save up to X percent of water usage in industry. This means a saving of X liter water per X amount of time.		
<i>Advantages</i> Easily applicable, sustainable intervention, users have an economic incentive to apply measures,		

relatively inexpensive.	
<p><i>Constraints</i></p> <p>Behavioral change is a crucial success factor, stimulates expansion of water demanding activities, and leads to decrease in sanitation and hygiene if applied incorrectly.</p>	
<p>Responsibilities:</p> <p>Department of Science and Technology (DOST)</p> <p>PC of Can Duoc, Can Giuoc, Chau Thanh, Tan Tru</p> <p>News and Television</p> <p>Women's union, Youth union</p>	
<p>Investment costs for public authorities</p> <p>Program for raising awareness/Information Centre = 1 Billion VND</p> <p>Seminar at District level = 500.000 VND</p> <p>Brochures + documentation = 200.000 VND</p> <p>Total cost for public authorities: Approx. 1.7 Billion VND</p>	<p>Investment period:</p> <p>1 years</p>

Intervention Sheet 1h – Water saving technologies in irrigation (pilot project)

Name: Water saving technologies in irrigation	Location: 4 districts	Type of intervention: Physical intervention
<p>Objectives:</p> <p>Reducing the usage of water by applying water saving technologies in the irrigation sector.</p>		
<p>Intervention:</p> <p><i>Fields of application</i></p> <p>Within the agricultural sector, the amount of demanded water for irrigation can be reduced in different ways. For example, drip irrigation technologies can be applied, cropping patterns can be optimized, or salt resistant crops can be introduced for the application of brackish water resources.</p> <p><i>Methods of application</i></p> <p>Selecting applicable crops means replacing water dependant crops for drought tolerant or salt resistant crops, or adjusting crop cultivation to seasonal water availability. Examples of point-of-use conservation in agriculture are flood irrigation, overhead irrigation, drip irrigation, irrigation timers, soil moisture sensors, leak detection and evaporation pans. Effectiveness of irrigation systems can be increased by construction of line canals, piping systems or flow-return systems.</p>		
<p>Results / Impacts:</p> <p><i>Appropriate crop selection</i></p> <p>Appropriate crop selection can save up to X percent of water usage. This means a saving of X liter water per X amount of time.</p>		

<p><i>Point-of-use conservation</i></p> <p>Combination of different point-of-use conservation methods can save up to X percent of water usage in agriculture. This means a saving of X liter water per X amount of time.</p> <p><i>Optimizing effectiveness of irrigation systems</i></p> <p>Improvement of irrigation systems can save up to X percent of water usage in agriculture. This means a saving of X liter water per X amount of time.</p> <p><i>Advantages</i></p> <p>Easily applicable, sustainable intervention, farmers have an economic incentive to apply measures, agriculture more in balance with nature.</p> <p><i>Constraints</i></p> <p>Change in crop cultivation will encounter resistance; point-of-use conservation leads to decrease in crop quality if applied incorrectly.</p>	
<p>Responsibilities:</p> <p>Department of Agriculture and Rural Development (DARD)</p> <p>Department of Natural Resources and Environment (DONRE)</p> <p>Department of Science and Technology (DOST)</p>	
<p>Investment Cost:</p> <p>Selection of 100 ha pilot area and studying options for reducing irrigation water demands: 1 Billion VND</p> <p>80-120 million VND / ha for implementing water saving technologies in pilot area: total 10 Billion VND</p> <p>Monitoring and Evaluation of water savings, costs, benefits and environmental impacts = 1 Billion VND</p> <p>Total investment for pilot = 12 Billion VND</p>	<p>Investment period:</p> <p>4 years</p>

Intervention Sheet 1i – Land use change from agriculture to aquaculture

Name: Land use change from agriculture to aquaculture	Location: Coastal Region	Type of intervention: Feasibility study
<p>Objectives:</p> <p>The objective of this intervention is to study options to overcome structural salinity problems, in particular in the south-eastern parts of the four Districts in the pilot area, with an estimated surface area of 12,700 ha. Currently these agricultural areas suffer from severe salinity problems with regard to their surface water supply. The purpose of this intervention is to study the feasibility of land use change from dry land agriculture or rice cultivation into aquaculture</p>		
<p>Intervention:</p> <p>Conduct a feasibility study on land use change from dry land agriculture or rice cultivation into aquaculture. The following key research questions are central:</p> <ol style="list-style-type: none"> 1) To assess the current water use of different agricultural functions in the areas suffering from severe salinity problems; 2) To study current and future water availability for different agricultural user functions (quantity and quality), including for aquaculture; 		

- 3) To compare current user functions and future options/ambitions for user functions, taking into account socio-economic development and climatic changes.
- 4) Study options for changing current agriculture into aquaculture, in terms of total surface area to be allocated for aquaculture and their locations, based on the results of steps 1, 2 and 3. It should be noted that eventually land use changes need to be part of an integrated master plan for water resources management in the whole area.

Background rationale: Changing agricultural lands into aquaculture ponds requires a drastic change of land use and water management, including excavation of soil. The aim is to create aquaculture ponds including fish, molluscs, crustaceans and aquatic plants, where farmers manage the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc.

Aquaculture may be introduced in the following areas (based on results from District meetings):

Can Giouc District:

Name of area: Xa Long Phung, Xa Phuoc Vinh Tay, Xa Phuoc Lay. Total area by approximation: **5 x 6 km = 3,000 ha.**

Can Duoc District:

Name of area: Xa Tan Chanh. Total area by approximation: **5 x 4 km = 2,000 ha.**

Tan Tru District (Source: DARD Tan Tru):

Tan Phuoc Tay commune, Duc Tan commune, Nhat Ninh ommune. Total area: **4.094,09 ha.**

- Aquaculture area (outside the dyke): 600 ha (Planning for aquaculture)

- Total land area used for aquaculture: 360 ha

Chau Thanh District:

Name of area: Xa Thuan My, Xa Thanh Vinh Dong. Total area by approximation: **3 x 9 km = 2700 ha.**

Ecological shrimp farming

An alternative and more sustainable way of economic development for this area might involve ecological shrimp farming. The regulations for ecological shrimp farming have already been established by the responsible authorities (i.e. MARD) and they ensure high quality and sustainable produced shrimps which are increasingly demanded by the international market. However, the potential for this relatively new way of sustainable economic development has been underexplored so far and would at least require more investments in business development, including market and feasibility studies, business showcases or small scale pilot projects for sustainable farming systems, consortium building (in particular SMEs and NGOs) and a marketing strategy to make it a viable industry.

Results / Impacts:

Detailed study on the feasibility of land use change from dry land agriculture or rice cultivation into aquaculture based on available water resources, with the ultimate objective to create areas with a high economic value, but able to withstand higher salinity levels than dry land agriculture or rice cultivation.

Responsibilities:

Department of Agriculture and Rural Development (DARD)
Department of Natural Resources and Environment (DONRE)
PC of Can Duoc, Can Giuoc, Chau Thanh, Tan Tru

Investment Cost:

Investment period:


Feasibility Study Aquaculture: 4 Billion VND	2 years
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Intervention Sheet 1j – Feasibility Study Water recycle and re-use

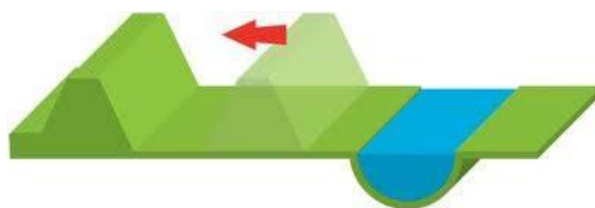
Name: Name of intervention	Location: 4 districts	Type of intervention: Physical intervention
Objectives: To prepare for the optimization of recycling wastewater and using it to grow food crops or for reuse in households and industry, in order to mitigate water scarcity problems and reduce water pollution.		
Intervention: The UN Food and Agricultural Organization (FAO) has called for governments to increase the amount of treated wastewater being used for irrigation purposes as this will reduce costs for farmers, villages and cities and improved water quality. There are three types of water reuse: <ol style="list-style-type: none"> 1) Use of grey water 2) Treated sewage 3) Industrial water <ol style="list-style-type: none"> 1) Grey water: <ul style="list-style-type: none"> • Grey Water = all non-toilet household wastewater • Can be a good water resource during times of drought and water restrictions, but its reuse can carry health and environmental risks. • Grey water can be reused following a few simple steps with readily available systems. • A number of products are now on the market that enable access to grey water from domestic plumbing situations. These products are designed for immediate grey water reuse. 2) Treated sewage <ul style="list-style-type: none"> • Recycling wastewater can ease the pressure on water resources and avoid the need to discharge wastewater to the environment • With some treatment, it is suitable for a wide range of uses including irrigation and domestic uses • Irrigation with raw wastewater is suitable for agriculture if it is properly collected and treated > more study on economic feasibility is needed 3) Industrial water <ul style="list-style-type: none"> • Reusing industrial water can play an important part in reducing the demand on precious drinking water supplies. • With appropriate management, which may include treatment, industrial water can be used for a wide range of purposes including industrial uses (e.g. cooling, material washing) or non-industrial uses (e.g. irrigation, domestic uses). • To reuse industrial water in a safe and sustainable way it is important to identify, assess and appropriately manage the risks. <p>The example of Water Reuse in Singapore:</p>		



<ul style="list-style-type: none">Singapore's Public Utilities Board (PUB) treats 30 percent of the nation's water demand with a combination of conventional wastewater treatment, screen filtration, membrane microfiltration and reverse osmosis. UV and hydrogen peroxide disinfection complete the process.The resulting water exceeds the quality of Singapore's traditional drinking water supplies across a wide variety of parameters, from bacteria and organic substances to color and clarity.	
Results / Impacts: Safe use of wastewater in agriculture, households and industries offers multiple benefits, e.g. mitigation of water scarcity problems and reduction of water pollution.	
Responsibilities: Department of Natural Resources and Environment Department of Agriculture and Rural Development Department of Industry and Trade Department of Health Department of Planning and Investment Department of Science and Technology	
Investment Cost: Cost of feasibility study on use of grey water Cost of feasibility study on use of treated sewage Cost of feasibility study on use of industrial water Combined research project/feasibility study at ministerial or provincial level = 3 Billion VND	Investment period: 3 years

Intervention Sheet 1k – Feasibility Study Dyke replacements

Name: Name of intervention	Location: Long An Province	Type of intervention: Feasibility study
<p>Objectives: To prepare for moving a dyke and rebuilding it more inland to widen the floodplain, and thus increases river discharge capacity.</p>		
<p>Intervention: This intervention will conduct a feasibility study of dyke replacements in the Vam Co River Basin. A dyke replacement increases the floodplain. A floodplain has a water storage capacity and promotes the river discharge. The increased width of the floodplain will result in a less high water level with the same amount of water. Hence, more water can be discharged until the maximum height of the dykes has been reached. Thus type of physical intervention is especially effective when constructed more upstream. However, in the widening of the floodplain new bottlenecks more downstream may occur, because the newly formed floodplain increases the discharge capacity of the river. This should be taken into account when determining the distance that the dike can be placed inland. The picture on the right shows a visualization of dyke replacement.</p>		



Results / Impacts: Lowering the levels of peak discharge, this reducing flood risk	
Responsibilities: PPC of Long An Department of Agriculture and Rural Development (DARD) Department of Natural Resources and Environment Department of Planning and Investment PC of Can Duoc, Can Giuoc, Chau Thanh, Tan Tru	
Investment Cost: Cost of feasibility study = 2 Billion VND	Investment period: 2 years

Intervention Sheet 1I – FS for Increasing retention capacity

Name: Name of intervention	Location: Long An Province	Type of intervention: Feasibility study
Objectives: To prepare for developing retention areas, in order to increase retention capacity of the Vam Co river Basin		
Intervention: <p>This intervention concerns a feasibility study of retention areas in the Vam Co River Basin. In retention areas extreme high water discharges are temporarily "parked". If the water level drops again, the area is emptied. Selection of a specific location for a retention area depends on a wide range of criteria and needs to be carefully evaluated. In contrast to other river widening measures the effect of retention is also of benefit for downstream areas. After all, part of the flood peak is removed and it will benefit the entire region downstream of the intake point.</p> <p>The construction of a retention area in an existing landscape is always a complex project. In any case it is accompanied by:</p> <ul style="list-style-type: none"> • the construction of new dikes to a closed ring to make the construction of inlet and outlet works • the adaptation of existing waterways system • the adaptation of road infrastructure (crossings with new flood dykes and possibly flood proofing or diversion of roads) <p>In general, there is a choice between green retention areas and blue retention areas.</p> <p><u>'Green' retention:</u> a very low flood frequency and predominantly maintaining existing land uses. For green retention areas the flood frequency is statistically in the order of once per 10 or 100 years, which is not significantly different from the flooding of the protected inside dike areas in Long An Province.</p> <p>A retention only at extremely high river discharge can be deployed over the longer term associated with intensive agriculture in that region (cattle). Indeed, land-based agriculture is a profitable and stable form of use for an area that should remain open. For the residential and commercial buildings a flood-proof location on the edge of retention area may be considered.</p>		

<p><u>Blue 'retention'</u>: a higher flood frequency and corresponding adjustment of land uses in the area. Blue retention allows for a more varied structure. More design measures are required, and also more intensive management for adjusting the total available retention capacity (because the area is already partially inundated). Is an area frequently used as a retention area, then the land-based agriculture function needs to change in the direction of more extensive forms. After all, temporary water storage structures may lead to loss of land or damages to crops. Summer inundations are always harmful to vegetation. Winter inundations reduce crop yields. Waterlogging of an area and inundations do not have only negative impacts on agriculture. There are possibilities to combine it with energy crops, reed cultivation, willow cultivation, nature-oriented farming, hay or for example the development of new estates. Depending on level dynamics, altitude, water quality, timing and duration of inundation and depth of the water, blue retention area specifically provides opportunities for nature.</p>	
<p>Results / Impacts:</p> <p>Increased retention capacity and new economic developments, related to energy crops, reed cultivation, willow cultivation, nature-oriented farming, hay or for example the development of new estates.</p> <p>Green retention is favorable & taking advantage of natural ponds, lakes.</p> <p>The construction law of VN states that you not allow converting lake/pond to cultivation or resident purposes or you must replicate that storage area elsewhere.</p>	
<p>Responsibilities:</p> <p>All departments dealing with water, agriculture, nature, infrastructure and economic development</p>	
<p>Investment Cost:</p> <p>Cost of feasibility study = provincial level = 1 Billion VND</p>	<p>Investment period:</p> <p>2 years</p>

Intervention Sheet 1m – FS for Wetlands development and/or restoration

Name: Wetlands development and/or restoration	Location: Long An Province	Type of intervention: Governance intervention
<p>Objectives:</p> <p>To prepare for development of new or restoring existing wetland in order to temporarily store flood waters, during high runoff events.</p>		
<p>Intervention:</p> <p>Feasibility study on the potential for wetlands development and/or restorations in the Vam Co River Basin.</p> <p>During rain storms and snow melt events, the amount of water running over the surface of the land increases, and in severe storms, flooding may result. Many wetlands, particularly floodplain wetlands, have the capacity to temporarily store these peak discharges. Although wetlands have often been referred to as natural sponges that soak up water, they actually function more like natural tubs, storing either flood waters that overflow riverbanks or surface water that collects in</p>		

isolated depressions. As flood waters recede, the water is released slowly from the wetland soils. By holding back some of the flood waters and slowing the rate that water re-enters the stream channel, wetlands can reduce the severity of downstream flooding and erosion.

Results / Impacts:

Reduce the severity of downstream flooding and erosion.

According to the Vermont Wetland Rules, wetlands that provide for the temporary storage of floodwater or stormwater runoff to the extent that they make an important contribution to: reducing risks to public safety, reducing damage to public or private property reducing downstream erosion or enhancing the stability of habitat for aquatic life, are significant wetlands. In determining whether a wetland has significant impact on water storage for flood water and storm runoff, the following considerations should be taken in account: consider the extent to which it:

a. The extent to which reduces either the magnitude or frequency of risks to public safety or of damage to public or private property due to flood water or stormwater runoff after considering:

1. Its significance relative to other water storage capacity in its own watershed or in the watershed of any watercourse to which it is tributary. In particular, available water storage capacity upstream of the wetland should be considered.
2. Whether it is contiguous to a lake or pond which would provide storage benefits independent of the wetland.
3. The extent of development and impervious surface in the watershed.
4. The history of damage to public and private property and economic loss due to flooding within the watershed downstream of the wetland.
5. The characteristics of development and resources in or near the floodplain downstream of the wetland.
6. The extent to which the wetland's water storage capacity is created by beaver dams and similar temporary conditions

b. The extent to which it attenuates flood peaks and reduces water velocities, thereby reducing scouring and erosion.

c. The extent to which it maintains the geomorphic stability of important habitat for aquatic life by attenuating peak flows of flood waters or storm water runoff, or reducing the scouring and erosion of stream banks, or both.

Hydraulic and hydrologic analysis of the extent to which a wetland serves this function shall utilize average annual, 10-year, 50-year and 100-year storm frequencies in generating hydrographs for the wetland's inlet, outlet and at critical locations upstream and downstream.

Responsibilities:

Department of Natural Resources and Environment (DONRE)

Department of Agriculture and Rural Development

Investment Cost:

Cost of feasibility study = 2 Billion VND

Investment period:

2 years

Intervention Sheet 1n – FS and Pilot Project Economic and financial measures

Name:	Location:	Type of intervention:
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Economic and financial measures	All districts	Governance intervention
<p>Objectives:</p> <p>To identify the feasibility of economic and financial measures that can spur behavioral change in water use through incentives or disincentives; change conditions to enable economic transactions; or reduce risk. Rather than specifying a particular type of behavior that the water user has to comply with, economic instruments create the economic incentives (e.g. price signals) to encourage or discourage certain behavior, but leave it to the water user to devise his / her own way of dealing with this incentive.</p>		
<p>Intervention:</p> <p>Identification of the feasibility of:</p> <ul style="list-style-type: none"> – Financial incentives to install water use efficient devices; e.g. low interest or forgivable loans, tax credits, rebates, buy-backs of inefficient devices. – Fines for non-compliance of regulatory requirements – Pricing structures; e.g, increasing block rates, seasonal rates. – Full cost pricing <p>Additionally, further study is required on the feasibility of the following principles and concepts:</p> <ul style="list-style-type: none"> • <u>Polluter pays principle</u>: Following the Rio Declaration on Environment and Development (1992) Vietnam is encouraged to implement the polluter pays principle (principle 16), which is enacted to make the party responsible for producing pollution responsible for paying for the damage done to the natural environment. The project "Vietnam Capacity 21", funded by the UNDP, supported Vietnam to effectively initiate the consideration and integration of environmental protection (including the polluter-pays principle) into investment planning and decision-making. More work is needed however. Implementation of the polluter-pays principle in the pilot area would mean that parties producing waste, wastewater and other types of pollution would have to pay tax (for example by means of ecotax) in proportion to the amount of pollution. The polluter-pays principles is normally implemented through two different policy approaches: command-and-control and market-based. Command-and-control approaches include performance and technology standards. Market-based instruments include pollution taxes, tradable pollution permits and product labeling (Bugge, 1996). A combination of both approaches is recommended for the pilot area in order to protect domestic, agricultural and industrial areas from increasing pollution. • <u>Public-private partnerships</u>: One of the main challenges of climate change adaptation is finding ways to finance climate change adaptation plans, operations, infrastructure and projects. In the last few decennia, new forms of finance scheme and structures have become available and are now commonly used (Bossert et al., 2006). These modern forms, finance schedules and structures are often known as public-private partnerships (or PPP's). Within the context of climate change adaptation, PPP's might enable the public sector to spread the cost of the investment over the lifetime, in contrast to traditional financing where the public sector is required to provide capital, while the benefits will come much later and are mostly uncertain. For example in the pilot area, the potential of public-private partnerships related to the climate-proofing of the industrial zones and agricultural activities needs further study. • <u>Economic Diversification</u>: In the near future one of the major threats to environmental security in the pilot area will be a transition to industrial shrimp farming, according to the new economic strategy. Most of the villages have concrete and ambitious plans to increase production of shrimps by using intensive methods. A transition to industrial shrimp farming should be carefully considered as regards environmental impacts, the sustainability of this type of farming, and potential economic alternatives. The area itself provides the potential for economic more sustainable alternatives which have been underexplored so far, such ecological shrimp farming. <p>The pilot area might also explore opportunities for entirely new economic activities in the</p>		

<p>field of renewable energy, for example solar energy, wind resources, stand-alone desalination units, with or without coupling to food and salt production, including a community based (and decentralized) method to adapt to and mitigate climate change.</p> <ul style="list-style-type: none"> • <u>Payment for ecosystem services</u>: Ecosystem services such as carbon sequestration, flood protection and protection against soil erosion are directly linked to climate change and healthy ecosystems are an essential defence against some of its most extreme impacts. A comprehensive and integrated approach towards the maintenance and enhancement of ecosystems and the goods and services they provide is therefore needed. Literature suggests that working with nature's capacity to absorb or control impacts in urban and rural areas can be a more efficient way of adapting than simply focusing on physical infrastructure. Green Infrastructure⁵ can play a crucial role in adaptation by providing essential resources for social and economic purposes under extreme climatic conditions. Examples include improving the soil's carbon and water storage capacity, and conserving water in natural systems to alleviate the effect of droughts and to prevent floods, soil erosion and desertification. Hence, it is important to explore the potential for policies and measures to boost ecosystem storage capacity for water in the Vam Co river basin, and more in general the potential for payment of ecosystem services. 	
<p>Results / Impacts:</p> <ul style="list-style-type: none"> • Overview of the potential and feasibility of different economic and financial measures • Identification of success and limitation factors for each potential measure • A differentiation of feasibility of instruments for different water user groups: domestic, agriculture, industry. 	
<p>Responsibilities:</p> <p>Department of Science and Technology</p> <p>Department of Finances</p> <p>Department of Planning and Investment</p>	
<p>Investment Cost:</p> <p>Feasibility study = 2.0 Billion</p> <p>Apply in pilot area in one commune = 500.000 VND</p>	<p>Investment period:</p> <p>3 years</p>

Intervention Sheet 1o – Communication and education measures

Name: Communication and education measures	Location: All districts	Type of intervention: Governance intervention
<p>Objectives:</p> <p>Education, capacity-building and communication are imperative for effective climate change adaptation.</p> <p>The objective of this intervention is to increase awareness on water-related issues and to build capacities amongst different user groups (i.e. domestic, agricultural, industrial water users), in particular related to the following topics: water use efficiency, water saving technologies, water</p>		

⁵ Green Infrastructure is the interconnected network of natural areas including some agricultural land, such as greenways, wetlands, parks, forest preserves and native plant communities, and marine areas that naturally regulate storm flows, temperatures, flooding risk, and water, air and ecosystem quality.

conservation, rainwater harvesting, etc.	
Intervention: Study and design of the following communication and education measures: <ul style="list-style-type: none"> • Social marketing campaigns on water conservation, including school programs • Demonstration sites and information centres on water saving technologies, water use efficiency, rainwater harvesting, etc. • One-on-One meetings with major water users • Published materials such as "how to" manuals, case studies, technical reports, resource libraries; • Special project committees, seminars and workshops with specific water users 	
Results / Impacts: Increased awareness shared knowledge and increased capacity on water use efficiency, water saving technologies, water conservation, rainwater harvesting, etc. By promoting and facilitating education and capacity-building and communicating with sectors, including water services and public health communities, as well as the public at large, governments can reduce the vulnerability to climate change effects. Moreover education can help to prevent maladaptation or negative effects of autonomous adaptation.	
Responsibilities: All departments + districts of Long An Province, in particular Department of Communications	
Investment Cost: Price of one feasibility study = 500 Million VND Price of (design and implementation of) one social marketing campaign in four districts = 400 Million VND Price of one information centre (setting-up and running 5 years – 3 people) = 5 million/month salaries/person + renting office 2 million/month + equipment = Approx. 1 Billion VND Price of “how to” manual = 100 Million VND Total cost: 2 Billion VND	Investment period: 4 years

Intervention Sheet 1p – Regulatory measures

Name: Regulatory measures	Location: All districts	Type of intervention: Governance intervention
Objectives: To identify the feasibility of measures establishing or changing laws and regulations. Legislation should not present barriers for adaptation and be flexible enough to accommodate ongoing environmental and socio-economic changes. In particular existing legislation and transboundary agreements might require revision.		
Intervention: <ul style="list-style-type: none"> – Existing legislation, from the local to the transboundary levels, should be assessed vis-à-vis its capacity to support adaptation to climate change. For example, legislation prohibiting the use of wastewater may need to be changed into legislation that sets requirements on the safe use of wastewater. Transboundary agreements should include provisions for addressing flow variability and availability of safe water. – Study on the requirements or enabling legislation to consider water use efficiency in planning. 		

Identification of the feasibility of the following regulatory measures:

- Bylaws for new construction; e.g. requiring "shunt pipes" to facilitate addition of water meters in future, low-flow fixtures, standards for installation and construction of water mains, meters;
- Building and plumbing code restrictions. e.g. toilets, faucets, showerheads, water and sewer lines, downspouts, water processing and cooling systems;
- Regulations for intensive shrimp farming: The transition to industrial shrimp farming requires guidelines and regulations for avoiding water pollution caused by excessive use of pesticides, fertilizers, and/or antibiotics.
- Regulations for domestic and industrial waste (water) management: In the pilot area, many livelihoods are evenly divided and living near rivers, drainage channels, waterways, and all waste (e.g. plastics, batteries, and organic waste) is thrown directly into the water or buried next to the house. Also the industrial zones in the pilot area (e.g. food processing industry) are major sources of environmental pollution. Hence, effective regulation for domestic and industrial waste (water) management is required.
- Law revision and enforcement on forest protection: One of the most important threats to environmental security mentioned by stakeholders is the uncontrolled cutting of mangroves for construction materials, firewood and charcoal. This problem runs parallel with the exploitation, selling and using of timber and other forest products with unknown origin. At the same time, it is very rare that people are fined or prosecuted for illegal cutting, since most offenders are poor and law enforcers are reluctant to punish poor people. Since this is the only practical instrument available to current law enforcement the prevention of illegal cutting is quite ineffective. Hence, a law revision enabling an incentive-based structure or policy to protect forests is needed. A possible alternative to dealing with illegal cutting is payment for ecosystem services (see intervention sheet 1o – Economic and Financial Measures).

Results / Impacts:

- Identification of success and limitation factors for each potential measure
- A differentiation of feasibility of instruments for different water user groups: domestic, agriculture, industry.

The investment feasibility survey will focus on a number of distinguished subjects. Critical elements regarding the product, the market, the production, the organisational and financial structure and costs and revenues will be defined and analysed, yielding a defined return on investment and a proposition of the best of alternative options for chances of success of the investment.

Responsibilities:

Department of Law

Department of Science and Technology

Investment Cost:

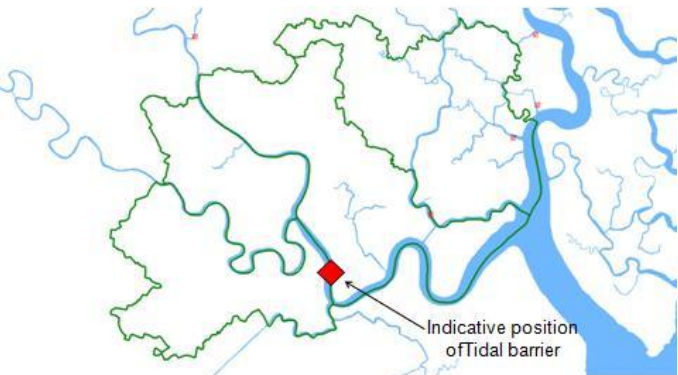
Feasibility study 2 Billion VND

Investment period:

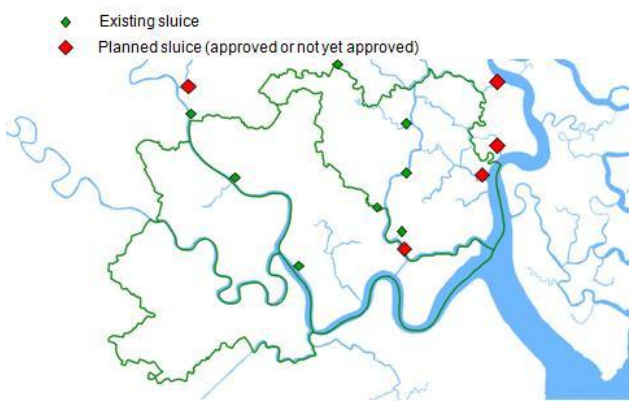
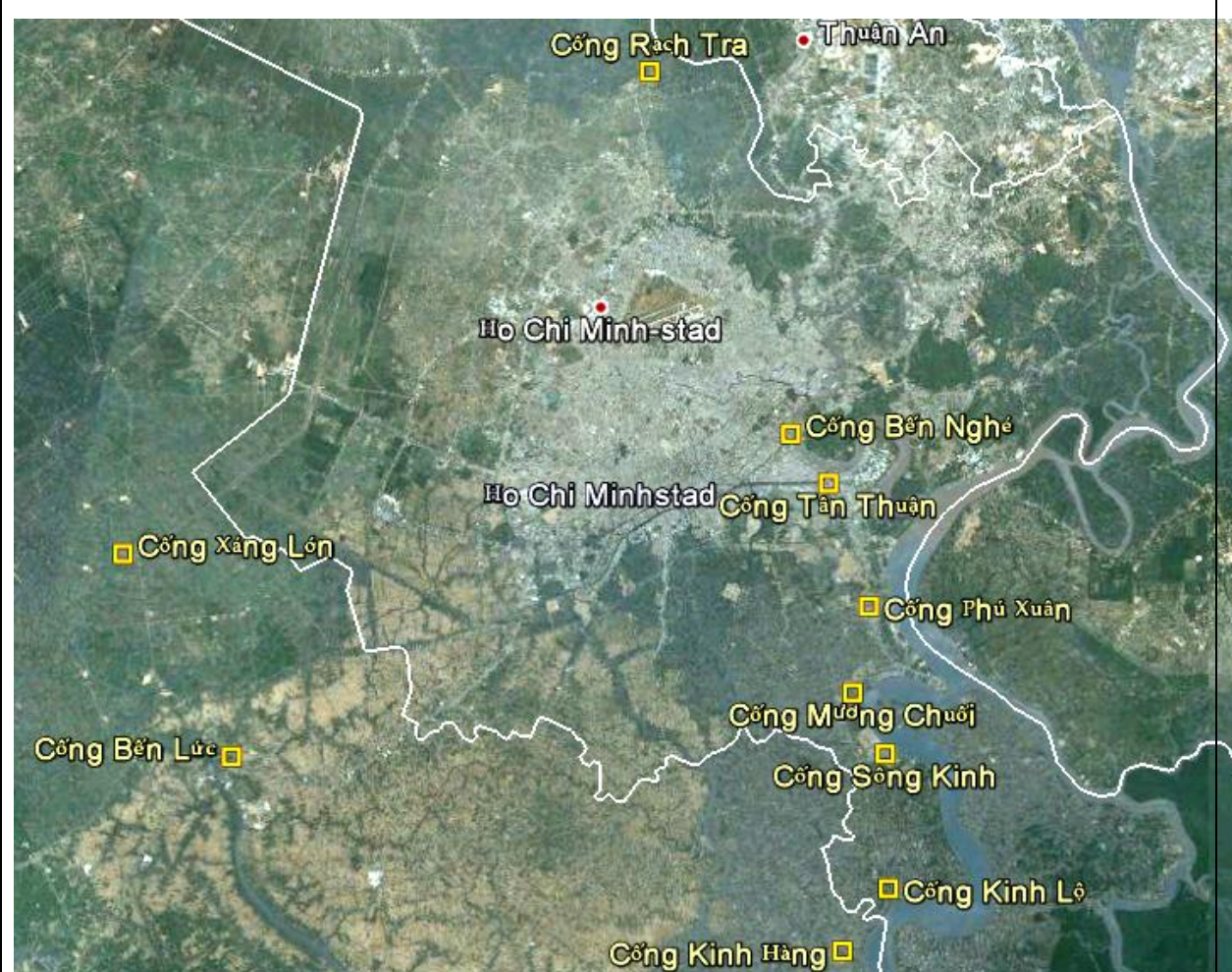
2 years

Intervention Sheet 2a – Construction of Tidal Barrier

Name: Construction of Tidal Barrier	Location: Tan Chanh - Thuan My	Type of intervention: Feasibility study
Objectives:		

To conduct a feasibility study on the construction of a semi-permeable tidal barrier in the Vam Co river, in order to protect the coastal districts against salt water intrusion and sea level rise.	
<p>Intervention:</p> <p>Feasibility study on the possibilities for constructing a semi-permeable tidal barrier in the Vam Co River basin, in particular taking into account the impacts on navigation, and how to solve obstacles for river navigation (e.g. building a shipping lock or sash lock) and environmental impacts, requiring a cost-benefit analysis and environmental impact assessment.</p>	
 <p>The map shows the Vam Co River basin with its tributaries. A red diamond marks the 'Indicative position of Tidal barrier' on the main river channel. The river flows from the top right towards the bottom left, eventually meeting the sea on the right side of the map.</p>	
<p>Results / Impacts:</p> <ul style="list-style-type: none"> -Substantial reduction of salt water intrusion into the pilot area - Negative impacts on navigation - Does not protect against flood from upstream - Impacts on the ecological system - High expenses 	
<p>Responsibilities:</p> <p>Department of Dike Management and Flood Control, DARD Department of Natural Resources and Environment Department of Industry and Trade Department of Infrastructure Department of Transportation Department of Science and Technology</p>	
<p>Investment Cost:</p> <p>Cost of one feasibility study = 2 Billion VND</p>	<p>Investment period:</p> <p>2 years</p>

Intervention Sheet 2b – Construction of sluices

Name: Construction of 12 sluices	Location: 4 districts	Type of intervention: Physical intervention																														
Objectives: Construction of sluices in the pilot area to mitigate saltwater intrusion.																																
Intervention: Sluices yet to be approved 9 Sluices to be approved (see picture below for positions) <table border="1"> <thead> <tr> <th>Sluice</th><th>Crest level</th><th>Width (m)</th></tr> </thead> <tbody> <tr><td>BIG1</td><td>-2</td><td>50</td></tr> <tr><td>BIG2</td><td>-6</td><td>100</td></tr> <tr><td>BIG3</td><td>-15</td><td>100</td></tr> <tr><td>BIG4</td><td>-12</td><td>100</td></tr> <tr><td>BIG5</td><td>-10</td><td>100</td></tr> <tr><td>BIG7</td><td>-2</td><td>50</td></tr> <tr><td>BIG8</td><td>-6</td><td>80</td></tr> <tr><td>BIG9</td><td>-7</td><td>80</td></tr> <tr><td>BIG10</td><td>-5</td><td>60</td></tr> </tbody> </table> 			Sluice	Crest level	Width (m)	BIG1	-2	50	BIG2	-6	100	BIG3	-15	100	BIG4	-12	100	BIG5	-10	100	BIG7	-2	50	BIG8	-6	80	BIG9	-7	80	BIG10	-5	60
Sluice	Crest level	Width (m)																														
BIG1	-2	50																														
BIG2	-6	100																														
BIG3	-15	100																														
BIG4	-12	100																														
BIG5	-10	100																														
BIG7	-2	50																														
BIG8	-6	80																														
BIG9	-7	80																														
BIG10	-5	60																														
																																

Results / Impacts:

Damage reduction: 63.5 Billion VND/year (based on SOBEK damage assessment, Scenario A2 2050 including dike levels at msl +3.00 m) > see below overview

Flood damage at selected land use (1000 USD)				
	without sluices		with sluices	
	Reference	Alternative		Difference
Can Giuoc		5860,2	4068,7	-1791,6
Can Duoc		2096,6	979,0	-1117,6
Chau Thanh		212,4	212,4	0,0
Tan Tru		382,3	267,9	-114,4
				-3023,6 1000 USD
				-63,5 Billion VND

Responsibilities:

Department of Dike Management and Flood Control, DARD
 Department of Natural Resources and Environment
 Department of Industry and Trade
 Department of Infrastructure
 Department of Transportation
 Department of Science and Technology

Investment Cost:

2 – 2.5 Billion VND to build one meter of sluice gate.

Total length for 9 sluices = 720 metres

Total investment cost for 9 sluices = 1440 Billion VND (including 10% preparation costs)

Investment period:

Start date dependent on approval procedure. Implementation period is 4 years

Intervention Sheet 3a – Import of fresh water from upstream groundwater

Name: Import of fresh water from upstream groundwater	Location: Pilot area and adjacent upstream districts	Type of intervention: Feasibility study
Objectives: To assess the feasibility of importing groundwater from adjacent upstream districts in the Vam Co River Basin		

Intervention: Feasibility study on the import of groundwater from adjacent upstream districts in the Vam Co River Basin Surplus water from underground sources in adjacent upstream districts could be pumped through pipelines or into canals to carry vital supplies to areas facing water shortages. If groundwater extraction will be increased, regulations have to be implemented to sustain the supply. An overview of the availability can be created by conducting an integrated groundwater resources assessment study, including the identification of opportunities for recharge areas and measures to avoid overexploitation and pollution. Based on this study, groundwater extraction regulations can be developed, including monitoring, pricing and enforcement. Additionally, for the import of groundwater exchange arrangements need to be established between the donor and recipient.	
Results / Impacts: An assessment of the feasibility of increased freshwater supply for the pilot area by means of importing fresh water from upstream groundwater, in particular during periods of severe droughts and water scarcity. Costs: some studies in UK indicate that large-scale transfers of water are more expensive than the other options available to meet water demands in UK. Such cost-benefit analysis needs to be undertaken for Long An Province as well. Environmental impacts: Assessment of environmental impacts of large-scale groundwater exploitation needs to be included.	
Responsibilities: Department of Planning and Investment Department of Natural Resources and Environment Department of Agriculture and Rural Development Department of Industry and Trade Department of Science and Technology	
Investment Cost: Cost of one feasibility study = 1 Billion VND	Investment period: 1 year

Intervention Sheet 3b – Import of fresh water from upstream surface water

Name: Import of fresh water from upstream surface water	Location: All districts	Type of intervention: Feasibility study
Objectives: To assess the feasibility of importing fresh water from upstream surface water (e.g. rivers, lakes, reservoirs)		
Intervention: Surplus water from upstream surface water resources, such as rivers, lakes and reservoirs, could be		

<p>pumped through pipelines or into canals to carry vital supplies to areas facing water shortages. Specific elements of the feasibility study include:</p> <ul style="list-style-type: none"> • Assessment of the feasibility of emergency river support schemes • Assessment of the feasibility of ensuring minimum flows from upstream reservoirs 	
<p>Results / Impacts:</p> <p>An assessment of the feasibility of increased freshwater supply for the pilot area by means of importing fresh water from upstream surface water, in particular during periods of severe droughts and water scarcity.</p> <p>Costs: some studies in UK indicate that large-scale transfers of water are more expensive than the other options available to meet water demands in UK. Such cost-benefit analysis needs to be undertaken for Long An Province as well.</p>	
<p>Responsibilities:</p> <p>Department of Planning and Investment Department of Natural Resources and Environment Department of Agriculture and Rural Development Department of Industry and Trade Department of Science and Technology</p>	
<p>Investment Cost:</p> <p>Cost of one feasibility study = 1 Billion VND</p>	<p>Investment period:</p> <p>1 years</p>

Intervention Sheet 3c – Import of fresh water from adjacent river basins

<p>Name:</p> <p>Import of fresh water from adjacent river basins</p>	<p>Location:</p> <p>Long An Province</p>	<p>Type of intervention:</p> <p>Feasibility study</p>
<p>Objectives:</p> <p>To study the feasibility of transferring water from Saigon river or Mekong river (when there is surplus) to Vam Co river (when there is shortage).</p>		
<p>Intervention:</p> <p>Water transfer schemes attempt to make up for water shortages by constructing elaborate systems of canals, pipes, and dredging over long distances to convey water from one river basin (the donor basin) to another (the recipient basin). Under certain circumstances, large-scale water transfers fulfill an important role in providing water to those in need, but overall their benefits are doubtful. Hence, the feasibility study will conduct a cost-benefit analysis of a water transfer scheme from Saigon river (when there is surplus) to Vam Co river (when there is shortage). It will assess potential environmental damages as well as economic and human costs.</p> <p>Environmental damage assessment: water transfers may seriously impact the environment of the donor basin. They create or escalate threats to critically endangered species, Ramsar-listed wetlands, and protected areas. Dams constructed on the river from which water is taken can devastate its</p>		

ecology, disrupting environmental flows and blocking migrating fish.

Assessment of economic and human costs: Water transfer schemes compromise rivers' ability to provide food and water. Even when "only" 10 to 15% of water is taken from one basin, it can cause droughts in both basins in times of little rainfall. Economic benefits generated in the recipient basin often come at the cost of those living in the donor basin. Some projects have displaced entire communities. People whose livelihoods depend on the donor basin have not always been consulted on how they will be affected. In the past, this has created social conflicts between the donor and recipient basins and governments. And while a water transfer scheme is designed for their benefit, residents of the recipient basin also face negative consequences. Cost overruns are common and planned benefits may fall short. Without massive government subsidies, farmers in areas receiving water could pay as much as US\$1 per cubic metre, making their produce more expensive locally than that available on world markets and threatening their livelihoods.

Results / Impacts:

Cost-benefit analysis of a water transfer scheme from Saigon or Mekong river (when there is surplus) to Vam Co river (when there is shortage). It provides an assessment of potential environmental damages as well as economic and human costs.

Large-scale water transfers will only be progressed if they are demonstrated to be an economically and environmentally viable option to meeting a forecast water supply deficit.

Responsibilities:

Department of Planning and Investment

Department of Natural Resources and Environment

Department of Agriculture and Rural Development

Department of Industry and Trade

Department of Science and Technology

Investment Cost:

Cost of feasibility study = 2 Billion VND

Investment period:

2 years

Annex 5 - A model for participatory learning and interactive learning techniques

Strategies for water management need to evolve to reflect experience through a 'learning approach'

Adaptive water management implies a real paradigm shift in water management from what can be described as a prediction and control to a management as learning approach (Huntjens et al., 2010; Pahl-Wostl, et al, 2005). Such change aims at increasing the adaptive capacity of water management at different scales. Examples of structural requirements for a water management regime to be adaptive are summarized in Table 4. Two different regimes characterized by two different management paradigms – management as control versus management as learning - are contrasted as the extreme, opposing ends of six axes. Depending on the context, bridging the gap between the two paradigms may take time but developing mechanisms for facilitating learning processes in the policy may be a first step.

Table 4 - Different regimes and their characteristics (From: Pahl-Wostl, et al., 2005)

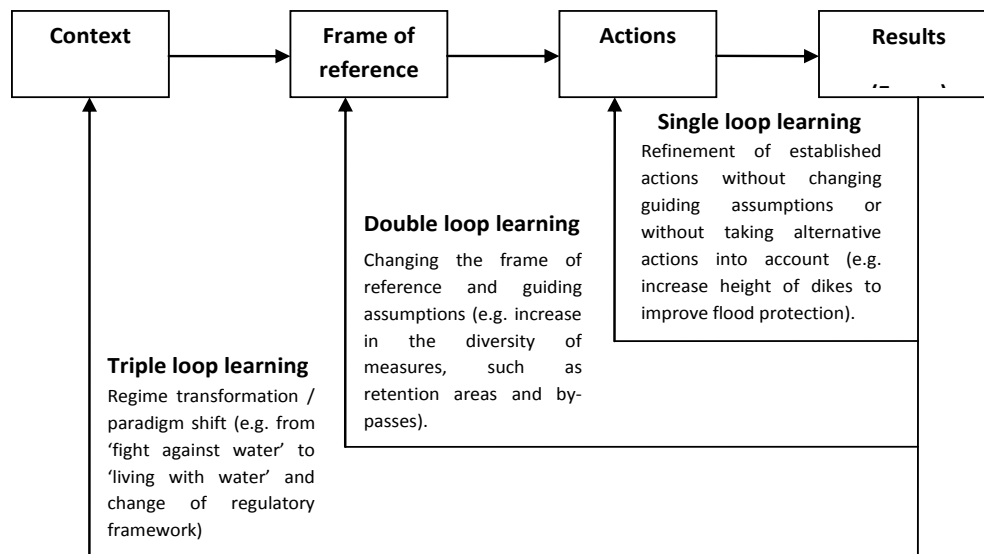
Dimension	Prediction, Control Regime	Integrated, Adaptive Regime
Governance	Centralized, hierarchical, narrow stakeholder participation	Polycentric, horizontal, broad stakeholder participation
Sectoral Integration	Sectors separately analysed resulting in policy conflicts and emergent chronic problems	Cross-sectoral analysis identifies emergent problems and integrates policy implementation
Scale of Analysis and Operation	Transboundary problems emerge when river sub-basins are the exclusive scale of analysis and management	Transboundary issues addressed by multiple scales of analysis and management
Information Management	Understanding fragmented by gaps and lack of integration of information sources that are proprietary	Comprehensive understanding achieved by open, shared information sources that fill gaps and facilitate integration
Infra-structure	Massive, centralized infrastructure, single sources of design, power delivery	Appropriate scale, decentralized, diverse sources of design, power delivery
Finances and Risk	Financial resources concentrated in structural protection (sunk costs)	Financial resources diversified using a broad set of private and public financial instruments

...and adjustment to the legal framework can support this learning approach, for example concerning access to information and enhancing participation in decision-making

Improving legal provisions concerning access to information and participation in decision-making (e.g. consultation requirements before decision-making) may be a first step towards increased policy learning. Increased levels of policy learning lead to more advanced coping strategies in governance systems confronted with social and physical challenges (Huntjens et al 2011a). Policy learning is defined by Hall (1988) as a 'deliberate attempt to adjust the goals or techniques of policy in the light of the consequences of past policy and new information so as to better attain the ultimate objects of governance'. It is important to take into account that learning takes place at different levels beyond just refining established actions or single-loop learning (Figure 5). Advanced information management and integrated cooperation structures discussed in the sections above are key factors leading towards higher levels of policy learning: advanced information management may be considered the lubricating oil within cooperation structures.

Partnership approaches amongst stakeholders improve this learning process

Developing and sustaining capacity through increased interaction between stakeholders and institutions for example joint field visits or common training session is needed to build up experience to cope with uncertainty and complexity of socio-ecological systems.



Triple loop learning concept derived from Hargrove (2002), and adjusted by Huntjens et al (2011a). Reproduced by permission of Robert Hargrove, 2011.

Results from empirical analyses show, for example, that centralized political and economic systems, privatization, commercialization of the environment, rigid bureaucratic systems, and political secrecy and poor public access to information can impede social learning. The quality of the interaction, the shared ownership of a task or project, openness for mutual testing and contradiction, and the opportunity for reflexive moments are all important components of such a practice (Pahl-Wostl et al, 2007a).

A sample of interactive learning techniques (Source: Huntjens et al 2011b)

Backcasting is a method to develop normative scenarios and explore their feasibility and implications. Important in the sustainability arena, it is as a tool with which to connect desirable long term future scenarios to the present situation by means of a participatory process. The method is used in situations where there is a normative objective and fundamentally uncertain future events that influence these objectives. The central question of backcasting: "if we want to attain a certain goal, what actions must be taken to get there?"

Brainstorming is a group creativity technique designed to generate a large number of ideas for the solution of a problem. Many variants available: nominal group technique (often used in GMB), group passing technique, team idea mapping method, electronic brainstorming, directed brainstorming, individual brainstorming, question brainstorming.

Case studies allow you to develop the ability to analyze, ask relevant questions, develop decisions and defend one's point of view; improve participant's communicative skills; develop ability to see situation from several different angles and take into consideration various factors that influence the situation; and develop several decisions and analyze them.

Focus groups are broadly defined as meetings to obtain public understandings on a distinct area of interest in a permissive environment (Morgan, 1997). In a relaxed atmosphere, a group of six to eight

people share their ideas and perceptions. Within a smaller group, the participants usually feel that they have a larger influence on the discussion, and it is easier to tempt reticent participants to contribute.

Foresight is a tool for developing visions, understood as possible future states of affairs that actions today can help bring about (or avoid). Foresight is a non-deterministic, participatory and multidisciplinary approach. It can be envisaged as a triangle combining "Thinking the Future", "Debating the Future" and "Shaping the Future".

Group Model Building is a method for facilitating 'deep involvement' of a group of individuals in the building of a model of a particular management system, in order to improve group understanding about that system, its problems and possible solutions, which will directly or indirectly lead to better management decisions (Hare, 2003). When using such a method, the model itself is not the product of the process; the product is the generation of common understanding among model builders during the process.

Multi-Stakeholder Dialogue aims to bring relevant stakeholders or those who have a 'stake' in a given issue or decision, into contact with one another. The key objective of an MSD is to enhance levels of trust between the different actors, to share information and institutional knowledge, and to generate solutions and relevant good practices. The process takes the view that all stakeholders have relevant experience, knowledge and information that ultimately will inform and improve the quality of the decision-making process as well as any actions that (may) result. With sufficient time, resources and preparation, an MSD can be a very effective tool for bringing diverse constituencies together to build consensus around complex, multifaceted and in some cases, divisive issues.

Nominal Group Technique is used to structure group work aimed at gaining consensus on priority setting and/or highlighting topics of importance in the management system (Delberg et al., 1975). To overcome the problems of domination and marginalization of the group members, the technique begins with a round-robin collection of participants ideas about a subject in private. This enables all participants' view to be collected fairly. Each participant's ideas are then presented for critical appraisal and discussion by the group in a facilitated group workshop. The ideas are then ranked in this workshop by the group using some form of voting/ranking system. The highest ranked idea is then set as the idea of highest priority and importance to the group. This technique is good for getting groups to prioritize ideas belonging to a single theme, however, it does not work well for multiple themes and if quick decisions are required (Hare, 2003).

Reframing is an intervention stimulating participants to go beyond their own frame of reference and to approach a problem or relation from a different perspective. It is possible to use such intervention when processes are stagnated on content and/or social relationships.

Role Playing Game (RPG) is a type of game in which the participants assume the roles of characters and collaboratively create stories (Waskul & Lust, 2004). Participants determine the actions of their characters based on their characterization, and the actions succeed or fail according to a formal system of rules and guidelines. Role playing games can be linked to group model building. In this type of application, models can be represented in terms of role playing games wherein the participants are not simply observing the model from the outside, but actually embedded in the game as actors making decisions about management.

Sources: Above sample of interactive learning techniques is from Huntjens et al (2011b)

Annex 6 – Final Conference Speech of Mr. Simon van der Burg, Consul General of the Royal Netherlands Embassy in Vietnam

Final Workshop Climate Change Adaptation Strategy, Lower Vam Co River Basin

Vietnam and climate change: policy for sustainable development

Speech by

Consul General Mr. Simon van der Burg
Consulate General of the Kingdom of Netherlands, HCMC

28 February 2013

Distinguished representatives of the Government,
Authorities of Long An province, and other Mekong delta provinces,
Representatives of Dutch knowledge institutes,
Ladies and gentlemen,

Welcome

1. It is an honour to have the opportunity to address you at the final Conference regarding the ‘Preferred Climate Change Adaptation Strategy for the Lower Vam Co River Basin’. I would like to express my gratitude to the Peoples committee of Long An for hosting this important meeting. The Netherlands and Vietnam have very close cooperation in the field of Water management and climate change adaptation. This final conference underlines the intentions and good spirit of Vietnam and the Netherlands in particular, to strengthen the cooperation between both Delta countries coping with the challenges on climate change.

2. But let me first introduce myself. My name is Simon van der Burg. I work for the Dutch Ministry of Foreign Affairs and I have been appointed recently as the new Consul General for the South of Vietnam with residence in Ho Chi Minh City.

Bilateral cooperation

3. As Vietnam and the Netherlands are both Delta countries there is a solid basis for continued cooperation on climate change adaptation strategies. Deputy Prime Minister Hoang Trung Hai visited the Netherlands in November 2012 with a large delegation to discuss climate change adaptation as a priority of the bilateral cooperation. Both countries have committed themselves for long term cooperation. Governments are key in leading the process of adaptation plans to provide continued safety and security to the inhabitants in the Delta regions. As adaptation measures are expensive, it requires especially in developing countries a thorough planning process in relation to time, urgency and finance. Vietnam is actually in the middle of this process.

4. The Netherlands and Vietnam have been working together for several decades on water, agriculture and adaptation to climate change. May be you remember that the Netherlands, through NEDECO, drafted the first masterplan for the Mekong Delta in 1992. After 20 years and due to new information on climate change this plan is now being updated by Vietnam and the Netherlands. It is a joint process resulting in a more strategic and integrated long term vision for the Mekong delta as a whole.

5. The last years Vietnam and the Netherlands have cooperated on 3 large programmes in the South of Vietnam on Climate Change adaptation. This was the ‘Mekong Delta Plan programme’ where a long term strategic approach is developed with the purpose to build a climate change proof sustainable delta (including the area of HCMC). Secondly, the ‘HCMC moving toward the Sea programme’ where emphasis was on building climate proof delta cities while addressing complex urban spatial planning. The third programme is the ‘Flood and Inundation Programme’ (FIM), looking into flood hazards, flood risks and integrated water management. Actually, all three programmes will present their final conclusions this year and the recommendations will be followed up through our bilateral cooperation.

Climate Change Adaptation

6. Climate Change is of the highest priority to Vietnam. The last years several severe floods were broadcasted on television. It is clear that the extreme events of climate are taking place and that we have to cope with the facts. Although floods will always come by surprise, we have to be better prepared to avoid disaster and casualties. This requires the highest political priority to integrated planning, adaptation measures and early warning systems. Not only by expensive mitigation measures, but also by innovative approaches, adapting to changing future water levels. Also planning through a participatory planning process is crucial to the success of the strategy. The Dutch advice therefore is: ‘Plan for the future and act now’.

7. Making climate change adaptation strategies is not a simple task and requires intensive cooperation between the policy makers, scientist and the local stakeholders to design such plans. It should be adaptive to future changes (economically, environmentally, socially, politically etc.) and it should also address issues crucial required investments at the right time. Challenge is not to overdo and run in high costs and not underdo causing safety risks. A healthy economic environment should be created that supports investment, infrastructure development, agricultural production and safe urban areas.

Relevance

8. The results and ‘lessons learned’ obtained from our project presented today are very useful as a provincial response plan for climate change adaptation. The adaptation strategy for the Lower Vam Co River Basin, contains also useful information to the Mekong Delta Plan. Although the Mekong Delta plan is a long term vision with long term objectives it should guide the provincial plans towards more sustainable and integrated adaptation strategy and land use. Both plans should be coherent and contributing to the same objectives. Especially the participative approach applied is *thé* key to success for a broad based and accepted adaptation strategy.

Deltas2013- Global Delta Dialogues

9. Finally, I would like to take this opportunity also to call your attention to the important upcoming Deltas-2013 conference organized by Vietnam, the USA and the Netherlands. This conference follows up on the successful first conference that was held in New Orleans in 2010, where some of you might have participated also. The second ‘World Delta Dialogues

conference' will be organized here in Ho Chi Minh City between 20 and 24 of May. Your political leaders and experts are sincerely invited to make this conference a success. Focus will be on the sustainable management of Deltas. We expect more than 400 participants from many delta countries. Please keep track on the website *deltas2013.com* for information regarding this major event.

Appreciation

10. To conclude my speech, I am looking forward to learn from your views and strategies to be presented today. I would like to thank all Vietnamese organisations that have supported to this draft strategy, especially the Peoples Committee of Long An. I would also like to thank the Dutch partners who supported in this strategy and have travelled frequently to offer training and guidance.

11. It is clear that Vietnam is fully committed to prepare for a sustainable future and is eager to find partnerships with other delta countries that are heading the same challenges of adaptation and improved water management.

Finally, I wish everybody a very constructive conference!
