CLIMATE ADAPTATION FLAGSHIP
www.csiro.au

Exploring Mekong Futures: A compilation of participatory scenarios and visions

Technical Document

Tira Foran, John Ward, Anne Leitch, Lu Xing, Alex Smajgl

Editors

June 2013

Climate Adaptation Flagship

CSIRO, Canberra, Australia

Citation

Foran T., Ward J., Leitch A., Smajgl A. (2012) Exploring Mekong Futures: Compilation of Scenarios. Technical Report, June 2012. CSIRO, Australia.

Copyright and disclaimer

Important disclaimer

This document communicates outputs of a participatory multi-stakeholder process. All content is the work of individuals or ad-hoc groups of individuals. The contents of this document shall not be interpreted as representing the position of any particular organisation. In some cases, results have been transcribed from audio recordings.

Acknowledgments

We would like to thank the more than 200 people that participated in the scenario building workshops. We acknowledge the following people for their help with facilitation and event organisation:

Mr Nguyen Thanh Binh, Dr Angela Bush, Mr Chanthanet Boualapa, Mr Lilao Bouapao, Mr John Dore, Mr Hua Hong Hieu, Prof Uraiwan Inmuong, Dr Xu Jianchu, Mr He Jun, Dr Chayanis Krittasudhthacheewa, Mr Souphasay Komany, Dr Yanyong Inmuong, Dr Guillaume Lacombe, Dr Robert Mather, Dr Dang Kieu Nhan, Dr Someth Paradis, Ms Ornuma Polpanich, Mr Lan Pousavanh, Ms Aura Salmivaara, Mr Yan Samrith, Mr Pech Sokhem, Ms Phatcharee Srikuta, Mr Thanakit Thuwasri, Mr Hell Tony, Mr Van Pham Dang Tri, Dr Nguyen Hieu Trung, Mr Vo Van Tuan, Ms Nuchanart Vararakprapat, Mr Lu Xing, Ms Su Yufang, and Dr Bai Zhihong.

Contents

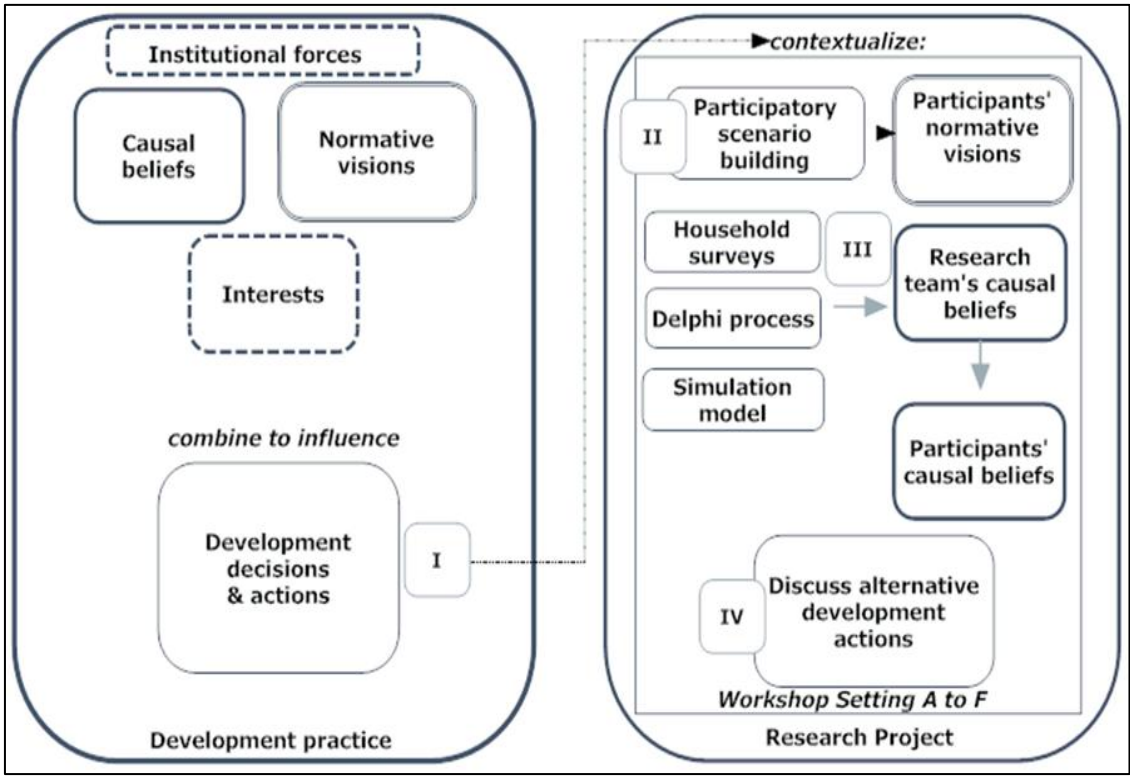
Figures

Tables

1 Introduction

This document is a compilation of scenario outputs produced during participatory multi-stakeholder workshops organized between January and August 2011 as part of the **Exploring Mekong Region Futures Project**. Our intent is to provide key outputs of the scenario building process as a reference for researchers and practitioners. We conducted eleven participatory scenario building workshops in six settings: Cambodia, China, Laos, Thailand, Vietnam, plus a regional setting. Scenario building was used to generate a set of 'visions' of the wider Mekong Region, which, following the Project's methodology, was recorded (see Figure 1, step II) before subsequently uncovering participants' causal beliefs, that is, their beliefs about how to attain particular visions. By visions we refer essentially to verbal images and storylines which describe an ideal future. The stories produced through this process contain both desirable and undesirable events. The visions are plausible to the extent that they are embedded in plausible stories produced by the participants (see Foran [in Press]). Section 2 of this document summarizes the methods used to create the narratives. Sections 3 to 9 present various outputs of the process, notably the initial and group-specific 'scenario frameworks'. These frameworks are the foundation of the creative narratives. We then present the lightly edited narratives, one for each group of participants in a given process. After the narratives, we show tables which summarize the vision as desired and undesired events according to the perspective of each group.

Figure 1 Role of participatory scenarios in Mekong Futures project



Source: (Foran et al. In press).

2 Method

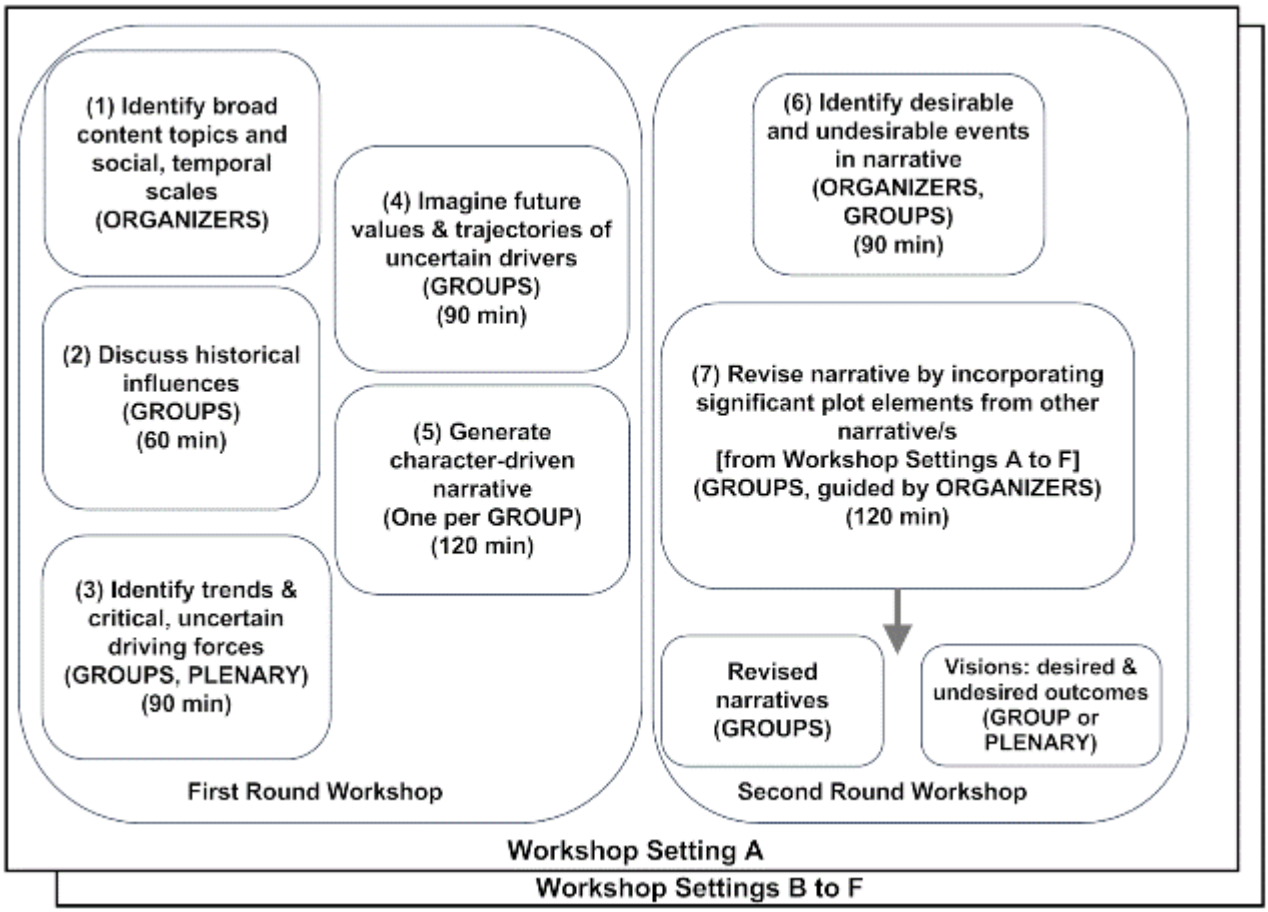
Rationale

The qualitative scenario-building activity was the first workshop in a series of workshops organized at the regional level and local levels, as described in the Project's methods paper (Smajgl et al. 2011). A primary goal of this activity was to allow 'visions' to emerge.

We defined a vision as a set of desired and undesired events discernible and embedded in a participant-created, exploratory scenario narrative. Exploratory scenarios express plausible, emergent consequences of selected driving forces. Participants created such scenarios during a first set of workshops. In a subsequent set of workshops they explicitly reflected on normative aspects of their narratives.

This section summarizes the seven-step technique we developed to generate the detailed, exploratory scenario narratives (Figure 2). Readers interested in additional details and results (including participant and organizer reflections on this activity) should refer to Foran et al. (In press).

Figure 2 Narrative scenario building process



Source: (Foran et al. In press).

(1) Scoping and contextualization

The process requires preliminary identification of the subject (issue) and defining social, geographic, and temporal dimensions of mutual, negotiated interest to scenario organizers and prospective participants. When the goal of the exercise is to explore the future of a geographic area, which will be influenced by multiple policy issues, subject and temporal scale should not be defined too narrowly.

(2) Discuss historical influences

This step focuses on exploring the question "What forces have made the area or issue what it is today?" Although a scenario exercise aims to explore the future, clarifying the role of social forces and influences that have been important in the past is vital. This step provides a way to move between the essentially arbitrary system boundaries chosen in Step (1) and the future-oriented discussion beginning in Step (3).

(3) Create initial scenario framework

This step leads to an initial scenario framework: a set of important social and ecological driving forces, classified as either trends or critical uncertainties. Driving forces are scale-dependent factors that have an influence on the system and that are usually out of the short-term control of policy makers. A critical uncertainty is explained to participants as a force with high impact, but with multiple possible future outcomes or trajectories (Jäger et al. 2007). Driving forces can be classified on a two-dimensional array in which the horizontal axis represents perceived uncertainty, and the vertical axis represents perceived importance, in terms of impact on society. This array constitutes the initial structure from which detailed narratives can be subsequently created (see e.g. Table 1 below).

(4) Create a specific scenario framework

The purpose of this small group step is to create a finite and coherent set of imagined statements about the future, from which a more elaborate narrative can be created. This framework should include trends as well as critical uncertainties selected on the basis of their interest value to participants.

(5) Generate first-order narratives

The purpose of this small group step is to translate dynamic abstract forces in the specific scenario framework into a concrete and more detailed qualitative narrative. A scenario storyline should, by definition, offer answers to questions of agency – how change occurs (process or mechanism) and by whom – questions which are underdeveloped or missing from the specific scenario framework.

The Project found it useful to generate individual character-oriented stories. Visualizing individuals - as opposed to only more abstract entities such as nation states, markets and other institutions, or large organisations - challenges story developers to imagine how forces and events in the scenario framework manifest in the lives of individual protagonists.

(6) Recording notable events and dynamics

This step allows organizers and participants to begin reflecting on significant events and dynamics that occur in their first-order narratives. Such events and dynamics are "notable" in large part because they include normatively desired and undesired changes or outcomes. Prior to this step, scenario organizers analysed each narrative, identifying and tabulating notable events, classifying them as desirable, undesirable, or ambivalent (see Annex). Using tables of candidate events as an aide to discussion, participants review their first-order narrative, and generate their own table of notable, desired and undesired events.

(7) Revise first-order narratives

This activity allows participants to improve the coherence, plausibility, complexity, and interest-value of narratives. Participants can enrich draft narratives in several ways. They can add more imaginative detail about what happens to key drivers over time; draw on elements from the original joint scenario framework not yet used; and revise their narrative after reviewing dynamics and plotlines that appear in stories

created by other participants (i.e. other small groups in the same workshop or other groups in 'distant' workshops).

Stories

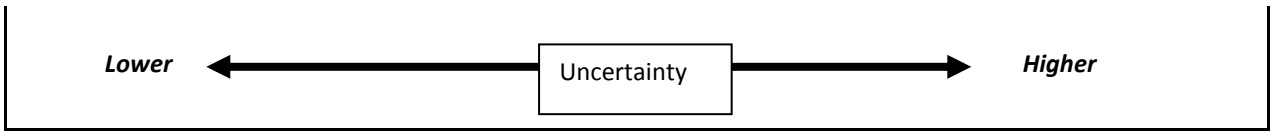
A total of 21 narratives were produced (one revised narrative per participant group), ranging in length from 472 to 1404 words (μ=900, σ=261). Seventeen out of 21 groups completed the full methodology. On average, narratives produced using our character-driven technique are significantly longer ($0.001<P$) than participatory rural development scenarios reported by Van Berkel et al. (2011). Average narrative length increased between first and second round storyline development ($\mu_{roundone}$=687; $\mu_{roundtwo}$=945 words, n=17). Rotational turn-taking between participants resulted in significantly longer narratives ($0.001<P$).

Topics common to all workshops included environmental change, rural livelihoods and farming systems, governance responses to social inequality, and enabling institutions at different scales (Foran et al. [In press]).

3 Regional scenarios

Table 1 Initial scenario framework

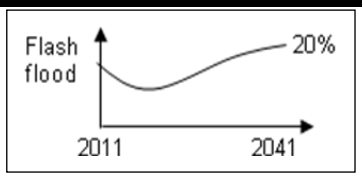
	Trends	Uncertain drivers
Higher Impact	Social, political, economic • *Increasing mobility of population* • *Industrial development* • *Open market & border trade* • *Market economy* • *Tourism development* • *Economic development models* • *Yunnan as "Gateway" strategy* • *Implementing environmental protection policy* • *Urbanization* • *Jinghong geographic position* • *Cash crop plantation* • *Human intervention* • *Car industry development* • *Improving infrastructure* • *Technology development & import* • *Migration* • *Industry needs* • *Integrated regional economy* • *Internationalization* Natural resources and land use • *Limited land resources* • *Land use intensification* • *Increasing demand for natural resources* Ecosystems • *Climate change (temperature increasing)* • *Environmental protection* • *Rain forest protection program in Xishuangbanna* Food • *Dietary transition from rice based to diversified diets* Energy • *Hydropower development*	Social, political, economic • *Demands of outside market for natural resources: land, hydropower, minerals* • *Guiding policy of economic deployment* • *Local future economic plan* • *Globalization & promotion of China's position in the world* • *Investment* • *Changing prices of rubber and tea* • *The power of the outside investors* • *Changing life style* • *Vocational & higher education* • *Increasing population* • *Government policy* • *Capital flows* Natural resources and land use • *Natural resources' property rights* Ecosystems • *Impacts of chemicals used* Food • *Water resources for agricultural production* Energy • *Alternative energy: biofuel and other alternative energy technology*

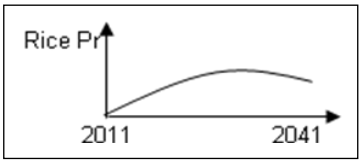


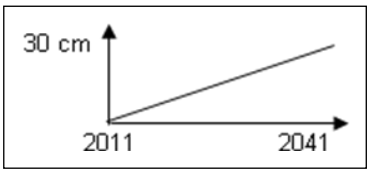
3.1 Regional Group One: Angkor group

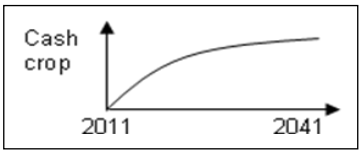
Table 2 Specific scenario framework

Trends & uncertain driving forces	Imagined outcomes 2011 – 2041 / Trajectory
Climate change	Sea-level rise (20-30 cm) Less water available Extreme droughts/floods Temperature increase 1C Land slides & Flash floods Decrease aquatic animals Rice production increase but more vulnerable Biodiversity degradation Low carbon technology New investment opportunities NAMA (Reforestation REDD+) Regional carbon market
Land use change	Less land for agriculture More monoculture plantations (cash crops) Less rice production Consolidated intensified farms Few forest 'islands' left Agricultural intensification
Investment (social & environmental impacts)	Water pollution, air pollution, land fill Industrialisation More investment in green sectors Higher income in urban More off-farm work Market-forces reinforcing inequalities Labour-intensive sectors moving to Laos and Cambodia Increased social welfare and protection Increase income unbalance
Urbanisation	Urban share of population increases from 35% to 66% (logarithmic) High education (100% literacy) High demand for niche market like organic food, herbal medicine, High speed intercity links New transport technology Urban energy production Urban food production
Regionalisation	Mekong Council Trade liberalisation with transparent processes Increased specialisation









	ADB facilitated process, increasing investments (economic relationships) and improved dialogue, will lead to constantly increasing regionalisation National bottom-up process nurtured from outside

Narrative

It is the year 2041, Mr. Kong is 60 years old and lives in Chiang Mai renting an apartment. Unfortunately, his apartment is located right next to a high-speed railway close to a slum area. Before, Kong lived in the Mekong Delta but his land got flooded. He was a rice farmer. His farm had suffered before then by increased climate variability and salinity levels. Neighbouring communities debated collectively how to stop the salinity intrusion and they submitted a proposal to build embankments to the provincial Government. His rice production and the rice production in the whole area was peaking just before 2020 but the salinity levels and other climatic factors had caused a continuous decline in rice production ever since. However, now new rice varieties were developed that use just half the water and are much higher saltwater resistance. But back in 2020 changing environmental conditions translated into dramatic reality as some villages in the Delta had to be resettled, and Kong was very worried about the next 20 years. Nobody knew how much sea level rise and environmental change would happen. In 2020 he had to migrate to Ho Chi Minh City where he rented a city apartment.

Kong has three children, two sons and a daughter. He remembers how when his oldest son turned 20 and couldn't find a good job and had to start in a garment factory. But later his son started a trade and investment company working mostly in Laos, Cambodia and China. Over the past few years his oldest son also invested in strategies to avoid the new carbon tax to improve his other businesses. First, he had to take a course to learn about carbon trading and he wished the government would provide better facilitation in the highly complicated process of getting carbon funds. However, after the training course, his oldest son provided capital to other enterprises throughout the Mekong region to reduce carbon emissions allowing these companies to profit from the carbon market, which was introduced in 2020. Based on his success, Kong's oldest son moved to a small mountain village close to Luang Prabang. He bought a block of land but prices had risen dramatically over the years.

Kong's daughter teaches English and Chinese at the international school in Phnom Penh. Kong's youngest son lives in rural areas in Savannakhet where over the past thirty years access to markets was improved and irrigation and electricity infrastructure has been developed. Once a year, Kong spends a few weeks in the rural areas of Savannakhet where his youngest son lives to get away from the city pollution.

Kong is very happy with the progress of his children because they all found a good job and some of his own investments over the years since he moved out of rice farming have turned out well. At one stage he did lose a lot of his money in investments in rubber plantations due to the drought. Already when Kong moved to Chiang Mai he visited the area of North Thailand for his investment ideas but the water in many areas was too polluted for green investments.

Major new infrastructure is having a mixed effect on the region. Hydropower investments have helped meet the increasing energy demand across the region, but have had a variety of other environmental and social impacts. New large scale irrigation investments enabled by hydro reservoirs have affected the distribution of water at the local and regional levels. Mining investments have contributed significantly to regional growth, although have also contributed to regional air and water pollution.

Improved governance and regional institutions has resulted in effective power trading across the region via a regional 500kv grid, resulting in increased energy efficiency. More effective water management at the regional level has helped countries in the region avoid conflict over scarce water resources, and cooperate on flood management. Food security has been achieved via steadily improving agricultural, fisheries and aquaculture productivity, enabled by new technologies and improved extension services.

Currently, Kong discusses with his oldest son to borrow money to invest in organic farming, which would deliver its produce to local markets in Chiang Mai. Kong grows himself vegetables on the rooftop of his

apartment, next to the solar panels. Kong believes in his organic food idea because food production in the Mekong region has turned into intensified large scale farming. But at the same time, demand in cities is increasing for niche products, such as organic food. He is ambitious to expand his business by investing in other green sectors to reduce pollution. His newest idea is papaya. Kong's oldest son's wife is a biologist and provided him with special seeds that were developed in space to produce large size papaya, three times the size of papayas he remembers from 2011. Kong is planning to join a local farmers group that helps members adopt new technologies and understand the market, which has helped many others in similar positions. Another idea is aquaculture, but the problem is to find the right fish species. He doesn't want to use exotic species although they are easier to grow because he is very worried about diseases, especially during the dry season. His children gained experiences with aquaculture in Vietnam, Cambodia and Laos.

Kong also invests in solar energy solutions, which increases his carbon budget allowing him to still drive his car. But because Kong loves the environment he decided to drive a hybrid car. He always reminds his youngest son to drive more fuel efficient cars, because he grew up in Savannakhet and just a few drive hybrid cars.

Kong plans to write a story about his experience in the Mekong region to explain how the regionalisation evolved. In this book he also wants to continue urging the Mekong Region Council [a new institution] to improve social welfare payments, especially for people in slum areas. But Kong's particular concern is to lobby the government against deforestation and environmental damage.

The NAMA Committee [a new institution] helped to establish targets and incentives to reforest 40% of the land and reduce the Mekong region emissions by 20%, and local communities and governments were able to meet this target.

[Note: NAMA refers to 'Nationally Appropriate Mitigation Action' under the UN Framework on Climate Change. This is a relatively new concept whose operational rules have not yet been specified. It is similar to the concept of 'Program of Activities' (PoA), which is a mechanism under the Clean Development Mechanism to generate Certified Emissions Reductions at the household and community level (i.e. scaling up opportunities for emissions reduction beyond the level of a single project). The emissions reductions can be sold on international carbon markets.]

Especially since 2020, the few forest islands that were left started to get connected, which was funded and implemented by local conservation-driven committees. But lots needs to be done, Kong thought. City life, for instance, gets more crowded every day and energy and food demand seems to grow exponentially. City planning seems to require much more investment to provide a healthy environment for the urban population.

Kong heard through his own blog about Chinese scientists that found that increasing water pollution is posing growing risks to regional food security.

This morning he read in the Mekong Post about the flash floods killing more than ten people in Northern Laos and destroying many houses. He thinks it is really time to develop a local action plan for climate adaptation.

And because he believes in own action, Kong started planting trees quite some time ago. He is so excited about his tree planting; not only did he get the carbon credit from the regional carbon market but also hornbills returned to his forest and he received additional payments for these ecosystem services. All his experiences have brought him many invitations to international events. Just last week he received an invitation to the 43rd regional working group meeting convened by Alex's daughter, who is now the CEO of CSIRO.

One point Kong wants to make during this workshop is to emphasis the social dimension of climate change. Kong believes that the weather is getting hotter and he believes this is due to the increasing energy consumption and he recognises that the costs of energy increased slightly, which is OK for upper classes but because of the increasing income gap he wants the government to help the poor households.

3.2 Regional Group Two: Tonle Sap group

Table 3 Specific scenario framework

Trends & uncertain driving forces	Imagined outcomes 2011 – 2041 / Trajectory
Trends	
Demands for natural resources	Increase
Foreign direct investment	Increase
Regional integration	Increase
Economic inequality	Increase
Uncertain drivers	
Governance	Low quality 2011-2025 for natural resources; Improvements in social welfare before 2025 Rapid improvement after 2025
Coordinated use of Mekong basin water resources	Emerges after 2027 "law enforcement at regional level"
Environmental impacts	Increasing negative impacts until 2025; U-shaped trajectory; Degradation is halted by 2040
Future of smallholder farming and fishing livelihoods	[see narrative]
Migration	Significant rural to urban migration
Emergence of middle class	Yes

3.2.1 DISCUSSION OF FRAMEWORK: MARCH 2011

Ton Lennaerts: We started out discussing and agreeing on a number of certainties, these are ongoing trends you can see developing already in the basin. These are the natural resource demand, direct foreign investment further increases in future, and because of that, demand for skilled labour and education is given a lot of attention; industrialization and mining increases. Regional integration increases due to the investments in natural resources development; [integration] brings also more trade and transport. Because of these events the natural way of life of parts of the basin is really changing and will change further. There is a widening gap between rich and poor. These developments are inevitable. They are happening and will continue.

The uncertain drivers on which we agreed are [1] good governance, and enforcement of laws and regulations, enforcement capacity of natural resource management agencies; another uncertain driver is [2] the coordinated use of the basin's water resources; [3] environmental impacts are uncertain in future; [4] small scale livelihoods meaning small farmers, fishermen; it's uncertain what their future will be. Then we have [5] migration from areas because of all this [investment]; there will be resettlement areas because of environmental deterioration [environmental services won't be as good as in the past] then we have [6] an emerging middle class of people who are well off.

On all these six uncertainties we discussed the trends, how they could develop between 2011 and 2041. Just to give a few examples, good governance - enforcement of the rule of law, regulations, enforcement capacity - we agree this would go on at the present low implementation levels in each of the countries, but

because of activities in 2025 related to more democratic governance in some of the countries in the basin, and also because of a big disaster of which you will hear more, and more activism from NGOs, there is [indeed] change.

Governments get serious about implementing their laws and regulations, serious also about building enforcement capacity in responsible agencies; and then we see an improvement of governance related to water and environmental resources.

Similarly for example on the environment, the environmental impact will continue because of all this foreign investment in natural resources development and other sectors, and a large emerging middle class. This middle class becomes larger as you can see here . . . only when government is serious about implementing their environmental laws and regulations, then we see that environmental degradation will come to a halt in say 2040. [Based on] these trends to 2040 we have built a storyline.

Narrative

This is the story of Bopha and her brother. Bopha is an 11-year old girl from a floating village. She has a six year old brother, Pisith. This is her mother, Kunthea, her father is away somewhere out fishing in the lake. Her father's name is Libok.

This family, like most of the other families in this village, made a living from fisheries.They were very poor and in 2011 the government is very corrupted. Government officials often come to the village to collect money and there is no transparency in governance and the people are suffering a lot during this time. Bopha has got to drop out when she only finishes grade 3. She started helping fishing in the village with her parents. In 2020 she became sixteen years old, so she decided to move out of the village to seek a job. She worked in Phnom Penh as a housekeeper, and also she worked in a restaurant to make some money to help her parents. During this time, in the city she sees shopping malls, the Wal-Mart shopping centre, and more and more cars; traffic jams are commonplace. But she also buys a mobile so that she can sometimes call home and she also regularly goes back to the village to visit her parents and she sees big changes in the village. During this time, there was a lot of improvement in governance in terms of law enforcement consistent with other GMS countries. Democratic elections happen. Because of investment from the government, her brother is able to attend university and the government is really trying to help the poor and use part of national revenue for poverty reduction.

The Green Angkor Company invested in a dry fish processing plant and offered some training courses to villagers in order to make them good employees. The company also provided credit access to villagers who become contract fish-producers now. Production went skyrocketing and people initially made a lot of money, which encouraged more and more people to join them. Eventually, the whole area was full of nets and feedstock.

However, the company went bankrupted due to the overproduction and pollution caused by excessive artificial fish-raising, water in the floating village gets seriously polluted. Since this is a fishing village, people do not have land, not even in the dry season. There are obviously fewer fish, and smaller fish, in the lake. Out-migration becomes a necessity. Some friends of Bopha move to town to work in nearby [?] projects, some friends move to new or emerging town, some work the same town as where she works, Nagatown. She actually gets rich enough to send some remittances home to support her family and life seems getting better and better day by day.

She attended some training programs provided by the govt, especially development projects which was related to integrated non-polluting agriculture. She also attended another program which linked farmers to the market. After these training courses, she used the skills and cooperated with other trainees, they signed contracts (oral, informal agreement) with sellers which ensure their reliable organic food production. They then became economically viable, their social network improved. More and more people attended various kinds of training courses, and had a better chance to get a job and become more accessible to various job opportunities. Some even started their own business and created jobs for their relatives and neighbours.

But suddenly in 2024 a flood struck the country and affected a significant part of the region. In the flood she lost some of her relatives including her parents. After this disaster, the influence of civil society in the country increases in number and gets stronger. More and more people get activated and they participate in trying to bring some changes to the country and to the community. Under such circumstances the government improves in many ways in democracy, and civil society is growing separately. Bopha decided to do something to change the situation in her native community. She and her colleagues want to make sure the water pollution won't happen again. They organise regulation lobbies to local government officers and lectures to raise public awareness of serious water pollution.

People know more and more about themselves and the outside world, and government is forced in some ways to change. So by 2027 government becomes serious in imposing law enforcement at regional level. By this time, Bopha becomes a married lady who returns home again with her children to visit her brother. Now her brother's family becomes one of the middle class families. Her brother becomes a leader of a Clean Water political party, and he is highly motivated to push the present government to set up a public monitoring system to ensure effective enforcement .This is adopted by other GMS countries leading to improved political stability.

She finds that many middle class members get a lot of land and the environment is slowly improving. After the disaster, the six countries agree to sit down to set up a committee which include different parties and shareholders in each country. The committee adopts standardised law enforcement to improve the water management and the environment in the region.

3.3 Regional Group Three; Banteay Srey group

Table 4 Specific scenario framework

Trends & uncertain driving forces	Imagined outcomes 2011 – 2041 / Trajectory
Trends	
Energy demand	High
Food security for Mekong people	Declining
Regional integration	Increasing, but bilateralism stronger than regionalism
Uncertain driving forces	
Price of oil, price of carbon	150% increase in real price
Carbon capture and sequestration technology breakthrough	Viable after 2035
Policy support for RE	Renewable energy share equals 20% of total energy supply 3 dams built on Mekong (totalling 3000MW)
Policy support for nuclear	No support because no safe nuclear
Free trade agreement	Yes
Land concessions	Yes
Rail link	Yes
Fish availability (Mekong wild fish)	10% decrease; >300% increase

Narrative

My name is Bopha. I am seventeen years old in 2011. My family has a small amount of land and my mother Ranee sells things at the market. My father Sophanna is a farmer, he is forty years old.

One day in 2015, a solar & biomass power plant is built in Bopha's village. A young man named Jie Tang from China who is studying power engineering, visits the village to help built the new plant, which is funded by World Bank and Asian Development Bank.

Until that time Sophanna had been improving his farming with a 'system of rice intensification' which requires more chemical inputs and water supply. Bopha was 21 when the energy plant arrived, and it allowed her to buy fish and process it using the lower cost energy.

Three years later, with the income from fish processing, Sophanna opens a larger store selling things from China. Sophanna asked his wife to stop selling things at the original market store and manage the fish processing business.

However, because of the increased water pollution the fish population has significantly been declined and fresh fish price was increasing. Combined with the oil price increase, this reduced their profits. Sophanna asks Bopha's brother Vireak to come home from university to help with the business.

Meanwhile Jie Tang is now a young engineer working in the regional electricity dispatching centre (established 2022) dispatching hydropower from Yunnan and Myanmar. He visits Bopha's village. He is welcomed in Cambodia because of a wonderful regional energy deal negotiated in 2020 due to increasing regional cooperation under GMS Environmental and Development Committee, allowing the construction of a physical grid. The biomass power plant can now sell power to the grid, further increasing income.

In 2025, a free trade agreement is signed by the GMS countries. The fish business becomes unviable because of cheaper fish imports from Vietnam, and the family fish business becomes bankrupt. Meanwhile a Chinese investor offers to buy the family's two hectares of land for the purpose of building a pulp and paper mill. The family decides not to sell because land is scarce. Many villagers discussed the issue and they felt that they would be better off selling in five years because of news of a new road. One day father Sophanna comes home with a sad face, he says I heard there will be more hydro dams upstream. Maybe the family should move to town. The family also learnt that a road will be built and the compensation paid is only one-third of the land cost. They discussed the option to go to the city and decided to go. By 2030 the family is in the city of Siem Reap and Bopha's brother makes a living as a technician servicing solar hot water and PV.

In 2030 nuclear is not available, and Jie Tang is at a meeting debating whether to build more hydropower plants or not because of major impacts of dams experienced in China. Cambodia's PM in his 52nd year of rule, finally agrees to the Lao dams because he has negotiated a fair energy deal for Cambodia.

Bopha is unsuccessful finding work in the city. Meanwhile the pulp and paper plant did not materialize because of water shortage resulted from increased water extraction for sugar cane plantation in the North-east of Thailand, the government decided that some upstream watershed areas were critical for conservation, promoted indigenous species timber plantations and new rice varieties with less water demand and high yield

Payments for environmental services become available. Bopha is now married and she and her husband, who has a background in forestry, move back to her home village to join the community tree plantation enterprise. He promotes tree planting by people in the village in order to conserve forests and promote ecotourism By doing so they can increase incomes from selling carbon credits.

Meanwhile in Vietnam water level is becoming less and less and there is a feeling of water shortage, and loss of fisheries. Vietnam sends a delegation to Cambodia and Laos to negotiate limitation of planned dams and upstream rubber plantations, but this is unsuccessful.

By 2030 Sophanna is 60 years old. With money from selling land and farm machinery, he buys a new plot of land on outskirts of city, and starts growing vegetables and fruit trees to earn some income for his old age.

By the year 2035, because of stresses in the Vietnam Mekong Delta, many people from Vietnam move to Cambodia in the area where Jie Tang is now one of expert group supervising construction of one of Mekong dams. Because carbon capture and sequestration technology is now viable, more coal fired plant are built. Later Jie Tang becomes director of the GMS power grid. Twenty percent of all energy is from renewable energy including large hydropower. This is no development of nuclear power (because lack of confidence in finding a safe technology).

Many years ago Jie Tang married Bopha's beautiful sister. To expand the coal part of the grid, Jie Tang and Bopha's sister decide they need to go to Vietnam for five years. Their three children are now citizens of the

GMS. Meanwhile the price of carbon has gone up 150% from what it was in 2030, Bopha's tree plantation is more profit from selling carbon credits. It has opened up opportunities for agro-forestry which is benefiting the region. Produce from sustainable & organic agro-forestry now being shipped out north.

One day some investors decide to explore a wood processing factory in the community because the cost of transport is quite high. Meanwhile in Vietnam land use changes, less land is used for rice, aquaculture expands, many farmers move either to Cambodia for fish processing or Thailand to practice agricultural diversification with mix crops.

By 2040 two railway lines are built from Siem Reap to Thailand and to the Laos border. Money from Cambodian oil revenues funds these. Sophanna is now 70 and his market veggie business is small but successful. Has a contract to sell to Koulen II, a large restaurant popular with tourists visiting Siem Reap. Bopha has had an interesting life. Her daughter is now 17 and deciding what to do with her future. Should she join her uncle to work in bio-energy or should she try what she can make of her life in a big city where many industrial zones demand more labour?

By 2050, all three Lao dams are operational. Governments of GMS countries organize community consultation around additional proposed dams. Bopha's daughter says no, we don't want more hydro because of impacts on biodiversity. So in the region there is more pressure to build coal plants.

Laos decides the three dams on the Mekong are enough. Energy demand is real and strong and price is high. Laos is benefitting from its reform of hydropower governance back in 2012, implementing payments for environmental services (PES) and benefit sharing throughout the country.

Bopha and her sisters and their husbands take a rare holiday to Laos after a long life of work. After their holiday Bopha decides there is huge potential for tourism in their own area, especially since tourism is booming in Siem Reap. She encourages her daughter to return from Bangkok to start a small eco-tourism venture in their area. Looking back on their life, Bopha considers that she and her family are lucky.

3.4 Summary of desired events

Table 5 Summary of desired elements in first-round narratives

Desired element	*Additional comments*
Group One	
Social reform that can be implemented without having a major crisis or disaster as a trigger	Critical discussion of the relationship between disaster or crisis and social change; role of individual champion
Deeper regional integration	Example: reorganization of GMS and MRC into a supra-national institution with a broader mandate (than water) considered to be relevant by all stakeholders. Downstream countries like Vietnam may be increasingly interested but do other countries including China have sufficient incentives to join?
Carbon trade	Requires carbon tax; environmental education; international technical assistance
Group Two	
More cooperation among Mekong neighbours	"We haven't found an acceptable term to describe water management in the Mekong region"
Improved governance	Improved governance requires improved management and monitoring
Benefit sharing	Some members of the Group argued for a re-conceptualization of ecosystem services: not just as a property right or common access but also something that has economic value and can be replaced [?]
Group Three	
Successful reform of hydropower governance	

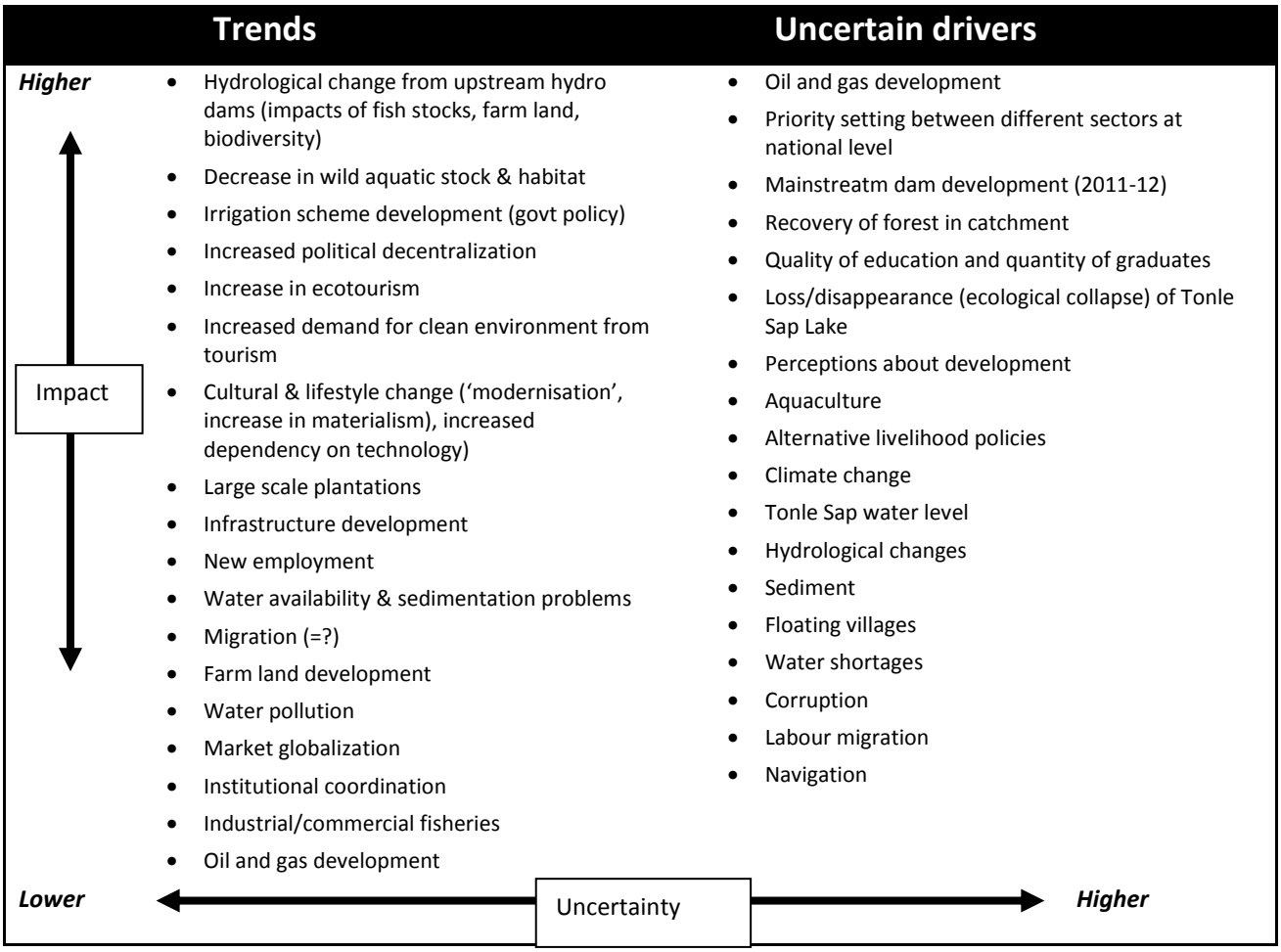
(including in Laos)	
Payment for environmental services	Requires understanding value of such services
Possibility of significant upward mobility for rural people	In the Group's story several improve their level of material wellbeing by starting or joining new 'green technology' businesses

Source: Authors, based on workshop discussion

4 Cambodia (Tonle Sap) scenarios

Note: The scenario frameworks were developed during the first round workshop (16-17 March 2011). The narratives presented below are revised narratives from the second round workshop (6-7 July 2011).

Table 6 Initial scenario framework



4.1 Group One

Table 7 Specific scenario framework

Driving force	Imagined outcome 2011-2041
Trend	
Policies favoring large-scale agribusiness	Yes
Transition out of subsistence agriculture	Yes
Uncertain drivers	
Alternative livelihood policies	(Not clear) Weak social safety nets on the one hand; Inevitable livelihood diversification on other hand

Narrative

In 2011, Mr Phalla, 45 years old, lives with his wife, Mrs Phally and four children in Kach Rotes village, Kompong Prieng commune, Sangke district, Battambang province. Mr Phalla remembered that 25 years ago he lived with his parents who were moderately well off famers with four hectares of paddy lands. All those paddy lands were given to their six children who had their respective families. The number of families increased, but the amount of agricultural land remained the same. They were therefore forced to allow their children to migrate to seek employment by selling their labour and clearing mined forests to expand their agricultural land to earn their living. Mr Phalla also remembered that prior to the Paris Peace Accord, this area was full of mines and UXO and many people lost their lives or became disabled when they went to clear thick low forests. People still face mines and UXO that have been causing danger to people and cattle.

In 2010, Mr Phalla heard that the Royal Government of Cambodia developed a new rice policy introducing the ten rice seeds in demand with the international market supply to export one millions ton of rice by 2015. Mr Phalla and his family were satisfied with this policy, expecting that the Royal Government would help provide advanced technology, and expand the irrigation system and the use of organic fertilizers. However, he had a small area of paddy that was hardly enough to meet his family's needs, not even talking about the remains for sale on the market. Therefore, he thought that he had to try to enhance cultivation techniques, select seeds and farm fish in the paddy according to agricultural technical specifications in order to increase rice yield and food to upgrade his family's standard of living.

Moreover, Mr Phalla's family also observed that this new rice policy attracted local investors and other foreign investors, whereby many companies would purchase land from local people to create large farms for rice growing. These promoted development of infrastructure and new technologies. Some local residents were no longer farmers as they had sold paddy to companies to establish large plantations using local people's labour and machinery. Mr Phalla's children and the young people in his village could become factory workers, but these jobs were not stable as the social safety network was still weak and incomes as well as savings were still at low levels. Mr Phalla expected that the government would establish and implement more new policies to protect the interests of workers and farmers through such means as the social welfare policy, irrigation policy, salary policy, agriculture sustaining policy, vocational training and land policy and so on.

To become professionally skilled workers, the Royal Government took a long-term investment measure to eradicate illiteracy and promote an education and vocational training program.

Through the above principle, Mr Phalla expected that between 2030–2040 local people would become skilled workers in the areas of irrigation system control, modern agricultural technologies (fish breeds, seeds of rice, crops, organic fertilizers, use of rice transplanting machines, rice harvesting machines and

other equipment). People living in his locality would make a change from the economy totally depending on nature to agro-industry. By 2030, Mr. Phalla expected that two of his four children who had their respective families would become model farmers with machinery and achieve high yield and the other two would become merchants and rice mill owners.

Mr Phalla heard that there was a change to using rice seed that needed less water than before but produced high yield and rubber dam water storage systems/airbag dams. Therefore, he hoped that traditional or customary farming would change and intensive rice farming would be adopted by gaining good experience in the region. However, Mr Phalla grew concerned about the news that dams had been constructed and a water diversion project constructed at the upper Mekong River and the Tonle Sap Lake's surroundings and saltwater protection project, and the flood prevention project at the lower Mekong River. Mr Phalla used to read and had heard the news that when all the dams were constructed and put into operation in 2020, hydrological patterns and alluvia would change biodiversity and agricultural production around the Tonle Sap Lake.

4.2 Group Two

Table 8 Specific scenario framework

Driving force	Imagined outcome 2011-2041
Trend	
Dry season agricultural development	Yes
Economic globalization	Yes
Mining development in the Tonle Sap ecosystem	Yes
Uncertain drivers	
Forces affecting hydrology and sediment regimes	River and lake no longer exist in 2040
Loss of forest cover	Ongoing loss despite a forest management policy, because infrastructure development is given higher priority

Narrative

This is a story about Mr. Sante Vitou's childhood during the 1980s when he was a resident of the Kravanh district, Pursat province. The place where the child Sante Vitou used to live had three natural rivers: the Arai River, the Tauch River and the Thom River (Pursat River). The Arai River and the Tauch River flowed into the Thom River across Pursat provincial town towards Tonle Sap Lake. The three rivers created a rich and beautiful landscape around the rivers, attractive to all people and animals. The three natural rivers were not only places that provided a beautiful landscape to look at, but were also great warehouses of natural resources that played important roles in helping local people to make their living through the collection of products and by-products of those natural resources. Unfortunately, after that the natural resources were no longer abundant.

In 1992, in the gradual step towards peace along with the increase in number of people, their livelihood demands doubled and the lack of skill in effective and sustainable management techniques, the destruction of natural resources, particularly forests, with the aim of encroaching on lands for cultivation, housing and forest exploitation by outsiders emerged on a larger scale and with clear arrangement. In the meantime, due to the lack of laws, standard legal documents and policy in maintaining and protecting these natural resources besides from direct destruction, there was also indirect destruction such as pollution of natural resources through the use of chemicals (chemical fertilizers and agricultural pesticides) and forest fires.

As a result of this destruction of natural resources, the living standards of local people became more and more difficult as they could no longer make their living by only collecting products and by-products of natural resources. More severe than this, due to the effects of climate change, for example droughts and floods, the farming business of local people was unable to achieve high yields, sometimes achieving no yields. Due to these negative factors, inactivity and seeing more serious impacts on the livelihoods of people of the generation to come and to restore the natural resources that were almost totally wiped out, the Royal Government of Cambodia in the 2000s with spiritual, financial and technical support from national and international communities arranged to create laws, standard legal documents and policies related to the control, utilization and punishment imposed on any individuals who caused destruction, which would lead to disastrous outcomes for natural resources in the near future. Obviously, in order to control and utilize natural resources and for sustainable development, the Royal Government of Cambodia compiled the laws, standard legal documents and policies such as the declaration on the policy for national forest control in 2002, the land law in 2001, the law on commune/sangkat administrations in 2001, the law on forestry in 2002, the sub-decree on the concession forest management plan in 2000, the sub-decree on forest community control in 2003, the law on natural protected areas in 2008 and the program on livelihood and control of natural resources for 2006–2010, the law on water resources management in 2007 and other laws. In the meantime, the Royal Government of Cambodia has also tried to realize some other draft laws and sub-decrees such as the draft strategy for the control and evaluation of the program on livelihoods and natural resources management for 2006–2010. Moreover, in order to develop and facilitate improved living for people, the Royal Government of Cambodia has been improving and constructing additional infrastructures such as roads, bridges, schools, irrigation systems and providing employment opportunities through national labour institutions and local and international business partners. Moreover, in order to safeguard and encourage people's farming businesses, the Royal Government of Cambodia has provided advanced knowledge on agricultural technical skills including other crop seeds according to seasons and zones providing high yields such as rice seeds, animal, fish, etc. and has also helped seek domestic and overseas export markets.

Observing serious impacts arising from the destruction of these natural resources and the existence of laws, standard legal documents and policies and various other efforts of the Royal Government and the active participation of people in strengthening the enforcement of laws, standard legal documents and policies with a spirit of great responsibility and effectiveness, the natural resources around various rivers in Kravanh district that used to provide a beautiful landscape and views for all people and animals, and used to play an important role in improving the livelihoods of local people, will be controlled and developed promptly. Otherwise by 2041 local people would face disasters such as the forest becoming sparser, changes in the water level, a gradual decrease in fish and fishery resources, a gradual decline of land since there was no care and protection. The above-mentioned three rivers may therefore become shallow and dry.

4.3 Group Three

Table 9 Specific scenario framework

Driving force	Imagined outcome 2011-2041
Trends	
Quality of education	Slow improvement 2011–2031, skill gap not closed; fast improvement after 2031
Hydropower dams	Mainstream dams are developed
Hydrological change	Strong changes with negative impacts
Uncertain drivers	
Oil & gas development	No development (because of national heritage significance)
Corruption	Yes (affecting forest management)

Narrative

A girl named Nary was a daughter in a fishing family in Prek Toal village, Battambang province. She had five siblings and was the oldest child. She was educated to grade 5. Her family livelihood depended entirely on fishing. In the past, that place was rich in natural resources and was a beautiful landscape with an abundance of natural resources, enabling her family to make a prosperous living. People in the village did fishing, cutting thick low [land] forests for sale in the rainy season and caught small animals and bird eggs for grilling. This abundance attracted many people who started to move into the village to do the same businesses. Major problems occurred as a result in keeping with the saying that people, both big and small, gained benefits according to their abilities. These put great pressure on these natural resources.

Before 2003–2004, other pressures that could destroy these resources were not of interest to people. Population growth, especially the entry of people into the district and business operation using natural resources for additional income to earn their living, and the increase in temperature were other major pressures on ecological change in their areas. In 2004, impacts clearly emerged making the government, organizations and people grow increasingly concerned.

Fishing yields significantly decreased and thick lowland forests as well as birds were almost completely wiped out. Due to the change in hydrological patterns, many people, including Nary's family, faced extreme difficulty in their livelihoods. Young people migrated to Phnom Penh to seek employment to support the families. Nary also wished to go with them, but her parents did not wish her to go yet as her younger siblings were still small and Nary's mother wished to try a new opportunity in the village.

In the meantime, some nongovernmental organizations noticed the village's possibility of attracting tourists and also noted potential further difficulties should there be no solution. An organization came to disseminate information about eco-tourism and train famers in Nary's village on how to make handbags and various materials to be sold to tourists. Nary and her mother decided to learn that skill. However, before the operation of eco-tourism, as a result of many problems, handbag-making skills did not seem to have a market, and Nary's family livelihood could not await the transformation of the village into an eco-tourism village.

Finally, Nary's family still had to decide to allow Nary to seek employment in a shoe factory in the city. As she was an industrious girl who paid attention to work, she made many friends working with her. She worked at the factory for two years. Unfortunately, the factory where she worked went bankrupt as a result of the 2008 economic recession and she became unemployed. Fortunately, she was advised by her friends whom she knew and trusted when she worked at the factory and whom she told about her village situation, to learn at a nongovernmental organization that helped provide mixed agricultural professional skills. She tried to study hard until she acquired a specific skill so she had the skills to make her living. At last she returned to live in her home village.

During the time when Nary lived in the city, her village started to change as a result of the attention paid by the government, various organizations, and especially people's participation and awareness of the importance of natural resources on their lives. They had direct experience the difference between abundance and shortage. These encouraged them to actively participate in the organization of the village to become an eco-tourism village, a solution to make the maintenance of nature coincide with the development of their livelihoods. However, they would also not forget that eco-tourism could grow based on many factors, particularly unity and mutual trust between those living in the community, and a focus on collective interests rather than individual interests, which provided good outcomes over a longer period of time. Nary's family was pre-eminent in community work in the said village.

When Nary returned to her village, she and her family and the villagers were delighted. Nary started implementing mixed agriculture there and support was also provided in the form of market training. She educated neighbours in the techniques needed in respect of producing products without the use of chemicals, organizing groups to supply markets and exporting products to the markets. As a result, her family livelihood improved.

However, there were still many problems for her to face, such as lack of an irrigation system and climate change as well as flooding. Competitive use of resources in the river basin was also a challenge. Although Nary had some knowledge of training, she still faced a capital shortfall to operate her own family business as well as market competition. The farmers in Nary's village are in the process of cooperatively seeking solutions to these challenges.

4.4 Summary of desired events

Table 10 Group One

Desired situation		Unwanted situation	
Description	**No of votes**	**Description**	**No of votes**
Enhance cultivation	0	Population grows while the land does not	0
Enhance products	1	Being forced to encroach on natural resources	0
Utilization of land and water	0	Workers hire out/sell their labour	0
Mechanism for water distribution and compensation	1	Ability-based agriculture	1
Agricultural training (skills)	1	Natural disaster (drought, flood)	0
Promote the community producing seeds &quality products	2	No standard for determining agricultural land price	1
Policy sustaining agriculture sector (marketing, irrigation…)	2	Illiteracy	2
Expand market and attractive products	1	Customary farming	3
Expand cultivation area by accelerating mine clearance in cultivation areas and utilization of vacant land	2	Agriculture market issue	1
Irrigation system	3	Worker income/inability to save money	1
2030–2040 people will have skills	0	Loss of fishery yield	1
Long-term investment program (vocational education sector)	2	Purchase land and invest land for sale and rent to gain profit from those who wish to develop &increase production	2
Minimum cash limitation policy	2	No wish for construction of numerous hydropower plants	3
Social welfare policy	2		
Agro-industrial growth	1		
Keep inundated forest	1		
Vacant land tax policy	0		
Keep inundated forest biodiversity	2		

Table 11 Group Two

Desired situation		Unwanted situation	
Description	**No of votes**	**Description**	**No of votes**
Upper and lower Mekong River countries have good cooperation on water management	4	Chronic war	1
Enhance implementation of various management laws	6	Sports fields	0
Abundance of nature	4	Loss of river	0
Sustainable management, conservation & development	1	Deforestation	3
Population growth in the area	1	Inflow of Vietnamese people	1
Improved awareness of natural resources	0	Waste	0
Institution for forest and wildlife control & protection	0	Dwelling near river edge	0
Arrange residential order	2	Hot weather	0
Generate new jobs for people	2	Low water level	0
Restore and control water flow current	1	Unsustainable development	9

Prevent the collapse of bank	0
Increase number of foreign tourists in the area	1

Table 12 Group Three

Desired situation		Unwanted situation	
Description	**No of votes**	**Description**	**No of Votes**
NGO helps provide relief via teaching and helps initiate plans to earn living	2	Failure of the eco-tourism program	6
NGOs providing women with the skills to make their livings in the future	1	Risk of seeking employment in the city when only just turned 15 years of age	1
Try to absorb knowledge from the organization and they gain further knowledge	0	They become beggars	1
Have the courage to make decisions and use the skills until success is achieved	1	Collapse of factory	0
Return of girls to the village and commune to earn their living	1	Change of hydrological patterns	5
Earn their living by using their local resources with proper thinking	1		
Organize an eco-tourism program	3		
Sustainable livelihoods	2		
Many job opportunities for villagers in the future *Floating rice farming, rice farming after water recedes and fish farming in paddies. These are demonstrated by farmers to others to use as a model and to attract tourists to visit*:	3		

5 China (Xishuangbanna, Yunnan) scenarios

Note: The scenario frameworks were developed during the first round workshop (May 2011). The narratives presented below are revised narratives from the second round workshop (July 2011).

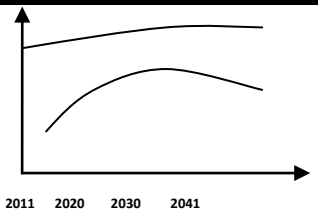
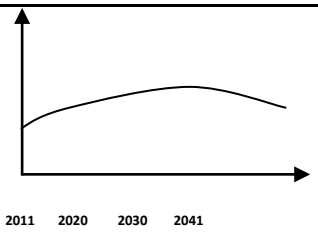
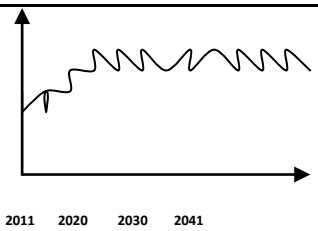
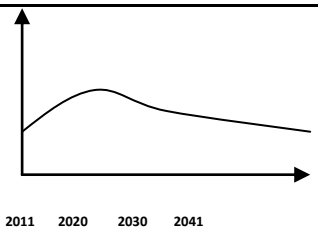
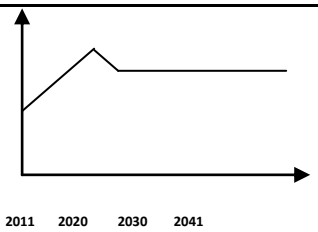
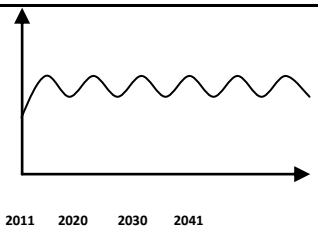
Table 13 Initial scenario framework

	Trends	Uncertain drivers
Higher Impact lower	***Social, political, economic*** • Increasing mobility of population • Industrial development • Open market & border trade • Market economy • Tourism development • Economic development models • Yunnan as "Gateway[1]" strategy • Implementation of environmental protection policy • Urbanization • Jinghong geographic position • Cash crop plantation • Human intervention • Car industry development • Improving infrastructure • Technology development & import • Migration • Industry needs • Integrated regional economy • Internationalization ***Natural resources and land use*** • Limited land resources • Land use intensification • Increasing demand for natural resources ***Ecosystems*** • Climate change (temperature increasing) • Environmental protection • Rain forest protection program in Xishuangbanna ***Food*** • Transition: from rice based to diversified diets **Energy** • Hydropower development	***Social, political, economic*** • Demands of outside market for natural resources: land, hydropower, minerals • Guiding policy of economic deployment • Local future economic plan • Globalization & promotion of China's position in the world • Investment • Changing prices of rubber and tea • The power of the outside investors • Changing life style • Vocational & higher education • Increasing population • Government policy • Capital flows ***Natural resources and land use*** • Natural resources' property rights ***Ecosystems*** • Impacts of chemicals used ***Food*** • Water resources for agricultural production ***Energy*** • Alternative energy: biofuel and other alternative energy technology
Lower	Uncertainty	Higher

[1] Yunnan as "Gateway" toward Southeast and South Asia for trade, economic collaboration, transportation, etc.

5.1 Group One ('Rainforest Group')

Table 14 Specific scenario framework

Driver	Value in 2041	Trajectory
Globalization/ regionalization (agriculture: industry: service)	GDP agriculture: industry: service = 27:13:60 Change: agriculture will start to decrease around 2029 Service is continuously increasing	
Demands for natural resources	Increasing demands for water Change: decrease after 2030	
The demands of outside market**	Decreasing demands Change: fluctuating & increasing trend	
Development policy**	Pay more attention on social and environmental issues, and frontier control Change: May be slowly improved by 2020, or decreasing	
Investment**	Increasing Change: Will be stable after 2020	
Climate change**	Increasing frequency of extreme events Change: Fluctuating, but continuously change	

Note: ** indicates uncertain driving force

Narrative

Name: Yi Xiang

Age: 12

Father's occupation: Rubber farmer

Mather's occupation: Country family home stay owner

Older brother: College student, major in environment research

In 2011, in Xishuangbanna's Manting village lived a 12 year old girl named Yi Xiang. Yi Xiang was in her fifth year of elementary school. Her family not only ran a "Country Family Homestay", but also had a 500 tree rubber farm. Rubber trees had been planted by every household in Manting because it was a very profitable tree crop. Meanwhile, her family had 50 ancient tea trees and planted 50 mu of terraced tea. Therefore, her family's living conditions were very high. Yi Xiang's brother A-Long is 7 years older than her and was in his first year of college at that time.

Recently, her village has begun slowly developing tourism and her family started to run a Tea House. Yi Xiang usually helps her family with running their tea house business, and for that reason she soon chose to give up her studies.

Recently, foreign investment had begun to enter Xishuangbanna on a small scale, primarily for developing hydropower and mining, and in every valley these projects could be seen. It was also observed that they began to affect local water resources.

As this point, the negative consequences of expanding mining operations in the area were already becoming apparent. Mining was generating considerable amounts of sediment, and meanwhile people were questioning the safety of local potable water sources, as incidents of disease were increasing. Many were openly wondering how closely the two phenomenon were linked. One pile of mining slag was placed on the mountain behind Yi Xiang's home, and one day during a torrential rainstorm, a flood of rainwater dragged the mining slag in a landslide down the mountain. Most of property and possessions of people living in the path of the landslide were swept away completely, included Yi Xiang's family.

Local large scale mining began to generate new problems. Laos and Myanmar would experienced definite degrees of environmental degradation, including local vegetation destruction, intensifying soil erosion, and water quality pollution caused even by middle and small sized mines. A friend of Yi Xiang's brother was engaged in research for mining development. He focused on sustainable mining development and negative impacts reduction. In Yi Xiang's eyes, there was another major problem of interest: water resources had become increasingly unreliable. And the local people were slowly becoming aware that the shortage of water could be a result of hydropower development.

In 2013, Yi Xiang's entire village experienced two serious natural disasters: first a powder mildew epidemic, and then a bout of hail storms severely affected the yields of both rubber and tea in the area. Through years of suffering in the wake of these disasters, villagers began to pay more attention to issues of environmental protection.

By 2015, society had become much more aware of issues of environmental protection and this awareness was strengthened by the efforts of a national environmental protection program. The program expanded the scope of discussion of environmental protection, and Yi Xiang's brother's work focusing on the use of organic fertilizer gained new support from the program. As a result, his program began to be provided ample funding and resources. Yi Xiang also slowly began to feel that environmental protection was a good idea, and she set about helping her brother construct an "Ecological Tea Garden". Through their hard work, their tea business began to generate significant profits, and their tea qualified for a 'Green Product Certification'. Meanwhile, based on support from the eco-tourism policy and Yi Xiang's family financial stability, her family decided to invest in the Nannuo Mountain construction of the "Paradise" summer

mountain getaway – a tea tasting and vacation area in one. The village used all new technologies to achieve zero carbon emissions and minimal environmental impact, and the tourists poured in. The village name became known widely for both its tea and vacation resort, and Yi Xiang became the area's manager.

In 2020, the long awaited Inter-Asia Railway opened. Because Xishuangbanna enjoys an unusually pleasant climate, more and more people from Northern China started to come to settle down and suddenly vast amounts of land were developed into winter housing. The saying, "In the winter you can use central heating, but I'll go to Xishuangbanna!" spread across the country and in the eyes of Northerners Xishuangbanna became shelter from the winter's cold.

And as peoples' living standards rose along with economic development, more and more cars were bought, the speed of town development hastened, and land previously devoted to rubber was rapidly transformed into real estate development areas and golf courses, with a serious impact on the environment. Meanwhile, everyone throughout society was discussing how to improve the sustainability of land and resource use. In 2028, the country established the policy, "three highs and ten smalls", placing even more emphasis on environmental protection, and ordering various enterprises to be shut down. National standards were set for the further development of hydropower and mining industries, which attached great importance to local participatory consultation, and major projects were required to consult local villagers.

The Asian Development Bank also began to aim at the Greater Mekong Region, putting scientific research and environmental development programs into effect.

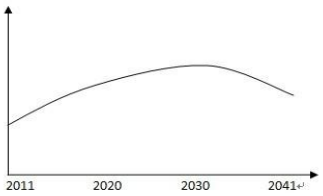
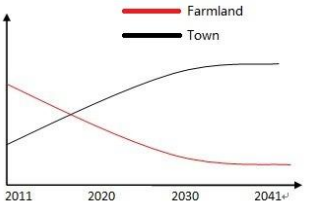
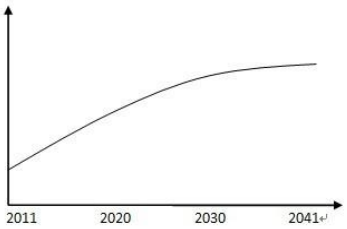
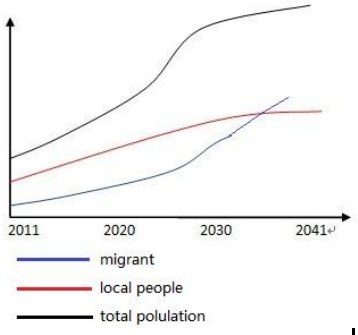
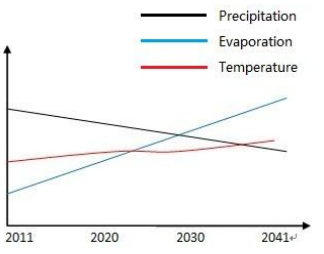
By 2030, the region had already begun to change immensely. China had established mechanisms for increasing cooperation with neighbouring nations, and Yi Xiang's brother was selected to work on the "Greater Mekong Region Environment and Development Cooperation Committee" with responsibility for research and development, and the promotion of renewable energy. He promoted the experience of the Eco-tea garden to communities downstream along the Mekong in order to improve organic agricultural production in this area.

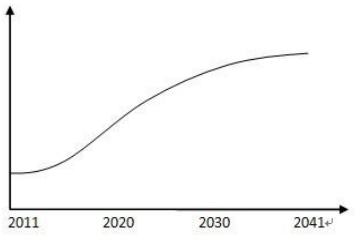
Meanwhile, Mekong region countries began negotiating how to plan the distribution of hydropower electricity throughout the region, as well as how to utilize region's available water resources as efficiently as is scientifically possible and.

By 2041, a series of environmental improvements have brought around some recovery, and the scope of monoculture plantation has been reduced. The ancient tree tea industry is developing quickly based on its economic and ecological benefits.

5.2 Group Two ('Rubber Group')

Table 15 Specific scenario framework

Drivers	Description	Trend	Trajectory
Technology Development	High yield rubber species Substitutes for rubber New hybrid transgenic varieties	High yield rubber species will peak at 2031 and then begin to decline	
Urbanization	Urbanization: more than30% (current) Increasing off-farm labour Reducing agricultural land, but increasing urban land Secure water supply Urban green space	Farmland shrinking, urban area increasing; urbanization is rising, but this trend level-off after 2031	
Capital Flows	Increasing land use rights transfer Industrial structure change Large-scale planting and re-allocation of human resources The emergence of new industries Diversified business model	Investment following an upward curve trend Tropical economic planting increasing	
Population Change	Population growth will be smooth Increasing outside mobile population Seasonal variation of population increasing Population quality improving (education, awareness of ecology, re-education)	Total population increasing； Rapid migrant growth, gradual growth of local people	
Climate Change	Temperature increasing Humidity declining Extreme weather increasing	Precipitation declining, Evaporation increasing, Temperature increasing	

"Bridgehead" policy change	Port construction No of customs clearance increasing Transportation development Trade increasing Environmental protection, ecological restoration Small family business Modern service industry	Trade increasing	

Narrative

In the city of Jinghong, on the banks of the Mekong River, lives A-Meng, the older of two children. His younger sister works for the Rainforest Protection Foundation and their family is ethnically Dai- their father is local Dai, their mother Burmese. Due to his family background, as well as the realities of the border area where he grew up, A-Meng is proficient in four languages- Mandarin, English, Burmese, and Dai.

25 years ago, influenced by his father's lifelong work as a rubber farmer, A-Meng had developed a strong interest in rubber and agriculture. In order to maximize his family's profits from rubber farming, he applied and was accepted to the Southern China Agricultural University to study rubber. After graduating in 2015, his father, already an old man, gave A-Meng all of his possessions, which consisted primarily of a 5 ha rubber plantation, and he and A-Meng's mother retired. A-Meng, thanks to his own knowledge and ability, transformed all 5 ha of rubber into an eco-rubber plantation with mixed herbs, orchids, and fruit and other cash crop trees which together made up an integrated development system of rubber, and began to generate great economic and ecological benefits.

In 2016, like his parents, A-Meng took the "in vogue" transnational path and married a friend and classmate from Myanmar. They had a son in 2018, and his wife tended to the family as a housewife. In regards to their son's education, A-Meng and his wife hoped that they could send him abroad to study, to gain a different type of education, and when he was 7 years old they sent their son to Chiang Mai for study and to train as a Buddhist monk for two years. Their son graduated from university and began to work as an intern for the Greater Mekong Region Committee last year.

In 2017, A-Meng decided to go into business with his friends investing in a rubber processing factory which. They soon discovered that rubber seeds were a major by-product of rubber processing, and in order to utilize them A-Meng established a biodiesel power station, which he eventually got linked with Greater Mekong Power Grid. Rubber seeds from the factory produced 5000 tons of biodiesel per year. The biodiesel power station qualified for a government low-carbon emissions development tax subsidy. In 2018, ecological legislation had improved immensely, resulting in the approval and implementation of an Ecological Protection Regulation in Xishuangbanna. 2020, the prefecture government made the "14th five year plan" to achieve the regulation's target that in 10 years, improving 1 million mu of low-yielding rubber land into high-yielding rubber, and returning 2 million mu rubber to forest, limiting rubber to an area of 3 million mu. A-Meng was involved in the rubber land transformation project as well. He bought the neighboring low-yielding rubber fields, increasing his holdings from 5 ha to 20 ha total.

A-Meng was awarded by the government the title of a "modern new rubber farmer" and began to be regularly invited to train farmers of eco-rubber plantations in Myanmar and Laos due to his success in the eco-rubber garden. Moreover, he established a rubber cooperative, which began to conduct online trade, product processing and technological training. He soon joined as a provider for the Mekong International Rubber Company, a branch of the Mekong River Rubber Trust, through which (being a multinational corporation) he could sell to anywhere in the world. Through years of economic development and gradual urbanization, agricultural and service industrial workers were increasingly hired from bordering areas in Laos and Myanmar. A-Meng too hired 10 fixed-term labourers to work on his plantation.

Economic development suffered from a serious drought in 2024 in Xishuangbanna. It changed the government's direction for development into one focused on ecological protection, and subsequently ecological factors were brought into mechanisms for assessing government officials' performance. In 2025,

ecosystem rehabilitation was implemented on a large scale due to a central government driven Ecosystem Payment System. Finally, the drought meant that A-Meng could not help but move from Daluo to Jinghong to a riverside town house, from where he would take the high speed rail back and forth from Jinghong to Daluo.

Drought also increases the cost of rubber irrigation and reduced rubber yields significantly. A-Meng and his sister often debated the development of rubber. Two years younger, his sister had attended Yunnan University and graduated in 2021 with a doctorate in environmental protection. Her doctoral thesis had discussed rubber production with their hometown as the primary example, and explored issues of natural resource protection. After she graduated, she joined an environmental protection society, where she met her American husband, a representative of WWF.

In 2025, through his wife's contacts, A-Meng leased a piece of land on contract from the Myanmar government for 50 years. On this land he planted 30 ha rubber, but 5 years later the Myanmar government established a new policy reclaiming that land back into their possession. This drastic change in policy left him just barely 15 ha, which he sold hastily at a loss of 100,000 USD. In addition, the next year brought a devastating hurricane, under which he lost nearly 3 ha of rubber, and the hurricane's winds destroyed the bridge to the rubber fields. Still worse, a severe drought this year has led to the loss of even more of his rubber crop.

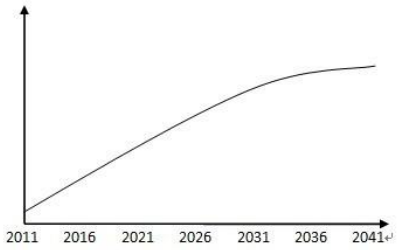
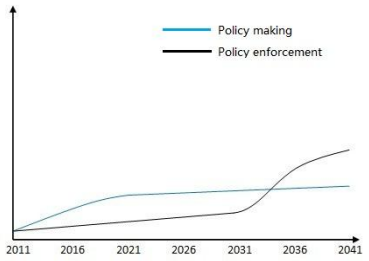
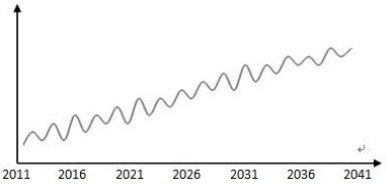
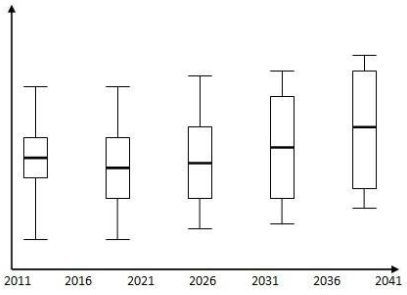
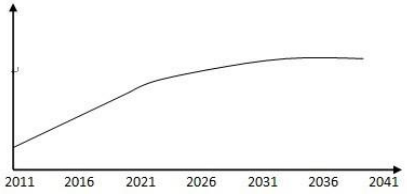
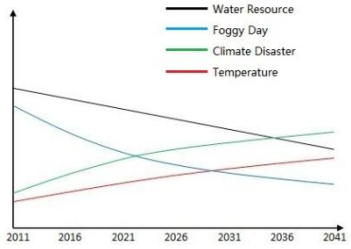
Moreover, A-Meng considered changing of rubber plantation after the economic crisis of China in 2025. At his wit’s end, his sister reminded him that perhaps it was time for a change, and under her advice planted 3 ha of dendrobium (a flower) whose market price was high. He funded the transformation in production in part with his own money, and raised the rest through the International Rubber Company and the Xishuangbanna Government, each investing one third.

With his sister's assistance, A-Meng and his sister also established a Rainforest Foundation, and donated 10,000,000 yuan as a loan for the ecological restoration of rubber plantations. In this year's international symposium called for 7 countries to restore tropical rainforest, with the belief that they should find a management approach which provides both profit and environmental protection, with the hopes of ensuring a bright future for Xishuangbanna.

Just after attending the government organized Rubber Ecological Restoration Tax public hearing, A-Meng drove to the airport to meet his parents, just arrived from their trip to Singapore. They all discussed ideas for the Rainforest Foundation to launch more ecological recovery in Myanmar. Now, A-Meng is considering not only what is to his own benefit, but also the whole Mekong Region's future. In 2041, Xishuangbanna not only is an international city, a well-known tourist destination and Southeast Asia Culture Creativity Centre, and also is becoming a Green Industry Estate and Green Tech Innovation Base in the Greater Mekong Region. All of A-Meng’s family members are citizens with an international perspective.

5.3 Group Three (Fernleaf Group)

Table 16 Specific scenario framework

Trends & uncertain driving forces	Imagined outcomes 2011-2041 & value	
Demands of natural resources	Increasing 20% each year in 2011-2031, but in 2031-2041 will gradually increasing	
Improving Environmental protection policy	Environmental policy making will be completed before 2021, but the implementation would be slowly improved in 2011-2031, and it won't be well implemented until 2031.	
Rubber price	Increasing & fluctuating	
Local future economic development planning	In 2011-2026, there are less sustainable plans, but improving; 2031-2041 more sustainable plans.	
Outside investment	2011-2021, Straight up increasing 2021-2041 Gently increasing	
Climate change	Less water resource and decreasing river water flow. Increasing frequency of extreme events & natural hazards Increasing temperature Increasing irregular rainfall Decreasing fog days and timing	

Narrative

Yu Xiang is a 45 year old female Dai. Her parents were both local rubber farmers. She had one older brother and when she was young her family had already begun farming rubber, and they were already a fairly well off family. Still, many people in her village had little interest in education, so she began helping her family with farm work from when she was very young and she grew very skilled at tapping rubber. Meanwhile, her older brother graduated from college and worked for a small hydropower plant on the Nanla River as a statistician. Due to his background, he was sensitive to the changes in water resources. A few years later, he married a local woman also very adept at rubber tapping. Yu Xiang married very early to a local rubber farmer, and raised one son and one daughter while helping her husband grow rubber, her family's main income source. But at the time, water resources were already beginning to shrink. The village built a water reservoir with money from a (non-local) investor, in order to secure their water supply, but still because of lack of water their rubber production remained low.

Because most of the area was devoted to monoculture rubber production, this significantly affected the living conditions of local people, especially in terms of domestic water availability, which was becoming more and more scarce. In view of the fact that, in 2021, the national government unveiled the "Return Rubber to Forest" policy, advocating vegetation diversification, water resource conservation, and better regulation of local ecosystems. But because the "Return Rubber to Forest" policy granted rubber farmers a subsidy lower than the present market price for rubber (the policy offered a subsidy of 500 yuan per mu, rising the second year to only 1,000 yuan per mu), many rubber farmers showed little enthusiasm for the "Return Rubber to Forest" policy. Yu Xiang's family at the time did not participate in the policy. At the same time, Nanla hydropower station was shut down as result of water shortages on the Nanla river, and Yu Xiang's brother lost his job. But her older brother's education level was rather high and he often took a much longer term view of things. He was more aware of issues of environmental protection than most. So he participated in the "Return Rubber to Forest" policy and "Rubber Plantation Transform" project actively, and received the corresponding subsidy.

Meanwhile, the local township government arranged agro-technology and forest management training. A number of technicians were sent to villages to guide forest rehabilitation with local species plantation in areas experiencing serious erosion, in order to achieve the targets of 'hatting' the tops of mountains (water conservation through mountaintop forest rehabilitation), 'belting' the mountainsides (through forest plantation for erosion control and water conservation), and 'shoeing' the foot of mountains (through landscape forest rehabilitation along riversides and roads).

Moreover, a major international carbon investment company had come to the area looking to make investments. With this new type of income source available, some farmers began to undertake the diversification of trees they cultivated, which to a significant degree accelerated national participation in the "Return Rubber to Forest" program. At the time, Yu Xiang's family's income from rubber was still not bad, so they chose not to participate in the carbon funded project either.

In addition to this, in 2021, national "Payments for Ecosystem Services" regulations were established, along with a greater degree of legal support for the "Sloping Land Conversion Program" and carbon projects, and guaranteed the provision of benefits to participating rubber farmers. With rubber farmers receiving cash subsidies, local vegetation began to diversify, and the local environment to improve.

In 2030, parts of the rubber plantation managed by Yu Xiang's family were aged, and productivity in those areas had dropped, greatly affecting the family's standard of living. Even more unfortunate, in 2031 there appeared a particularly harmful pest in the area, killing large areas of the family's rubber and causing the family's household income to drop sharply. All this occurred while both children were still in school. Just when they had come to their wits' end, they saw that because her brother's family had taken part in the "Return Rubber to Forest" program, their household income and living standard had improved. In the midst of all this sadness, some of Yu Xiang's family land was expropriated through a governmental plan for expanded urbanization, and a high compensation was paid to them. At the same time, efforts at land

reclamation had even begun, and Yu Xiang contacted the local mill and asked them to cut the aged rubber trees to be sold as floorboards.

Yu Xiang still planned to plant rubber after the elimination of aged rubber trees. But during that time, rubber saplings were very expensive, and with water shortages along with repeated incidents of disease and pests, the rate of sapling survival was very low. In order to raise their rate of survival, the family couldn't help but add chemical pesticides and fertilizers, which in turn increased their level of investment. Negative consequences resulted from this. Water pollution in the Nanla River was getting worse and aquatic life was disappearing. Finally, the Nanla River dried up a few years later and the owners of rubber plantations nearby built labour sheds due to the resulting flood of unemployed immigrant labour.

Meanwhile, local government popularized the knowledge of environmental and ecological protection through free night school classes held in the rubber demonstration garden. Yu Xiang had many friends and relatives visiting the Xishuangbanna Botanical Gardens-established Sustainable Rubber Demonstration Garden, which was gaining more and more attention for its demonstration of mixed cultivation. It also introduced the importance of scientific and technological innovation. These friends and relatives' view and her brother's experience greatly influenced Yu Xiang, and she finally decided to allow her two children to pursue higher education, and to begin to diversify her family's land uses. In 2035 one part of her land was designated as a government project development area, and her family was compensated again, but this time they used their compensation to transform one part of their low-yielding rubber fields into more complex vegetation systems, She also allocated one part of their land to a Zhejiang businessman, until her family was left with one small area of rubber to manage under a forest rubber farming system. Using these new approaches on their remaining land, their household income improved, and their livelihoods stabilized.

Because the market demand for rubber continued steadily, and despite fluctuations in rubber prices, overall prices continued to rise, bringing considerable income to Yu Xiang's family. Under these conditions, her two children were able to finish their university studies. Her son graduated with a degree in biology from Yunnan Agricultural University and married a Zhejiang woman, with whom he returned home and the two stayed in the local rubber demonstration garden with free rein to use his biology related knowledge to contribute to local rubber production and environmental protection activities. And Yu Xiang's versatile daughter, who graduated from Yunnan College of Art, then remained in Kunming's to work in its Minority Village. Due to her perfect performance, she was sent to Thailand to study, when a political coup occurred after they arrived. The members of her study tour hid on an organic farm where she got a chance to learn how high the profits from organic agriculture were. This organic farm experience influenced her and she quit her job in the Minority Village when she came back China, and returned to her hometown to begin organic farming. She benefited significantly from the proceeds of her organic farm in coming years, but as a result of her work in the Minority Village, in her memory was branded the importance of the rich life of her hometown and its traditional culture. With the support of her accrued savings as running her organic farm, she established a traditional culture museum, which focused on the presentation, preservation and promotion of traditional Dai culture. She also offered courses of traditional cultural inheritance in Xishuang banna University, to encourage the college students to study traditional culture during their holiday internships. These efforts improved local people's awareness of ecological, environmental and traditional cultural protection.

5.4 Summary of desired and undesired events

Table 17 Group One summary of desired elements

This story		Other stories from abroad		Additional trend & uncertain drivers
Desirable elements	**Undesirable**	**Desirable**	**Undesirable**	
Development of eco-tea garden and eco-tourism Winter housing Sustainable development of mining and hydropower Environmental friendly approach in governmental economical policies Free trade, fruit and vegetable duty-free Dominated by green industry development in Xishuangbanna Greater Mekong Sub-region Environment and Development Cooperation Committee	Large -scale rubber monoculture plantation Environmental damage by mining development Nature disasters as result of extreme climate change Eco-system damage by real estate and golf course development Border conflict No planned land use	Carbon market Organic farming Great Mekong Region Power Grid	Sea-level raising, Salinization Decreasing cultivable land Invasive species Monoculture plantation Water shortage Increasing frequency of extreme weather Develop first, clean up later strategy Dams and hydropower development	Renewable energy using based on hydropower development Organic agriculture development Modern agricultural technology development 5. Enhancement of MRC

Table 18 Group Two summary of desired and undesired events

This story		Other stories from abroad		Additional trend & uncertain drivers
Desirable elements	**Undesirable**	**Desirable**	**Undesirable**	
Rubber industry association establishment, rubber plantation and marketing improvement, diversified benefits of rubber plantation Rain forest fund establishment, eco-rehabilitation Land tenure reform to improve large-scale plantation Establish local carbon trade market linked to international market High-speed railway Economic integration Eco-efficiency guiding, integrated development with scientific support Unlimited labour migration within the region	Climatic deterioration Decreasing rain forest dropping, Substitutes for rubber Water table declining, shortage of water resource Increasing frequency of extreme weather Population growth rapidly with less education Rubber price fluctuating	Energy integration in Mekong region Renewable energy development Diversified agricultural production and management Technologies shared in region Carbon trade market perfection. International family, cross-culture communication GMS Greater network of energy, transportation and information.	Price declining of agricultural products Farmland shrinking Water pollution by industry and mining Sea-level raising, More dam construction on Mekong River.	New social network Responsible citizen and enterprise Eco-factor be a part of check mechanism of governmental officials' performance, Government cooperate for regional land and resource development

Table 19 Group Three summary of desired and undesired events

This story		Other stories from abroad		Additional trend & uncertain drivers
Desirable elements	**Undesirable**	**Desirable**	**Undesirable**	
Sustainable policies and project plans Convert rubber to forest Environmental payment system (EPS) Stable livelihood Public awareness of strengthen of environmental protection Biodiversity protection	Single economic structure, rubber is the only income for farmer Low public participation in EPS Shortage of water resource Over rubber plantation Reducing nature forest Biodiversity damage Land degradation Environmental deterioration	Free trade and unlimited migration in GMS. Farmer pay more attention to education which influence industry development Water resource using efficiently Green energy Organic farming Integrated farming	Nature disaster and environment pollution Water resource conflict Escalation of conflict between biodiversity and economic development, Unlimited urbanization Policy and economic fluctuating Increasing population, and blind economical activities plans and construction.	Hydropower construction Information access Integrated farming

6 Lao PDR (Nam Ngum) scenarios

Table 20 Initial scenario framework

	Trends	Uncertain drivers
	Social, political, economic	***Social, political, economic***
Higher Impact ***lower***	• Population growth • Natural resources & energy trading • Market share • Different level in economic • Hydro power investment • Water quality may change at some portions • Urban development • Natural resources depletion • Gap between rural & urban • Biodiversity depletion • Development in hydropower, mining and infrastructure • Market accessibility • Policy and strategy • More water use • Technical transfer assistance • Soil erosion • Tourism • Modify flow regime • Water resource & quality depletion • Energy accessibility • Chemical substance & poor soil quality • Forest depletion • Industrial and population growth • Irrigation schemes • Power production could increase nation's income • Create permanent job for local people	• Donors /foreign aid • Administration reform • Cultural change • Warmer temperature s • High rate in corruption, road accident, crime, robbery, etc, • Community participation • Effective of national economic policy • Increase in natural resources • Policy and regulation • Donor and development • Flood and drought • Climate change • Tourism industries • Dams reduce flooding • Increase water level at downstream during dry season • Logging • Shifting cultivation • Media and telecommunication
	• Staff capacity • Increase water consumption • Forest depletion (expansion of cultivated areas)	• Immigration • World economic crisis • Food processing factories
	Lower ⟷	Higher

6.1 Group One

Table 21 Specific scenario framework

	Drivers	*Values*	*Outcomes*
Certainty	Policy, strategy More water use for irrigation	Supportive 50ha-150ha folds 2011-2041	Sustainable river basin development Food security
Uncertainty	Climate change Donors and Development Partner Public Participation and ownership	Water Availability Wy +15% and DY -15% More from Grant to Loan Big	Impact Productivity Low water supply for irrigation in dry year Irrigation water deepness on Dam water regulation More financial ownership livelihood

Narrative

Rice farming and livelihood activity in a Viengkham District, Vientiane Province, Lao PDR

Character: Ms Vanh	Age: 12	Village: Nonsavang
Siblings: 11 (5 brothers, 6 sisters)	Parents: Dad (farmer),	Mum (trader)

Miss Vanh was born into a farming family at Nonsavang Village, Viengkham District, Vientiane Province. She is the third among 11 siblings. In 2015, Vanh is 16 years old and studies at the 6th class of upper secondary school, Phon My Secondary School, Viengkham District, Vientiane Province. Besides Vanh being a great student she also helps with several family activities and practices rainfed rice farming activity each year, which is the main income for her family.

In the years of 2016 and 2017, there are serious and severe drought and floods respectively, which create a considerable impact to the Nonsavanh villagers, including Vanh's family, In particular the rice yield is significantly reduced, since their rice farming activity is done only in the rainy season and reliant on natural occurences. Due to such serious impact, Vanh's family economic situation is terribly affected, in which Vanh has to cease her schooling in 2017 to help her family to fight against their deteriorating poverty. Some of her siblings have also to leave the family home to sell their labor in other areas. Due to such a serious situation, at the end of 2017, the government carried out a release policy for those people affected by natural disaster, in order to stabilize their livelihood and improve their poverty status. In particular the government has constructed several irrigation schemes to help farmers to practice two season rice farming. Simultaneously, international organizations, development partners and the Agriculture Development Bank have assisted in the form of grant aid and low interest long-term loan as a participatory village development fund.

Since the irrigation system has been constructed and the village development fund is available, in 2019 Vanh's parents are able to stabilize their family economy and Vanh has returned to school until she finishes upper secondary school. She continues to study at the University in the Faculty of Agriculture, graduating in 2024. At the time of her graduation, Vanh has been working at her hometown, the Viengkham District Agriculture and Forestry Office. Since she has been directly affected by natural disasters and as she loves her hometown, Vanh has paid a high degree of intention to her work to contribute to the district shift from self-sufficient rice production to increased commodity production. She has been rewarded by the District Authority as an excellent staff member.

In 2033, Vanh has been promoted to the Head of Viengkham District Agriculture and Forestry Office as she has an excellent record on agricultural promotion in the District. As a result, in 2041, the agriculture area of Viengkham District has been increased by 3 fold and rice productivity has been tripled, compared to 2033.

6.2 Group Two

Table 22 Specific scenario framework

	Drivers	*Values*	*Outcomes*
Certainties	Population growth	Rapidly increased	More dispute and competition
	Water resources degradation	Sharply decreased	Insufficiency and scarcity
Uncertainties	Increasing social problems/tension	Increased	Unsecured society
	Effectiveness of national economic policy	Need to be consolidated	Enhance more effective policy
	More natural resource consumption needs/demands	Increased	Insufficiency and scarcity
	Policy and regulation	Need more strong policy and regulation	Urgent needs and necessity

Narrative

Impact of population growth and development in Nam Ngum River Basin.

Narrator: Mr. Khamdy (Fisherman and gardener) Age: 35

Father: Mr. Souvanh (Farmer) Mother: Mrs. Bounmany (Farmer)

In the year 2011, Khamdy's family live in the Nam Ngum river basin where their homely house is located near the Nam Ngum river bank. His daily job is fishing and planting vegetable to sell in the community market nearby. His family comprises of seven members: his parents, wife, a daughter and two sons.
In the following year, a tile factory had been built as well as a new road access to his community, improving local transportation and employment opportunities. In the village, many people have been employed by the tile producing company, especially young people. Khamdy also works in the factory to generate additional income for his family. However, the income earned from this job is not enough to feed and support the whole family, because he does not have very high skill and experience in tile production compared to farming and fishing practices. Therefore all family members, such as his lovely wife and three children, continue to do fishing and plant vegetables. Five years later, the water quality of the river where his house is located has changed due to increasing pollution. Some fish have died, because the factory has released wastewater from their tile factory without appropriate treatment/disposal. This problem also affected the surrounding environment and water environment. For instance some species of indigenous fish died and the natural vegetable production has been reduced. His family sometimes collects these from the river bank nearby to sell everyday in addition to their small family garden. As a consequence, this significant impact has made it very difficult for his poor family to earn additional income and to send his children to school or get a higher education.

In the year 2020, the village has a new development image. A medium scale hydropower dam has been constructed while the road network has been also been further developed. This provides the local communities around that area with more comfortable transportation facilities combined with past tile factory development. The dam development has meant that households in the village have access to electricity. Because employment in this community is increasing sharply compared to other regions in the Nam Ngum river basin, more and more people are moving to work in this community. The average income of households is rapidly increasing as well. However, despite the development bringing vital employment opportunities, most of people prefer to do their inherited job, as they have in the past. The population movement has also created the social/community tensions in the village.

Another issue related to hydropower dam construction is that biomass clearance and material transportation has caused the degradation in the health of the river system problem through massive river bank erosion, sedimentation and downstream water quality degradation. As a consequence there is more flood and drought happening during recent years. In particular, the severe bank erosion of the Nam Ngum river just downstream of the dam has impacted local residents including Khamdy's house. He finally has to move his house to another safer place near the hill in the village. Luckily, his new home resettlement has been supported and compensated by the dam development company and partly from the government of Lao PDR fund. The government in cooperation with the developer has provided a new technique for indigenous vegetable plantation selling to the local market and nearby food factory. His oldest daughter has also been employed to work as chef in the dam company.

Later in the year 2026, the tile business that Mr. Khamdy has been employed for a long time has collapsed because of high s competition. The factory could not compete in the widespread market and with the tile quality of others in the regional market. This has reduced his family's income and meant his family could not sell vegetable to the food centre in the factory. Therefore, he has to find a new job. At the same time, the government has introduced a new policy for capital loan release for the local community who are poor. Mr. Khamdy borrows a small amount of capital from the government bank to establish a small business in the family by raising pigs and planting 1,500 rubber trees on his own land. In the beginning his lack of experience of raising fast growing pigs, and many people in his community complain about the bad smell from his pig farm that makes for an unpleasant atmosphere. Although, he recognizes the issue raised by his neighbours, he finally has agreed to consult with the government environmental agency and agriculturalist about the air quality problem. He gained some ideas to clean up the pig farm more regularly and he has borrowed some more money from the bank to start making bio-gas by using pig waste. This idea can reduce the cost of electricity consumption in the family. He uses the bio-gas for cooking over many years while raising pigs earns lots of income as well. He has also taught his friends in the community how to reduce the bad smell from the pig farm and how to use the bio-gas from pig waste. They are now doing the do the same Khamdy.

In the year 2035, Mr. Khamdy's family has raised 2,000 pigs and he starts to hire some labourers to work on rubber field maintenance and rubber collection. He then can export the rubber to the internal market as well as neighbouring countries and generate more income to add to his pig farming income. Eventually, he can send money to the government bank with its interest paid completely.

In the year 2041, his family becomes the best family model for environmental pig raising without bad air quality in the community. His family becomes rich because of his small business, patience, recognition for environmental importance and natural resource valuation and conservation. They finally are happy everlasting.

6.3 Group Three

Table 23 Specific scenario framework

	Drivers	*Values*	*Outcomes*
Certainties	Urban development	Increase about 20%-25%	Population come to settle in the cities increases about 700,000 inhabitants
	Tourism	Increase about 30%	Local gross income increase about 2,000 $/capita/year
Uncertainties	Social problem/tension	Increase about 5-10%	More social tension (drug abuse, alcohols and others)
	Natural resources use demand	Increase about 30%	Natural resource degradation (land, forest, mineral, and others)
	Policy and regulation	Enforce and implement by 70% or more	Effective enforcement and dissemination at local level widely and increase more public/society

			awareness and participation
	Communication and social relations	Increase by 70% or more	Public and communities acquire more data and information timely and widely

Narrative

New life of a young girl in Nam Ngum River Basin, Lao PDR

Name: Miss Phat (Eco-tourism businesswoman)

Age: 18 Father: Tha (Fisherman) Mother: Na (Trader)

In the small fishing village located in the Nam Ngum 1 dam reservoir called Xayoudom, Keo Oudom district, Vientiane Province, there is a young grassroots girl named Phat. In 2011, Phat is 18 years old and still studying in the last year of high school in Thalat. Her fishing family consists of seven members. She is the second older sister in the house. Her father is a skilful fisherman in the reservoir community and her diligent mother is a fermented fish trader in the district market. Both her parents have worked very hard to feed and support the family as well as promoting and sending all children to school. In the following year, Phat finished her upper secondary school and continued to study in the National University of Laos, majoring in tourism and services. Phat lives with her cousin in Vientiane when studying and she dreams of owning operating her own small business.

In 2015, she finished her University degree and returned to her village. Phat consulted with her family, letting them know that she would like to run a small business in her native born-village. Her family agreed to open a local food restaurant by combining their own funds and borrowing some money from the bank. As time passed, her business has run smoothly and Phat began to operate a guesthouse with a wide range of modern services such as a discotheque and bar in order to serve the local people and outside visitors coming to visit the reservoir village. Her ideas allowed her business to grow rapidly. In 2020, an unexpected incident threatened her business. A group of young narcotic men started fighting and taking drugs in the restaurant and her family considered automatically involving themselves in stopping this action. The local police suddenly closed her business and placed under police control for a while. She has been trained, and paid some fined money and eventually this business was terminated.

In 2023, Phat married Mr Seng who is a company staff member at a private service company. Due to her background and personal love in doing this kind of business, she decided to re-open her business, but changed from running a restaurant to an eco-tourism boat service in the area of the reservoir in her village. Her recognition of using resources in her community efficiently and effectively in association with environmental protection, her small business has been well-known and generated significant incomes year by year. Later in 2035, she discussed with her husband and family about up-scaling her environmental friendly business by increasing the number of tourist boats, restaurants on the boats and a tour mini-bus. In the mean time, she was able to establish three more small branches in the Nam Ngum basin in Vanvieng and Luangprabang and as well as spreading to the southern city of Pakse. With her businesses generating much more income and consistently growing year after year, she has enthusiastically established the “Reservoir Community Welfare Foundation” within the eco-tourism service association. She was designated as the chairperson of the fund committee for many years. The Foundation also brought about an increase in women’s voices and their views and capability was very important in this community development. The Foubdation has provided a wide range of opportunities for poor kids, young people on knowledge hub development skills and some vocational training related to environmental services. Recently, the foundation has become the first community-based awareness centre in the Nam Ngum river basin administered by the local community, focusing on eco-tourism development, community harmonization, upstream reservoir plantation of ancient trees and specifically sustainable natural resource use and management. Through all this hard work and changing ideas to manage the service, her community and business has boomed in popularity throughout the basin, Laos and the Greater Mekong Region and the

tourism sector in particular. Her good image and community vision has been promoted through advertising on her community website, media publications - posters, newspaper, and community-based magazines.

By the year 2040, her family has increasingly active in the ecotourism business and the improvement of good living conditions. Everyone in her family, including brothers and sisters, have permanent jobs and run their own small businesses related to environment conservation to serve the community. Miss Phat became a famous eco-tourism businesswoman. Significantly, people's living standards in her village have been improved along with the local economic development and sustainability.

6.4 Group Four

Table 24 Specific scenario framework

Trends	*Value*	*Outcome*
Implication of Energy and irrigation facility construction Market access of local producers/ farmers	Provide more energy facility, provide 100% of electricity consumption and can produce 2 seasonal agriculture practices, agricultural production increases from 2 tons to 6 tons per hectare and increase production for commercial purpose by 60%. High market needs.	Sufficient electricity consumption at household level, have more agricultural machines Very high local livelihood improvement
Uncertainties		
Policy and regulation Culture change Increasing demand for natural resource Need more technique and technology	Need more strong legislation Higher culture degradation and change Increased by 70 % Demand increased by 100 %	Efficient and effective relevant legislation and its supported documents Local culture may change in positive and negative ways Increasing of natural resources use disputes People are more aware on technology development

Narrative

Uncle Sar's Livelihood Change
Narrator: Mr Sar
Age: 55 Career: Farmer Wife: Mrs Phien (Farmer and housewife)
There is a family in Na Pheng village, Thoulakome district, Vientiane province which is located in the middle part of Nam Ngum river basin, Lao PDR. The family consists of five members; the head of the family is Uncle Sar who is fifty-five years old and his wife named Phien, who is fifty-three years old. They have two sons and a daughter. The oldest son is named Mr. Sompong and the youngest Mr Larkoe. The middle daughter is Miss Kingngam. All of them are attending either primary or secondary school. Their family is considered as a poor farming household, living in non-permanent housing conditions. They farm rain-fed rice which can only grow in the rainy season of the year. If the annual rain water is scarce, their rice production is insufficient to sell at the market. Moreover, in some years, flood and drought have been frequently occurred in their community which has caused their rice production to decrease. These problems have caused local people to think about different ways on how to improve their living standard. A common idea is to "leave their homes for employment opportunities in the cities".

A few years later, after the government funded development of the Nam Mang 3 hydropower plant, water was released through the powerhouse to downstream agricultural plains, including Mr. Sar's village on the Na Pheng plain. The community can therefore use this diverted water to grow their rice and vegetables in both the rainy and dry seasons. Moreover, the government also provided an irrigation system to control and supply water to the rice field, using water in the dam reservoir effectively. The Nam Mang 3 hydropower project and irrigation system provided the downstream community and water for hundreds of families to plant rice in two seasons including Sar's family, without the risk of flooding and reducing threat

of drought. The rice harvesting yield has doubled, increasing from 2.5 tons/ha to 6 tons/ha compared to previous years. For that reason, local farmers have generated more farming income. The irrigation system and additional water allowed Sar's family to expand his agricultural areas for growing rice, and many other households also plan to expand.

In the year 2018, Sar's family also grew green/non-chemical vegetables, feeding his own family and supplying the local market. Sar provided local food security in their family through a contract farming system. His family later became a model of agriculture practice in the village, so he has special support from credit loan arrangements of the local government bank to improve his farm, as well as training others about opportunities and methods for green agriculture and managing water for sustainable irrigation etc.

In recent years, Sar's family has built a new permanent house with in-house electricity facilities and a vehicle for transporting agricultural products to market in the city as well as a new tractor for his wide agriculture farm. He can now fully support his children to continue their higher education as others do in the same community. His sons and daughter graduated university in Vientiane. His oldest son finished with a degree in agriculture, while his daughter graduated with a bachelor degree of business administration. His youngest son was awarded a diploma of engineering. After they all fished degree at university, they returned back to their homeland and invested in a wide-range agricultural farm system which has become the biggest business in the village. Sar's family has become a livelihood model for living and happiness in harmony with a good environment and a sustainable development model in Lao PDR.

6.5 Summary of desired and undesired elements

Table 25 Desired and undesired elements reported by Nam Ngum River Basin Committee Secretariat

Grp	*Desired*	*Undesired*	*Actions*
1	Government and development partners help to improve local people livelihoods	Impact from natural disasters More children	Irrigation system development Promote education, technical assistance and development. Family planning Stakeholder engagement and active participation including involve local participation in the all planning process and development
2	Develop more factories, hydropower dam development which store water for electricity generation Improve local livelihoods and have a good living condition. Forest, biodiversity richness, plenty natural tourism sites.	Social & environmental pollution Avoid the economic development gap and difference Don't want to face natural disasters: flood, drought & rapid soil erosion	On-site permanent job training or vocational practices for local people Headwater and forest protection Develop the environmental plan comprehensively Have enough agricultural lands Have enough markets which can easily access by local communities Have more knowledge and capacity Improve and consolidate the law on forest protection and biodiversity including effective enforcement Promote job creation and skill development in all aspects for local communities Promote tourism
3	Sustainable and effective natural resources use. Linkage and balance between development and natural resource conservation.	Social tension or problems.	Clearly indicate the plan which can apply in different area in the basin appropriately All stakeholder participation and engagement Promote the integrated management mechanism Fund raising (government, international development partners and private sector contribution) Increase number of qualified officers or human resource. Indicate the development area clearly Build capacity & awareness of water & natural resource protection at all levels in

			basin Strong laws and regulations enforcement and continuation. Educate and increase common understanding on integrated water resource/river basin management at all levels Well-managed the population migration system
4	Policy Modern technology	Natural disasters.	Promote the cooperation and coordination of all relevant agencies at the central and local levels including local communities Establish the specific coordination unit at all levels in order to ensure the credit/loan access and make tax incentive Develop regulations which serve fairly both developers and local communities Conduct training, study visit and lessons learned exchange Establish ad-hoc committee and/or task force for disaster prevention and relief (especially flood and drought, etc.).

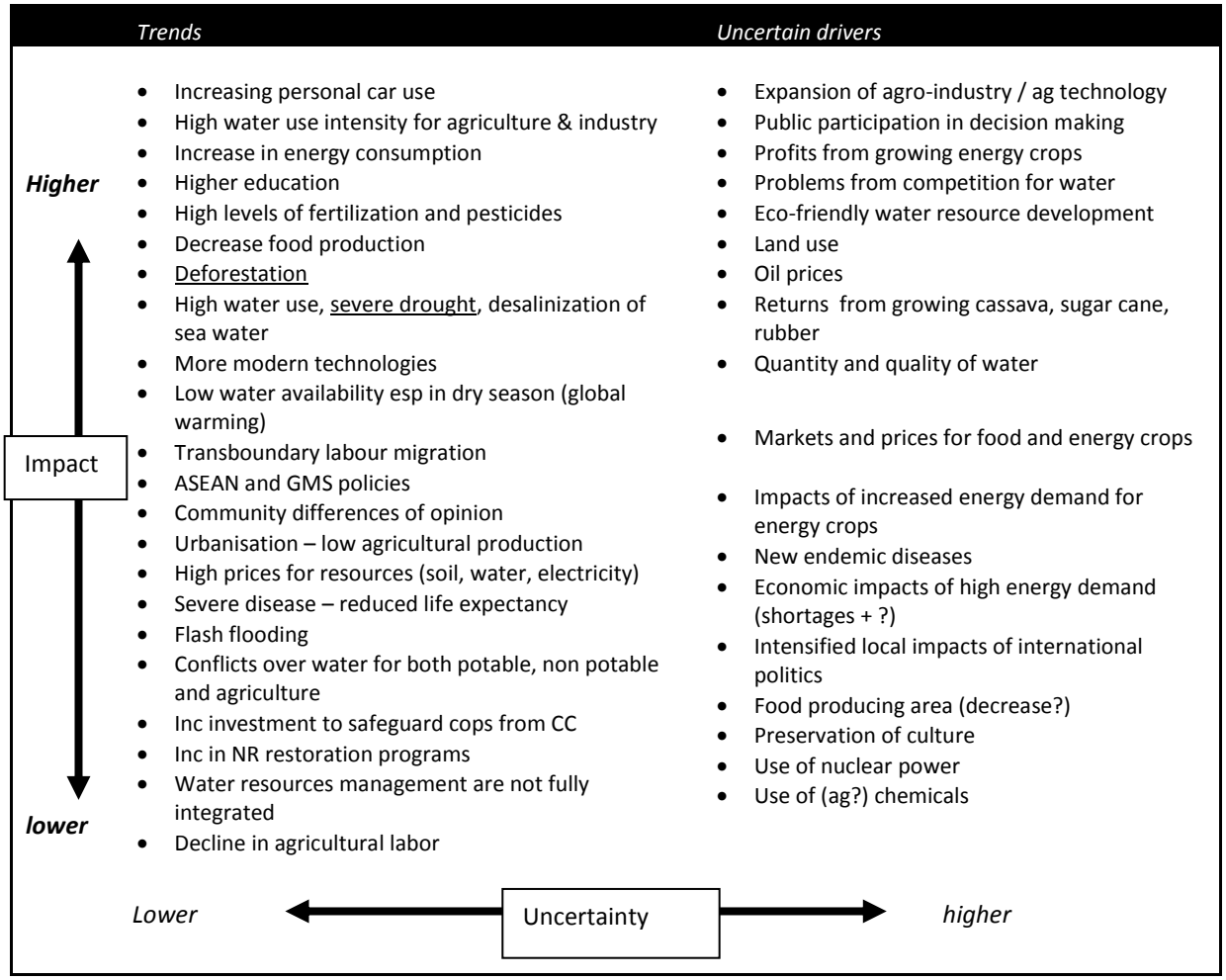
Table 26 Group One

Desired	***Undesired***
Government policy on community livelihood improvement	Severe impacts from natural disasters (flood & drought) to agricultural products & villagers' livelihood
Development and improvement of irrigation schemes	Vanh had to drop her class
	Vanh's sisters had to move to other places for working
	Vanh's parents have too many children (11 people)
	Poor economic condition of Vanh's family and villagers

7 Thailand (Huai Sai Baht, Khon Kaen) scenarios

Note: The scenario frameworks were developed during the first round workshop (20-21 January 2011). The narratives presented below are from the second round workshop (2-3 June 2011).

Table 27 Combined Scenario Framework



7.1 Group One

Table 28 Specific scenario framework

	Driving force	*Imagined outcome 2011 - 2041*
Trends	Energy consumption	High impacts: high cost of energy, more development of options
Uncertain drivers	Expansion of agribusiness factories	See below
	Profits from bio-energy and other crops	Follows market-oriented pathway of developed countries. High prices initially. Increased use of 'best practice' systems. Large farmers have competitive advantage. They increase land holdings. Small farmers exit. Moderate profits from sugar cane, rubber, cassava; higher profits from pesticide free vegetables, eucalyptus, rice
	Public participation	Moderate: ongoing incremental reform; people still lack authentic decision making power
	Integrated water resource development	More systematic mgmt including at the scale of individual farms; increase in dry season water storages; water pricing; increased conflicts over water if people are unprincipled; water allocations flow to owners of capital or large-scale ag projects that contribute to GDP
	Ag land tenure (land use change)	High impacts: distribution narrows; follows trends in wider society; [involuntary] land sales [owners become tenants]; capitalists buy land for factories, resorts, ag; former owners become employees
	Increased effects of climate change	

Narrative

A local sub-district chief, 40 years old, has two pieces of land. The first piece of land is about 10 rai [1.6 hectare] and the second is 100 rai [16 hectares]. He has two children, the first born is named "Keng" ["accomplished"] is a very good student. His father therefore supported him to study abroad until he finished his Master's degree. Keng was very knowledgeable, he was an expert in WEAP and SWAT modelling programs, which can be used for local planning and management of water resources.

Keng asked his father for the 100 rai piece of land with the hope that in five years' time he could definitely make a profit from this piece of land by growing sugar cane, a monoculture crop, because of its high price and ability to send to ethanol and sugar refineries. Keng imported modern machinery to support his production and used chemicals to improve his yields. His father therefore agreed to hand over the 100 rai of land, although the father personally believed in integrated farming following the self-sufficiency economy theory. After five years Keng was running a lucrative production, as he had hoped.

The younger son's name was "On" ["soft"]. He was not a good student but liked farming. His father therefore let this son learn integrated farming following the self-sufficiency economy theory. The father specified a plan for integrated farming and water management. He emphasized the importance of [maintaining] water quality in order to create the highest beneficial use as well as studying the state of wastewater from factories and [agricultural] chemicals and studying water shortages. As well, he taught about rice farming, fish culture, growing medicinal plants, short-lived garden vegetables. He taught On to plant different species of *Dipterocarpus* trees [e.g. *Shorea obtusa, Shorea siamensis*], which help create conditions for natural mushrooms to grow. As well, he taught how to process different products to add value to them, considering the importance of the environment and avoiding chemicals. They planted more than 2,000 trees.

Five years later, water quality in the Huai Sai Bat basin declined. Fish in the streams died in large numbers because of the release of chemicals from lack of awareness by factories and community members, which affected everybody's livelihood in the community.

As well, an economic downturn resulted in decreasing prices of sugarcane products. Keng lost money from not being able to sell his product at a favourable price. He fell into debt and his property was confiscated.

Keng returned to being dependent on his father. His father taught him integrated farming practices. Even though they were not rich, they could survive and take care of their family. Keng then understood that growing many plant species is better security than dependence on one crop. He turned to mixed agriculture following self-sufficiency economy principles, to fish culture, and to growing rotational crops such as plants in the legume family. He put excess material to good use, for example he fed cattle with spare grass and used cattle dung as fertilizer. He also made wood vinegar, and (liquid) bio-fertilizer. These are examples of using raw materials to add the highest value and a way of reducing expenses, reducing use of (industrial) chemicals by turning to use animal manure and liquid bio-fertilizer.

From there, he started to produce bricks from lateritic soils. Keng applied the knowledge he accumulated from past experience. He used internet technology to help sell products, and to study product prices and world market prices. As well he used different forms of modern technology.

His work included developing 'villager experts' for product development including communication within and between villages. This was supported by the relevant government agency with community participation. He paid off all his debts within ten years' time.

While practicing diversified agriculture, Keng, On, and their father jointly established a centre of organic agricultural learning that combined academic knowledge, local knowledge from villager experts, and modern technology, aimed at transferring knowledge to local people interested in applying it in their agricultural practices. They grew mixed crops, for example cassava, with the expectation that their project would be successful in ten years' time. They also established groups or networks in the village, for example a women's group and a youth group, in order to be key components in planning, management, and monitoring water quality in the community, to avoid the problems that occurred in the past.

They also established a toxic chemical-free vegetable growing group in the area, with support from the state, until it developed into a large toxin-free vegetable growing area, which sold to a major department store in the province. And in thirty years from 2011, a water diversion scheme from Lao PDR to Huai Sai Bat has been finished, according to the Khong-Chi-Mun project, making the Huai Sai Bat basin the largest organic vegetable growing area in the country, exporting products worldwide.

7.2 Group Two

Table 29 Specific scenario framework

	Driving force	*Imagined outcome 2011 - 2041*
Trends	Energy consumption	High; potential development of different forms of alternative energy
Uncertain drivers	Profits from bio-energy and other crops	High profits from sugar cane and pesticide-free vegetables (demand increases for safe vegetables); moderate profits from cassava
		Bio-energy crops increase; food crop production uncertain
	Public participation	Increased education -> better awareness of rights and responsibilities; development of supportive legislation
	Water mgmt / conflict	Conflicts increase because of lack of effective management, but construction of water diversion scheme to Huai Sai Bat resolves the water conflicts
	Agricultural land tenure (land use change)	Changes, as a result of expansion of the industrial sector
	Role and duties of local administrative organizations	Increased authority and mgmt budget supported by clear legislation

	Family livelihoods and patterns	Increased self-centeredness; people live apart; decline in public spirit

Narrative

In the next 30 years, Huai Sai Bat will be become more developed and urbanised. There will be a new main road built in front of through the entrance to this area, the so-called "East West Corridor", connecting Mae Sot (western Thailand) to Kwang Klee in Vietnam. Other roads will expand from four lanes to six lanes. The villages near the entrance to this place will experience growth and hence they will give this area a new name: "Phromnimit Villa."

The Khok Si Sub-District Administration Organization will be raised in status to a municipality. Because there will be more people living here, it will become an urban community. The Rajamangala University of Technology Isan develops into an international university with 40,000 students. People from ASEAN neighbouring countries come study here.

Communication will be 10G – the 10th generation. Economic, social, and political conditions change due to an increase in economic prosperity, but the main paradigms and social drivers will still be capitalism, consumerism, and materialism (in some sections).

Mr Dee, is a-60 year old farmer in the Huai Sai Bat area who must adapt himself dramatically. He has 30 *rai* [about 4.8 ha] of land [in a good location]. He decided to sell 25 *rai* of it to an industrial estate because of they offered a good price. He also believed that the industrial estate would be a source of income for the local community. With that income he planned to send his son Mr. Den to study at high levels and to return to be a community leader in the future. As for the remaining 5 *rai* [0.8 ha], Mr Dee still practices organic farming because he sees that he is still able to sell to urban communities. He grows plants in structures where he can control temperature and humidity, and hires labour from neighboring countries.

At the same time the state has policies and standards related to supporting the environmental protection industry and organic farming.

Mr Den graduated with a Masters of Public Administration from the National Institute of Development Administration (NIDA). His previous ambition was to return to become a community leader to develop his local place with the goal of developing the Huai Sai Bat basin to become an area with natural and environmental fertility, an area which can be used efficiently.

Mr Den ran for election, and was elected to the position of President of the *Khu Kham* Sub-district Administrative Organization (SAO). He started to implement his vision, with the support of the SAO for his plans and projects. They built a rubber weir to store water in the dry season and also built temporary retention basins in places with chronic flooding.

He asked for cooperation of the community and relevant people to help look after these projects. They supported forest planting to sell carbon credits, organic agriculture, and eco-tourism. In the beginning they experienced problems, especially water pollution, water management problems, because wastewater from industrial factories was not 100% under control. There were also conflicts over water between the industrial and agricultural sectors. Community cooperation and support from other sectors was still not great.

In the next five years, Den was still voted in as the President of the SAO. He was able to deliver projects to support and develop the Huai Sai Bat river basin as he hoped for, in an improved manner. At the same time state policies regarding environmental protection industries and organic agriculture became more concrete. Community meetings occurred. Common understanding was created at the local level and among all sectors to support the development of Huai Sai Bat basin, so as to restore it to its original state. In the end the basin was increasingly restored in different aspects.

Nature-viewing tourism down the Huai Sai Bat River was managed. Water quality improved. Den together with the community supported the community to achieve self-sufficient livelihoods. The community grew plants organically for local-consumption. They helped each other preserve nature, and local customs and culture, such as the *Bang Fai* rocket festival which the community would organize in May every year.

The Khu Kham Sub-district changed from growing rice to growing sugar cane for supply to ethanol factories because the price of sugar cane improved. Mr Den in his capacity as President of the SAO organized a project to support the growing of sugar cane, for example by establishing a Khu Kham United Sugar Cane Growers' Group, as well as homemakers' occupational groups, such as a [wetland] reed mat weaving group. These were means of creating income for the community. He also organized fertilizer credit cards and low interest loans for production. But in any case there were still problems with petty theft, which led the SAO to establish community policing to keep an eye on and take care of community living. This led to a better way of life for the Huai Sai Bat community. Their physical and mental health improved as the larger society developed more fully.

7.3 Group Three

Table 30 Specific scenario framework

	Driving force	*Imagined outcome 2011 - 2041*
Trends	Oil price, demand, consumption	High; oil and energy shortages with economic impacts; tractors use new non-fossil fuels
	Education	Minimum tertiary education for children born ca. 2011; speak Chinese and other languages
	Trans-boundary labour migration	Significant
Uncertain drivers	Public participation	High
	Agricultural land tenure (land use change)	Moderate; decrease in ag land b/c of declines in soil quality
	Water mgmt problems	High
	Profits from crops	High for sugar cane, cassava, pesticide-free veg; low for rice; decline in rice production as main occupation
	Agricultural technology	Moderate; buffalo no longer used
	Expansion of industrial factories	Moderate; establishment of sugar and ethanol refineries

Narrative

In 2041, Jintara, an eight year old girl went with her grandfather to sell sugarcane to the industrial sugar factory. The grandfather received 36,000 Baht from the sale, of which about 26,000 baht was his net income, after deducting the transportation costs. The transportation was so expensive because of the high oil price at that time (120 baht/L). While travelling back home, Jintara wanted to eat ice cream and so her grandfather gave her 50 Baht to buy it. When passing the Sam Sung District Office, Jintara saw a statue located in front of the office. She saw its big black body, four legs and its tail. She asked her grandfather "Grandpa, what is that?" The grandfather replied "It is a buffalo." Later, the grandfather took her to the province zoo, which preserves endangered species like buffaloes. Buffaloes were kept in the zoo for the younger generation to study, as it had long been an important species to the local farmers.

In 2046, Jintara's grandfather turned from growing sugar cane to growing rubber, because the price was very good, with latex at 400 baht/kg. Some farmers turned to growing more forest trees, to sell carbon credits (as the government gave genuine, systematic support to carbon trading), leading to lower use of chemicals. More forests led to more water absorption, but in any case the global temperature still increased by 0.5 degrees C. Carbon forestry resolved the problem of labour shortages in the rubber plantation. Even if rubber tapping provided more regular daily income, and more sustainable income, selling carbon credits could generate more income than rubber, because the amount of carbon would increase as the trees grew. Her grandfather turned from growing only sugar cane to growing additional

crops. He grew a mixture of 30 rai rubber, 25 rai rice, and 25 rai sugar cane in the same area. He grew cassava together with rubber [because of the time it takes for rubber to mature].

Her grandfather joined an organic fertilizer group, improving his soil, at the same time he allocated some (20 rai) of his land to mixed farming with the following activities: rice, pond digging, fish culture, fruit trees, pigs, and chicken. The main water source was the Huai Sai Baht. This generated more income for Jintara's family but they still adhered to sufficiency economy principles. In the dry season, her grandfather was a leader in assembling a group of villagers in that area to help dredge some sections of the river that had become shallow, and to improve weirs. They built a system of canals to irrigate their fields which gave them adequate water to use. As well, other groups started up in the area.

In his rubber field his grandfather installed a drip irrigation (learnt from You Tube, searched using the national wireless internet network) in order to increase productivity and expand the rubber tapping period. for his varied activities he had only his son and daughter in law as family workers. Jintara was still a child so could not help her grandfather; this led to a need for farm labour, which came from neighbouring countries in the Mekong region. However the development in medical and public health systems, led to a lower birth rate and increased longevity, which led to a 1 percent rate of increase in the basin's population.

When Jintara turned 19 years old, the grandfather foresaw that China was, at that time, a leader in the economic, food, technology and many other areas. Now that the high speed train was running b/w countries, her grandfather therefore decided to send her to study modern agriculture in Guangzhou. During that time China built dams across the Mekong leading to changes in the ecosystem and natural abundance. Combined with climate change caused from deforestation for dam building, this led to loss of fish species and change in agricultural area, because the level of the Mekong declined, impacting on Thailand's agriculture, increasing the cost of production and the cost of living. Farmers had to hasten to sell their produce to supply expanding markets, leading to increased use of chemicals.

Her grandfather decided to send her to study modern agriculture at the University of Guangzhou, China where she completed her bachelor's and master's degree. While studying, she fell in love with a young Chinese man. Upon graduation, they decided to get married and had one child. Together they ran an agricultural processing business in China until they built up a reasonable reputation in the region.

Fifteen years later (in 2061), when Jintara came back to visit her mother's place in Huai Sai Baht, the grandfather offered her his land. A broker offered to pay ten times the price, but Jintara refused, as it was her inheritance. She also saw a business opportunity.

She and her family had decided to return to her birthplace to settle. She established a rubber processing plant in Kranuan District, purchasing raw rubber sheets from the Mekong Region under a free trade agreement which exempted her from import duties. She exported processed rubber to European markets which gave a good income.

When Jintara became wealthy, she supported a research fund to support rubber growing in the basin, supporting the Rajamangala University of Technology Isan in developing a mechanized and sensor-controlled system of rubber tapping to reduce labour required of farmers in the area. The fund also supported the application of sustainable agricultural practices to rubber, reducing use of chemicals in cultivation and increasing the efficiency of water use.

7.4 Group Four

Table 31 Specific scenario framework

	Driving force	*Imagined outcome 2011 - 2041*
Trends	Domestic energy demand	Very high increase
	Regional policies (ASEAN, Mekong)	Free trade; more open borders; trans-national labour flows; farm land-grabbing conflicts; social problems and crime
	Modernization of technology	Adoption of modern labour-saving but oil consuming ag technology
Uncertain	Public participation	Increases with positive results: receptive policy response

drivers	Profits from crop production	Low for rice; good for sugar cane, cassava, pesticide-free vegetables, rubber
	Water resource mgmt	Problems allocating water to different sectors; conflicts
	Agricultural land tenure	Change in land ownership affecting the local area
	Climate change impacts	Longer droughts

Narrative

In the year 2011 a woman has a grandson named Ah Pao who is studying in the Faculty of Agriculture at Khon Kaen Univ. He is the son of her son Nathan. The grandmother believes that Ah Pao should be able to help his family, because in the next 30 years HSB will experience all kinds of development [for instance] with communications and roads increasing in capacity from four to six lanes. But the village has not developed specific examples of integrated mixed agriculture.

Ah Pao started to practice this form of agriculture, for example mixed cropping, beginning with underground bulb crops such as galangal and lemon grass; aboveground crops that are a little higher such as chilli, eggplants, squashes, melons; a little higher still such as papaya, jackfruit, all kinds of fruit trees. Trees grown for the future of his children and grandchildren include teak, rubber (*yang na*), star gooseberry (*mayom hom*) etc. Ah Pao had his grandmother borrow money from the Bank of Agriculture and Agricultural Cooperatives (BAAC) to buy back 10 rai of land that his father had previously sold, allocating 70% to cash cropping growing rice, cassava, and sugar cane, and 30% to mixed cropping. He had a fish pond, raised ducks, chicken, had fruit trees, standing [long-lived] trees, a vegetable garden. He reduced and his use of chemical fertilizers, substituted by organics.

He pulled together a group [of like minded farmers] and increased their membership.

He wanted people in his family to participate, so started an organic farming group [making] liquid organic fertilizer, pelleted organic fertilizer, green manure, as a way of reducing use of chemical fertilizers . . . starting with community organic fertilizer group. Produce was consumed in the household, and they could sell the surplus to other villages. The raw materials for making organic fertilizer could be obtained. Everyone in the community was able to eat toxin-free food enhancing their health, and in the future they planned to export organic agricultural produce.

By 2021, Ah Pao had made a good example to his community of practising organic agriculture. Though some people still used chemicals, it was a community of organic farmers. Ah Pao was appointed the chairperson of HSB community development. [The community developers promoted] zoning for residences, water sources, with cooperative water management. They gave priority to carbon trade, human development activities, and supporting organic agriculture, by starting to adapt the village environment – water, soil, forests – to organic agriculture, for example conserving beneficial insects; maintaining a natural [dynamic] balance; building water retention structures [*chalo nam*]; establishing a carbon emissions reduction fund; community forestry. Ah Pao initiated re-forestation and using the forested area to benefit from carbon trading.

Annie is Ah Pao's older sister. Even as a teenager she did not follow fashion. Nathan raised and taught her to be thrifty and frugal. The HSB community taught young people to preserve local knowledge. Even though Annie likes using the internet as a modern person she has not corrupted herself. The sub-district administrative organisation provides education about local knowledge systems. Ah Pao established a community learning center, and after Annie trained there to improve her work skills, she became an important force in helping train people in the community, assisted by internet technology.

In 2041, the learning centre which Ah Pao established 20 years ago was much stronger. Both Ah Pao and Annie's children maintained their intention. The HSB community is a place to visit, study, and learn for both people in Thailand and in other countries. In the learning centre the work is carried out by four groups as follows:

1. HSB organic agriculture group: takes organic agriculture seriously; has experts that disseminate information about making fertilizer; pelleted organic fertilizer; green manure

2. Marketing group: self-organized; and has committee chair-people for different aspects

3. Tourism group: [responsible for] field visits; like a supermarket for agri-tourism

4. Environmental conservation group: maintains and preserves the environment like it was in the old days.

7.5 Summary of desired and undesired events

Table 32 Group One

This story		*Other stories*	
Desirable elements	***Undesirable***	***Potential inhibitors***	***Potential enablers***
Integrated farming 'Sufficiency economy' philosophy (able to support a proper education for children) Production system needs to consider the self-sufficiency before shifting to trade market Appropriate understanding of sufficiency economy Ability to amend past mistakes Integration between old and modern things Cooperation between different groups at different levels Respect for the beliefs (and experience) of elder generation Government policy in energy crops is clear and definite long-term Crop supports for farmers (e.g. price guarantees) Community has volunteering spirit that transfers knowledge to next generation Farmers are educated Presence of limits on 'sufficiency' Farming is a socially honoured profession Focus on adequate water for agriculture, tree planting, re-forestation	Do not want farmers to follow global agriculture Do not use [modern] education to dominate farmers, but rather emphasize local wisdom Farmers push their children out of agriculture (-> loss of knowledge in agriculture)	R1: Global warming R1: Food and energy demand increased HSB2: Civilization increases in the village which leads to increase adaptation accordingly HSB2: Polluted water due to rapid development of technology (wastewater treatment system is not yet fully developed) HSB2: Migrant farm labour causes social and spatial problems R3: Development of each country is not coordinated, each pursues their own interest R3: Regional integration does not agree to have a common price which leads to a competition of price in the region R3: Transboundary labour migration leads to social competition and health impacts without social benefits for migrants R3: Free trade drives agriculture to industrialize CH1: Foreign investment (e.g. mine project, small-scale power plants) cause environmental impacts HSB2: Transformation of local politics, capacity to reform local government HSB2: Agricultural land zoning is not yet clear HSB2: Corruption in the bureaucracy and misuse of power HSB2: Inherited farming	R3: Development of basic social infrastructure by regionally-based collaboration CH1: Eco-tourism R1: Ability to adapt to new environments R1: Development of local climate change adaptations R1: Understanding of the social dimension in climate adaptation – state mechanisms respond to poverty R1: Authorized organization implements GHG emission reduction plan appropriately, at all levels R3: Compensation (although not sufficient) is given for various state projects R3: Reforestation to the areas where forest is lost R3: Reforestation to the areas where forest is lost HSB2: Social values [transmitted through] education* HSB2: Water management system in ago-industrial area and consumptions*

		career from ancestors [?] HSB2: Social problems: parents have no time to take care of their children; this affects family relations	

Note: * = moved from column 3 to column 4

Table 33 Group Two

This story		*Other stories*	
Desirable elements	***Undesirable***	***Potential inhibitors***	***Potential enablers***
Gravel road converted to a four-lane asphalt road		Lack of budget Community resistance	Supporting budget
Children receive higher education		Insufficient family income People have more stimulation (and ability to afford)	Education loan fund Better economic status of community
Local politics freed from cycles of patronage	[Corruption]	Patronage system Politicians lack consciousness Poor auditing systems	Good consciousness creation Integration of many systems to create information for decision making Use of knowledge Information access system
People have clearly-defined life goals	Lifestyles valuing luxury, worldly acclaim	Emotional arousal from various media influences Extravagance (overspending)	Education Good models like community leaders or wise people
People live according to the sufficiency economy philosophy (reduce high consumption)		Emotional arousal	Good models Implementation based on a sufficiency economy approach
Economic and social conditions develop w/transboundary communication		Policy and admin change Political conflicts of interest	Adaptation to the "ASEAN society" Continuity in key national policies
Systematic water management in HSB Basin	Competition for water	Encroachment of urban society People unwilling to cooperate in water management Lack of systematic water use; ad-hoc problem solving Lack of comprehensive water management plan; lack of implementation	HSB has a clearly defined basin development policy, which is implemented Penalties exist Communities have the strength to protect their rights
Environmentally and socially friendly manufacturing industries	[Polluting] industrial estates	Opposition of community due to lack of understanding about establishment of environmentally friendly manufacturing industries People want income from working in [polluting] industries Policies from political parties	Desire to increase incomes in community Applying lessons learnt from other problematic areas such as Maptaphut to control and regulate operations in the industrial sector Policies to promote the establishment of manufacturing industrial estate Watershed conservation [policies]
[Family agriculture has successors]	No successors in agriculture		Agricultural prices rise Farmers have been [better] accepted in society
[Want people to remain as landowners not tenants]	Do not want people to change from landowners to tenants	Investors succeed with use convincing strategies Extravagance (overspending) Incursion of manufacturing industry	Sufficiency economy principle practiced Support for agriculture from all sectors

Note: In the Table, inhibitors and enablers can refer to undesired as well desired events.

Table 34 Group Three

This story		*Other stories*	
Desirable elements	***Undesirable***	***Potential inhibitors***	***Potential enablers***
Adequate water sources (improvement of weirs, and dredging of water sources) Land possession is maintained	Increased cost of living (such as petrol) Severe use of chemicals in agriculture	Overbuilding of dams in the Mekong Region, affecting the volume of water in the HSB basin Climate change [effects] such as drought, flood Land prices rise	Trend of organic farming practices The use of renewable energy to reduce the cost of production, consumption and pollution Carbon credit helps encourage reforestation as polluters are required to pay expensive taxes Dam/s built in the Mekong Delta to prevent seawater intrusion

Table 35 Group Four

This story		*Other stories*	
Desirable elements	***Undesirable***	***Potential inhibitors***	***Potential enablers***
Livelihoods based on integrated agriculture, using technology	Monoculture crops	HSB2: Changes in the family institution, increase in individualism	CH1: Promote organic farming R1: Demand for organic crops
Create a balance between development and protecting the environment		HSB2: Over-expansion of agri-industries, with no proper zoning	HSB2: Expansion of agri-industries
Promote ethics and morality in the family, school and society continuously	Materialism creates a hardship for the family and society	HSB: Informal lenders [high interest rates]	CH: Promotion of local culture
Establish zoning for agriculture, residential areas and industries distinctly			tourism-Promote eco :1CH
Soil-water-forest conservation	Extravagance (overspending)		CH1: Establish environment protection committee in the region; R1: Carbon trading

Note: R=Regional; CH = China

8 Vietnam Mekong Delta scenarios

Note: The scenario frameworks were developed during the first round workshop (22-23 March 2011). The narratives presented below are revised narratives created during the second round workshop (6 August 2011).

8.1 Group One

Table 36 Specific scenario framework

Driving force	*Imagined outcome 2011 - 2041*
Food security	Declines
Environmental quality	Worsens
Upstream water use	Increased
Sea level rise	Abnormal

Note: This group did not make rigid distinctions between drivers with high and low levels of uncertainty.

Narrative

Progress of the story is based on four elements impact: (1) low food security, (2) bad environment, (3) more water use at upstream, and (4) abnormal sea level rise

Ms. Diem Xua was born in 2001 at Tra Vinh province, a coastal area of Mekong delta. The main income of Diem Xua family was based on 0.2 hectare that was practicing rice-shrimp. Besides that her parents could catch wild fish to sell for more family's income. The circumstances of her family is poor, however, she was still going to school.

There is an event of sea level rising in 2012 that was unusually severe impact to coastal areas (damageable schools, housing, agriculture production,...). Since the disaster, the lives and livelihoods of people in these areas were affected, including Diem Xua family. As a result, she had to drop out of school at fourth grade when she was only 11 years old.

Economic situation of Diem Xua family became more and more difficult due to environment pollution, saltwater intrusion, and her parents had died. Thus, she decided to leave the rural area to a city in 2021. She had an expectation that she could find a new job and having a better life condition. In the city, she failed to find good jobs with higher income because of her education level are low. Finally, she had to accept a job in the clothing manufactory with low wage. The living in the city was higher spending, so she could not save more money. However, she had a determined attitude in her life, she strived to go to school while she was going to work, and eventually she graduated from grade 12 through the policy of universal education for workers.

During the time of Diem Xua went away from her hometown, there were many projects that would be implemented in local areas, such as construction of irrigation systems for aquaculture, development of industrial zones and infrastructure investment,... These projects had created more opportunities for local people who could have a better access to public services and achieving a better life. In 2031, Diem Xua had returned home, she was not only to find better income opportunities, but she also married her boyfriend, who had been good relations with her as a childhood. After married, a young couple had invested in rice-shrimp farming, and one again she failed in farming because of the size (area) for farming was small and high levels of intensification (high density) to polluted the water sources. In addition, the abnormal changes of weather, untreated wastewater from industrial zones and technical knowledge of rice-shrimp farming is poor. The development of industrial areas in Tra Vinh had made water pollution. Contaminated water sources was not only affected the shrimp farmers, but also affected the whole community. Although the government had measures to handle the environmental pollution, enterprises and industrial producers had

not fulfilled the environmental protection as their committed to pollution in the countryside of Diem Xua. This situation would be continued occur again.

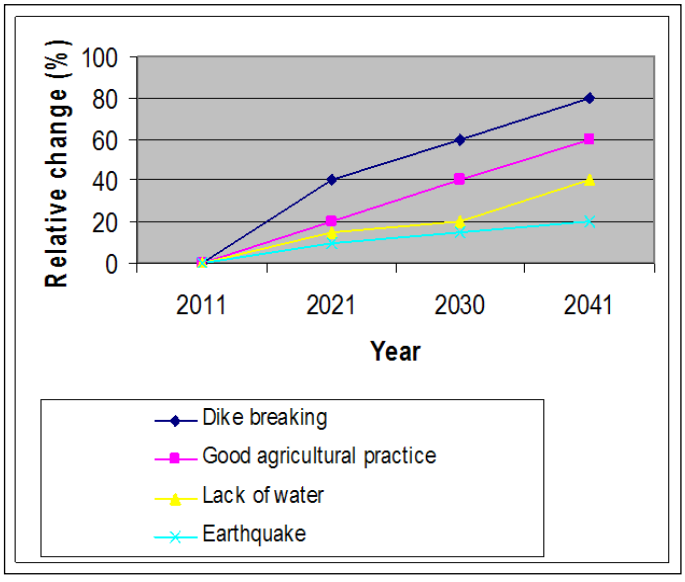
Later in 2031, the government of Vietnam, as well as Tra Vinh provincial governments recognized that invested in industrial zones had to limit the impacts on agricultural production zones and necessarily new techniques development to reduce environmental impact. Through the lessons were learned from Thailand in the development of multi-farm systems, organic productions and production cooperation, the government established a new rural model, improved infrastructure, treated wastewater and managed effective wetlands. Diem Xua and local people were supported the loans for production and could access to new techniques, so that there were many rice-shrimp patterns towards environmental friendly and cleaner productions were extremely successful.

By 2041, Diem Xua and local people are awareness of biological production that will bring higher efficiency. She has successfully applied these cropping patterns in terms of her production and also has achieved the desired results. Increasing income from rice and shrimp products, her family also has extra income from the sale of carbon credits and other income from industrial activities. Thanks to these incomes, she bought more land from other farmers who own small land and at less efficient production to expand her production (from 0.2 ha to 0.5 ha). Furthermore, thanks to the development of small-scale industrial clusters in the direction of new technologies, she and her husband have steady work in the industry. Striving to her struggles and in addition to the supports of the government, the economics of Diem Xua's family has been improving a lot compared to before. Her two children are attending to national standards schools and she hopes that her children will have opportunities to study abroad and success in their life.

8.2 Group Two

Table 37 Specific scenario framework

Driving force	*Imagined outcome 2011 - 2041*
UNCERTAINTIES	
Dike failure	Increase: crop loss; human loss; destroying infrastructure (house, road, school…)
Good agricultural practices	Increase: reduced water and soil pollution; increasing area of land use for agriculture
Water shortages	Increase: war in water use; agricultural production faces challenges; Using drought ability varieties in agricultural production
Earthquakes	Increase: destroying public and private property; human loss



Narrative

The revised story about Mr. Nguyen Tuong Lai

Mr Nguyen Tuong Lai grew up in a poor family. His parents are farmers and have small farming land area, therefore, their parents had to work as hired labour for their livelihood. In 2011, lives of people in some rural areas of the Mekong Delta are difficult, and they mainly live on rice and shrimp farming. These people, especially those living at coastal areas, had to face the problems of pestilent insect, poor crop as well as general economic difficulties such as crisis and unemployment, which leads to the wave of migration from rural to urban area. National and local government had to face the challenges of creating jobs for rural labour, policies of agricultural land accumulation with large scale, etc. At that time, Mr Tuong Lai was a pupil of 9th grade and had a sister named Doi Moi. His parents had to work hard to afford to let him and his sister to go to school.

In 2014, Mr Tuong Lai graduated from high school. His family's difficulty then was making an important decision for his future life. His father suggested sending him to their relatives in Can Tho city so that he can find a job and if possible after one or two years they would send him to Malaysia working as a kind of labour export [i.e. migrant worker].

His father's decision originated from the current trend of the rural area in the Mekong Delta - “difficult production conditions and difficult rural life made farmers leave their home and farms in order to move to urban areas to work as hired labour or as workers in factories and part of them had to mortgage their land in order to get money for their children to work as export labour”.

Meanwhile, Mr Tuong Lai's mother had a completely different idea with his father. Thanks to information from TV, staffs of agricultural extension and local government, his mother had recognized that policies of rural vocational training, new rural development, especially policies of investment for agricultural production, technical and scientific development, accumulating land with large scale production, may bring about good conditions and opportunities for Mr Tuong Lai to continue working within agricultural production field of his father and ancestors.

His family's final decision was that he would follow an intermediate program of agriculture in order to get new knowledge and be able to apply new technique in agricultural production. Then he followed the program in the context of only 40% of labour working in the field of agricultural production.

In addition, the use of inorganic fertilizers led to a bad consequence - agricultural products cannot meet the export standard for clean products. Therefore, he always dreamed of being able to have agriculture production using organic fertilizers, varieties which can survive with little water and resist salinity (thanks to the knowledge gained from school he knew that these varieties had been developed in Thailand), and he also recognized that his local need to invest in dike construction for better agricultural production.

In 2020, Mr Tuong Lai had completed his intermediate agricultural program and worked in his local community as a local agricultural extension staff. Now, his local area had invested in dike system to support agricultural production. Beside agricultural extension work, he also used his family saving money to [buy] 5 ha of land for production (thanks to open land policy and no more land possession limit).

The conditions of agricultural production in the Mekong Delta was better at that time: farmers began to use less pesticide, new varieties, management techniques to save water, and apply successfully the technique of "One Must-5 decreases"[2], particularly thanks to the closed dike agricultural production reached the optimal capacity, high output, and its products were sold with high price because European and U.S. markets favored Vietnamese agricultural products.

In term of policies, thanks to the success of new rural programs and the effectiveness of rural investment policies, the farmers in the Mekong Delta had begun to apply technology and science in agricultural production. In addition, the agricultural extension staff helped farmers more actively and frequently. Especially the farmers began to use organic fertilizers for 'green' agricultural production. Mr Tuong Lai was

[2] Must be right variety - 1. decrease pesticide, 2.decrease fertilizers, 3.enough water, 4. decrease post harvest loss, 5. decrease quantity of seed

sometimes proud of his effort in a role of extension staff when he encouraged farmers to use organic fertilizers instead of inorganic ones in agricultural production according to GAP and VietGAP.

Mr Tuong Lai got to know about this technique through internet where he discovered that Thailand had applied this technique successfully in agricultural production. Thanks to this success he bought 5ha of land (previous rented land) and his wife also delivered their first baby by this time.

There was an incident which caused serious consequence for local agricultural production, and his commune suffered the most. That was coastal dike breaking due to a serious storm in 2030. Consequently, most of rural agricultural land in the coastal area was salined, and domestic water was a shortage in urban area. By that time, farmers in the Mekong Delta recognized the bad consequences from destroying protective forests for shrimp farming, and they were also aware that the effects of climate change had become more severe, higher sea level, higher saltwater intrusion, etc.

To overcome consequence of dike break, policies related to agricultural production in the Mekong Delta also had positive changes, namely changing policy of limitation of land size, encouraging scientists to invest in doing research on salt resistant rice varieties, especially encouraging farmers to look for models of sustainable production and high economic efficiency.

Mr Tuong Lai's current challenge was how to find out a farming model suitable with salty areas. Thanks to the techniques learned from his brother-in-law (his sister's brother) he tried rice-shrimp farming model in his local area. As a result, he gradually succeeded in his trial of this model such as high market price of shrimp, and high yield of rice thanks to the use appropriate new varieties. By then, in the rural of the Mekong Delta emerged a part of farmers who did not have enough production ability and changed their jobs (thanks to policy of rural vocational training), and they sold agricultural land. Mr Tuong Lai and some farmers bought these pieces of land to “accumulate land”. Mr Tuong Lai bought additional 5 hectares of land to increase their land to 10 hectares. His oldest son was ten years old, and sent to international boarding school in Can Tho city. His second daughter was two years old. His house, and his neighbours,' were equipped with domestic furniture and computers. Thanks to the investment program of new rural development, most rural areas had wide roads, national power grid, and clean water. And most of agricultural production policies proved their effectiveness.

During this time, Mr Tuong Lai was also proud of the positive support of his wife because after giving birth to their oldest child, his wife participated in women's movement in rural area, in women-saving funds, “women helping each other get rich” movement, raising pigs within family scale, etc. All of these had brought positive economic effects for the family.

Today, after one-week trip back from Africa he was invited to attend multinational exchange program of culture-technique of agricultural production by Can Tho University (2041 is the second time he participated in this program). He is proud to report his experiences in front of farmers in the neighbouring countries. In his report he emphasized the change of his local farmers and farmers in the Mekong Delta. Rice-shrimp farming model was effective and evaluated as a sustainable development model in the Mekong Delta region. The enhanced adaptability to climate change, the figure of more than 80% of farmers applied technology and science into production thanks to new rural program, industrialization-modernization policies in agricultural production; agricultural development program, farmers, rural, mass organizations (farmer, women, youth) developed in conjunction with a network of extension club has brought out positive consequences.

Today, Mr Tuong Lai is having a drink with his friends. He and these “experienced old farmers” drew a conclusion that sustainable development can only be reached if the farmers are aware of issues relating to global climate change, enhance their capacity to cope with vulnerability, especially the need to build reasonable and effective agricultural production strategies beside their technological and scientific knowledge.

8.3 Group Three

Table 38 Selected uncertainties

Driving force	*Imagined outcome 2011 - 2041*
UNCERTAINTIES	
Water use upstream	Increase 150% by 2031, continues to increase to 2041 but at lower rate
Environmental pollution	Increase 150% by 2031, then decreases
Flooding in the Vietnamese Mekong Delta	Decreases by almost 75% by 2031, stabilizes at this level
Difference between rich and poor	75% linear decrease in inequality by 2031

Source: See Figure below. Flooding refers to annual flood pulse.

Table 39 Other elements of the framework

	Trends	*Uncertain drivers*
Higher	• *Increasing personal car use* • Erosion of river and coast bank • Salinity intrusion • Ground-water degradation • Rise sea level • Increase garbage (trash) • Environment pollution (air, water) • Spill oil • Reduce aquatic resources • Lack of fresh water • Increase diseases and plagues (human, domestic animals and crops) • Increase extreme weather • Policies for using natural resources • Develop technology and sciences • Hence education levels; English is second language • Industrial development • Using water resource unreasonably • Hydro-power plant development in upstream of the Mekong basin *Decline in agricultural labor*	• *Forest fires* • *War in water use* • *Food security* • *Dike breaking* • *Ecosystem change* • *Good agricultural practice* • *Ground-water salted* • *Sea level rises irregularly* • *Earthquake* • *Move water from the Mekong to other basins* • *High awareness of government laws* • *Unreasonable exploitation of natural resource* • *Environment change* • *Upstream countries overuse water resource* • *Narrow gap between the rich and the poor*
Impact		
lower		• *War in water use (between various areas of the Mekong Delta)* • *Irregular storm/flood* • *Thinking in term of local area only*
	Lower ← Uncertainty → *higher*	

Narrative

In 2040, the Mekong Delta of Vietnam [has] become a region with agricultural development, agricultural processing industry (seafood) and tourism. Infrastructure development [has led] to: (i) the movement of people in the Mekong delta, throughout Vietnam, and [to/from] regional countries is much easier, (ii) economic exchanges - cultural expansion in the region and the world (iii) a higher level of education; (iv) mechanization and automation in agriculture facilitates the production of high quality goods and

contributes to ensuring food security in the country and in over the world. To achieve the above objectives, Vietnam Government and the people have implemented the following:

By 2040, the Mekong Delta has become an area with developed industry and agriculture in terms of China and Southeast Asia nations also have conditions ahead, we utilized the comparative advantages to facilitate development such as development of industrial processing of agricultural-seafood products for export.

In the mainstream Mekong River, China, Laos and Cambodia are constructing dams and reservoirs; the constructions used for exploitation of water for agriculture in northeastern Thailand, Lower Cambodia and Laos resulting in upstream water is used increasingly. Therefore, utilization of freshwater resources in the Mekong Delta that is more economical and efficient is urgently required. In addition, reduced flooding in Mekong Delta due to operation (scientifically) of the dams in the upstream for hydroelectricity generation. The procedure of the reservoir's operation is the storage of flood water in the flooding season and discharge it the dry season. Thus, with the operation of reservoirs in a scientific way, flood peak was reduced to some extent due to upstream flow of the Mekong River depending on natural factors such as rainfall. As a consequence, in 2020, the governments of the Mekong River basin have a treaty for the management, exploitation and protection of water resources and benefit sharing.

To develop social and economic, local governments in the Mekong Delta have made: (i) ecological zoning plan for economic and social development, (ii) application of scientific techniques to put into production processes such as the development of varieties with characteristics adapted to flooding and high salinity conditions, construction of irrigation and flood control (iii) development of environmental friendly industry on poorly agricultural production, and inefficient fisheries, (iv) construction of sea dykes and forest development for coastal protection against erosion, crops protection, landscape creating for eco-tourism development, (v) investment for developing marine economy…

In 2010, the Government issued a program for new rural development strategy with the goal of industrialization - modernization of agriculture and rural areas, tied in agriculture, farmers and rural areas in the period of accelerated industrialization – modernization of the country. Construction and development process to ensure uniform, harmonious economic and social development, environmental protection, security - safe and orderly society, improving their material and spiritual for rural population.

Overall the gap between different economic sectors of society in many countries around the world is quite large and so this situation will be avoided to occur in Vietnam, the government should be able to determine a suitable policy in helping farmers have a chance to live better, provided that grow faster to keep up the development of other social components. By 2020 the gap between rural and urban areas is narrowing.

Environmental pollution will be occurred seriously in 2030 and then decline. From 2010 to 2030, increasing environmental pollution is caused by: (i) the awareness of people is not high in protecting the environment, (ii) the policy and the state law is not really reasonable, (iii) science and technology has not developed adequately to address environmental issues, (iv) focusing on economic development overlooked environmental protection Until after 2030, environmental pollution has improved because: (i) people have become more aware of environmental issues, (ii) policies and laws of the state were enhanced, specified and consistent with reality, (iii) technological development invent cleaner production technologies and better environmental treatment, besides the government has adopted policies to support for investment in environmental pollution abatement technology, (iv) more and more investment in environmental pollution treatments.

Solutions for development of agriculture-forestry-fishery in the Mekong delta include:

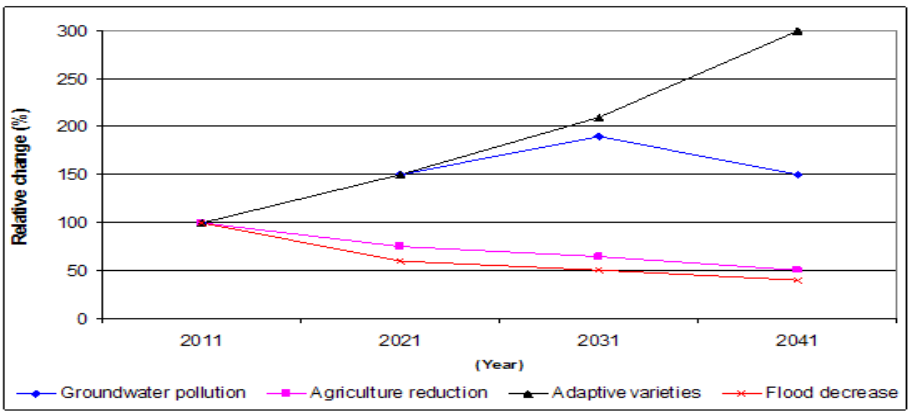
- Regulate amount of freshwater through reservoir construction, maintenance and development of watershed (in upstream through an agreement on benefit sharing the Mekong river basin and water storage in wetlands in the MD)

- Layout and shifting seasonal calendars be consistent with the conditions of water resources, climate by growing less-water used crops in dry season or short lifetime crops, integration of agricultural-forestry-fishery models.
- Building dams, culverts, breakwaters in estuaries to store freshwater for agricultural production. Government policy to build dams in estuaries such as Cai Be (Kien Giang), Vam Co (Long An) by using capital from National Development Program and from ODA.
- People in the Mekong Delta who depend heavily on the Mekong River; without proper attention to the exploitation and use of water resources, the Mekong Delta economic development will be facing difficulties. There must be fully aware of this problem from all different social sectors and properly use of water resources in the different areas needs attention at the international level with the aim to wisely use Mekong resources.

8.4 Group Four

Table 40 Specific scenario framework

Driving force	*Imagined outcome 2011 - 2041*
UNCERTAINTIES	
Groundwater pollution	Lack of water for domestic use
	Lack of water for agricultural production
	Increase in human sicknesses
	Increase in water use costs
Decrease in agricultural production	Food insecurity
	Poverty and socio-political instability
	Low incentives to agricultural technology development
Varieties adaptive to climate change	Agricultural production development
	Decrease in production costs
	Decrease in investment for climate change adaptation
Flooding in the Vietnamese Mekong Delta	Soil degradation
	Lack of water for agricultural development
	Negative aquaculture effects
	Increase in salinity intrusion
	Livelihood insecurity



Narrative

Dang Binh Minh, 22 years old, is a son in a five-member family. Being an advanced farmer's son in the coastal Kien Giang province, the Vietnamese Mekong Delta, Minh has studied crop science in Can Tho University which is expected to help him follow his father' interest and desirability in order to apply technology and science in agriculture. His father cultivates 2 ha of a rice-shrimp farming system that is considered as a sustainable farming system in the coastal area.

After graduation in 2015, Minh returns his home village to work as an agricultural manager strongly stimulated by "new rural commune model" construction in the Mekong Delta. Regarding the high energy demand of the riparian countries in the Mekong Basin, several big hydro-power plants are constructed in the main stream Mekong River. Consequently, freshwater resource discharge as well as water flow regimes in the Vietnamese Mekong Delta is greatly influenced. Therefore, agriculture is confronted with many difficulties: rice crop is destroyed by salinity intrusion and shrimp is lost due to water pollution. Minh's rice-shrimp model, "a sustainable model in the coastal area", is strongly damaged because of water-related risks.

As rural livelihoods have been unsecured, rural labourers migrate to urban areas for income-earning activities. However, they have undertaken low-skilled jobs since almost all of them are low educational grades and professional vocation. Moreover, the high pressures on urban life and the prolonged economic recession have led migrants to face with many challenges. As many factories are bankrupted or narrowed their production, the unemployment as well as social evils rapidly increases in the urban area.

At Minh's home commune, thank to his new ideas in agricultural production, community participation and the State's policy on the regional agricultural and rural development, he has projected agricultural diversification, applied bio-fertilizer to improve cultivated soils, implemented relevant water use measures, produced "green" agricultural products and cultivated paddy as Global-GAP requirements. As a result, his household economy that is promisingly developed becomes a good example on the "organic" agriculture-based economic development that is referred to migrants backing to the rural areas.

With his valuable contribution to the rural socio-economic development, Minh is promoted as a president of the District People's Committee by the year 2030. He continuously develops and implements the strategy that encourages migrants to develop sustainable agricultural economics. He integrates his organic farming alternatives into eco-tourism that provides more livelihood opportunities to local residents.

By the year 2035, although fresh water scarcity is still severe, thank to land use planning, relevant water use and adaptive rice variety application, a little decrease in agricultural production has not influenced rural residents' income improvement since rice production and trade is met GlobalGAP requirements and "a new style cooperative". He stimulates his son to study in "green food processing science and trademark building" that enables to create additional values in organic agricultural products. Moreover, competition in fresh water use in the Mekong Basin is relatively reconciled since water use and management regulations are approved through regional negotiations among the riparian countries, generating the legitimization to appropriately manage and use water resource in the Basin.

By the year 2041, the green agricultural products in the coastal community are highly accepted by the domestic and international markets. Rural livelihoods are secured and improved. However, Minh is anxious for the future agricultural development since the decline in water resource and competition in water use are still complicated because of climate change impacts and hydrological interventions, and the next generations, for instances his children, are not interested in agriculture. They have paid much attention to informatics and economics rather agriculture-based issues.

8.5 Summary of desired and undesired events

Table 41 Vietnam Group 1

Effective events within story and ranking		*Related events in other stories*	
Desired events	***Undesired events***	***Enabling elements***	***Inhibiting elements***
Mild weather Mitigation of environmental pollution (to have solution for waste products) To have support policies from Government (Agricultural policies implementation and modern rural area,…) Stable life and peaceful (at present) Improve intellectual standard of the people Better life in the future Subsidization for unemployment and pensions for farmers	Inclement and unfavourable weather Increasing Environmental pollution People forced to drop out of school because of economic difficulties (saltwater intrusion impacts farming) Poverty (low education, lack of capital and natural disasters,…) Policies from government is not inadequately poor people Disease	Labour force shortage in 2014 (VN2) Water pollution by using various inorganic fertilizers and wast from industrial zones (VN2, 3, 4; KH 1, THD 1 & 2) Broken dams and lack of fresh water for agricultural production and home consumptions (VN2) Saltwater intrusion (VN2, 4 & KH1) Mekong River water is reduced (VN3) Building lakes and dams at the upstream (VN3) Diseases (VN4) Lack of fresh water for agricultural production and home consumption (VN2) Climate change (KH1, 3) Deforestation (KH1) Urbanization (KH1) Declining water quality due to the human activities (Thai1) The conflict of water uses; between agriculture and industry (Thai2) The impact of natural disasters (KH3) Declining natural resources (KH3) Increasing population by migration (KH3) Poor infrastructure (KH3) The competition for resources (KH3) Lack of markets for agricultural products (KH3) Lack of capital (KH3)	Application of IPM methods (VN2) Technical supports from government (VN2) Build a big dike to control water (VN2) Reduce the flood damage by building the lakes and dams at upstream to manage water flows; water store in the wet season and water discharge in dry season (VN3) Government has more policies to improve income and develop rural areas (VN3) Countries at upstream have measures to improve water quality (VN3) Building a dike to prevent saltwater intrusion for farming in 2040 (VN3) Planning for land use (VN4) Construction of small tanks (VN4) Improve knowledge (VN4) Striving to overcome struggles; the solution of environmental protection, safety production and pollution reduction (KH1) To study the way to adapt climate change (KH1) The policy of government supports poor people and communities (KH1) Application of economic cooperation and support of advance technologies (Thai1) The supports of government grow crops without using chemicals (Thai1) Diversification of agricultural production (Thai1) There are appropriate policies for economic development and infrastructure (Thai2) A linkage in communities (Thai2) Loan supplies with low interest rates for farming (Thai2) The unity and trust about the living within the community (KH3) Non-governmental organizations support tourism development (KH3) Development of cultivation techniques in the local community (KH3) Local communities work together to find solutions (KH3)

Table 42 Vietnam Group 2

Desirable Elements	*Undesirable Elements*	*Potential Inhibitors*	*Potential Enablers*
(1) Good agricultural practices: pesticides and fertilizers rarely used **(4) VietGAP allows Tuong Lai to cope with salinity intrusion** **(8) Widespread adoption of GAP**			Organic farming systems from Thailand Farmers' knowledge sharing & learning networks through out agricultural extension system Mr Tuong Lai exchange his knowledge when visiting Africa Mr. Tuong Lai attend multinational exchange program of culture-technique of agricultural production by Can Tho University
(2) Most rice production protected by dikes	(2) Dike breaking (3) Storms (4) Higher saltwater intrusion	Deforestation for shrimp farming Low adaptability	Searching appropriate farming model Pro-rural infrastructure investment policies Investment of research program for searching resistant salt rice varieties
(5) Using new varieties **(6) Using organic fertilizers** **(7) Less pesticides**	(1) Pestilent insect, poor crop (6) Low standard of agricultural product (7) 40% of labour working in agricultural field	Using inorganic fertilizer	Rural vocational program Many factories in the urban areas
(3) Development of drought resistant varieties and varieties with low irrigation water requirement	(5) Water shortages increase		Policies of investment for scientist doing drought resistant varieties researches
	(8) Crisis and unemployment in rural area	Migration from rural to urban	Enhancing agricultural extension systems at rural Model of "One must-5 decreases" method.
(9) Advanced agricultural technology is applied in 80% of the Delta			New rural program (the government invests in infrastructure (wide road, national power grid, clean water), high technology in agricultural production, and other fields in order to reach 20 criteria of this program) Industrialization and modernization policies in agricultural production
(10) Mr. Tuong Lai accumulates land up to 10 ha			Changing policy of limitation of land size Policy of rural vocational training for hired labour or small land size.

Note: Numbers in parenthesis refer to preference rank as assigned by participant voting ("1" refers to highest rank for either desired event or event which participants wish to avoid). There are separate rankings for desired and undesired events.

Table 43 Vietnam Group 3

Story (in order of importance)		*Events from other stories*	
Desired elements	***Undesired***	***Potential inhibitors***	***Potential enablers***
By 2040, Vietnam will be an industrialized country with better standard living compared to year 2010		Be able to compete with China and Thailand in key industries	The development goals of the government
Cooperation with other countries MRC acts to minimize possible disagreements that may happen Better strategies to use freshwater in the Mekong basin; consciousness of international organisations of water resources use in Vietnam	Increase using of freshwater in upstream areas (for agricultural production such as Thailand and Cambodia) Improper use of water resources may reduce a chance for the development of MD		Enhance regional power (Mekong Committee; Basin 1)
Integrated policy for sustainable rural development → narrow gap in wealth in rural areas			
After 2030: environmental pollution reduced because of: (1) raising awareness; (2) improving policies; (3) applying of advanced technologies	Environmental pollution at peak in 2030		Network of learning and sharing knowledge of farmers
Upgrade level of education			More investment on education
Ultilize alternative energy as energy of solar, wind, tide, and biofuels to meet demand of electricity use		More money need to be spent; advanced technologies required; unstable sources of energy	Less environmental problems
Exploit efficiently and sustainably marine resources for national economic development	Overexploitation of marine resources, probably reducing biodiversity	Technological development required that is very expensive	Government's policies
Plant forest trees to reduce negative impacts caused by nature and human			
MD secured by (1) adjust crop calendars, (2) reinforce dykes along the main estuary, and (3) construct reservoirs			Many international projects being carried out to find out the solutions to adapt with predicted scenarios
Upstream reservoirs properly operated: store water in flooding season and discharge it in dry season	Upstream reservoirs reduce flood peak		Improved management of upstream reservoirs: consult with impacting stakeholders; benefit sharing (Basin 3)

Table 44 Desired elements, Vietnam Group 4

Desired elements	*Rank*	*Note*
New adaptation strategies are developed for regional planning to improve response in the Mekong Delta	8/21	Climate change is happening. High general properties. High active, mitigating of affects at lowest level.
Increase of adapted crop varieties (200% increase 2011-2041).	5/21	High sustainability of model. Food security will be interested in future. Flexible application (quickly, good results…) Affect livelihoods directly.
Increase in efficient water use + adapted varieties + reasonable scheduled farming changing, salt intrusion adaptation. **Adapted livelihoods for flooding risk.**	4/21	Flood situation is complex. High efficient of economy, environment protection. Decreasing of natural depending during flood.
People still interested in agriculture	3/21	
Rice – shrimp production model is sustainable	1/21	

Note: Rank refers to number of votes received (total = 21).

Table 45 Undesired elements, Vietnam Group 4

Undesired elements	*Rank*	*Note*
Decrease in [annual monsoon] flood frequency → reduced soil fertility, water shortage, increased salt intrusion, aquaculture and livelihoods are affected.	8/21	Agriculture: water is a key factor. Increasing of salt intrusion and acidity.
Ground water is polluted and saline	4/21	Surface water is more shortage and polluted in the future. Increasing of population → high water demand in future.
Decreasing agricultural output, loss of food security, poverty; unstable policy and social [society?], no plan for technical development of agriculture	3/21	
Agencies/organization do not recognize and reward significant achievements.	3/21	
Business and information technology are interested in the future.	3/21	

Table 46 Enabling and inhibiting elements in other stories, Vietnam Group 4

Enabling elements:	*Inhibiting elements:*
Communication	Increased migration
Clean and green of agricultural production	Losing farmland
Eco- tourism	Water pollution and scarce water resources
Plant diversity	Effects of climate change (storm, salt intrusion, drought, flooding…)
Clean energy	Unsustainable economic developments
Development of livelihoods in rural areas	Natural resources degradation
Optimization of water management and using	
Dialogue and improvement in cooperation between nationals in basin	

9 One vision for the region's future

This vision emerges from a synthesis of narratives produced in the Regional Study

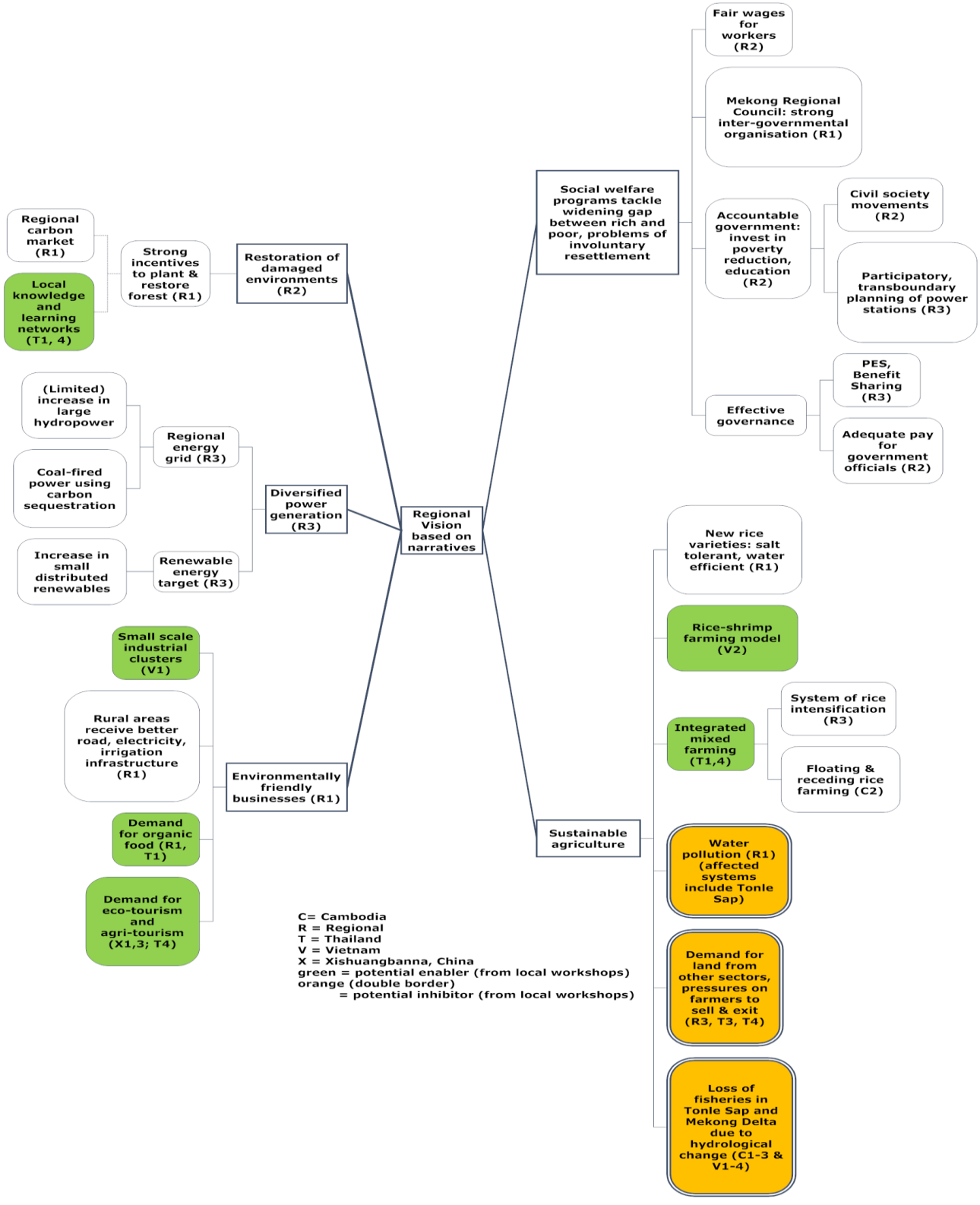


Table 47 Matrix of how change would affect other changes

This matrix maps a selection of changes suggested in stories that would affect stories in other countries positively. These enabling factors were discussed during the workshops. This matrix aggregates stories for each country, which means that changes could be part of one or multiple stories in each country (rows) and affect one or more visions in another country (columns).

enabling / from	Regional	Cambodia	Lao PDR	Thailand	Vietnam	Yunnan
Regional	Civil society movements; Regional carbon reductions target; Cooperative agreements negotiated for regional water & environmental governance	Civil society movements emerge; Mekong Council; Payments for Environmental Services & Carbon markets develop allowing new rural livelihoods	Civil society led participation in development decisions; Local industrial development; Adequate resettlement programs and compensation	Mekong Council; Payments for Environmental Services & Carbon markets; New technologies; Migration of skilled labour; Expansion of GMS power networks including massive increase in hydropower; Renewable energy targets for region; Consumer preferences for organic products	Civil society movements focused on disaster management; Improved hydropower governance; Mekong Council; Physical and economic integration; GMS policies allowing work force migration	Civil society movements improve governance with respect to disaster management; standard setting across GMS; Small scale renewable energy; Mekong Council; Carbon finance; Carbon finance and PES; Participation and social learning
Cambodia	Government investment in capacity of rural people; NGO investment in sustainable rural livelihoods	Diversity in work alternatives; Strong NGO sector	Forest, biodiversity richness, plenty natural tourism sites; Improved employment opportunities leading to improved living conditions: Credit access to establish tourism business; Eco-tourism development using hydropower reservoir	NGO supporting smallholder rice farming; rice-field based aquaculture; cross-border migration of poor farmers; NGO supporting smallholder rice farming, rice-field based aquaculture		
Lao PDR	Civil society led participation in development decisions; Balance between natural resource development and conservation; access to education	Exchange of innovative and successful ideas and knowledge; Civil society led participation in development decisions; Improved employment opportunities leading to improved living conditions; Local industrial developments	Exchange of innovative knowledge; Credit access; Access to education: change from rain-fed rice to commodity production: access to low interest credit	Change from rain-fed rice to commodity production; Infrastructure allowing access to markets; Exchange of innovative knowledge; Hydropower dam development; Establishing organic farm products and introduction of new technologies	Exchange of innovative and successful ideas and knowledge; Irrigation development from hydropower	Exchange of innovative ideas & knowledge; Balance between natural resource development & conservation; Civil society led participation in development decisions; Civil society led participation in development decisions
Thailand	Community consultation & planning; Integrated farming supported by water diversions; Local knowledge sharing & learning networks; Free trade; Community-scale action to restore river health	Physical & economic integration; Community leadership makes a difference: individuals establish centre of agricultural learning	Small scale integrated farming; Education improves; Physical & economic integration, regional free trade; Community leadership	High in- and out-migration	Improved education; Organic farming systems; Economic integration; Farmers' knowledge sharing & learning networks; High prices for key crops	High speed rail; Integrated small holder farming model; centre for learning organic agriculture; community activities to preserve culture
Vietnam	Rice-shrimp farming; Community consultation & planning; Policies promoting small scale industrial clusters in rural areas; Government investment in capacity of rural people	Integrated policies for sustainable development in rural areas lowers gap between poor farmers and rest of society; New crop varieties need less water	Industrial development; (good = organic) agricultural practices: Hydropower dams upstream operated well: Integrated policies for sustainable rural development; Advanced agricultural technology	New technologies ; New varieties; New rural commune model; High education; Out-migration of young generation; Cross-border migration of poor farmers	Integrated policies for sustainable development in rural areas; Pro-rural infrastructure investment; Government investment in rural development	

Yunnan	New institutions promote renewable energy and organic agriculture; Agro-forestry management training; New institutions to promote environmentally sustainable development; Investment in culture & eco-tourism	New technology development	National participatory based standards for hydropower & mining: private public cooperative eco tourism; ASEAN Free Trade Area; Management for profit & environmental protection; Financing for ecological restoration; Minimal chemical inputs; Regional based education	Pro-social and environment policy will help secure community livelihoods; Local Ecology foundation; Cross-bordering marriages; Technology development for renewable knowledge; Ecotourism development		Organic fertilizers

10 References

Foran, T., J. Ward, E. Kemp-Benedict, and A. Smajgl. In press. Developing detailed foresight narratives: a participatory technique from the Mekong region. Ecology and Society.

Jäger, J., D. S. Rothman, C. Anastasi, S. Kartha, and P. van Notten. 2007. GEO Resource Book: A training manual on integrated environmental assessment and reporting. Training Module 6. Scenario Development and analysis., UNEP and IISD.

Smajgl, A., T. Foran, J. Dore, S. Larson, and J. Ward. 2011. Visions, beliefs and transformation: Methods for understanding cross-scale and trans-boundary dynamics in the wider Mekong region. Resilience 2011: resilience, innovation and sustainability: navigating the complexities of global change. March 11-16, 2011, Arizona State University.

Van Berkel, D. B., S. Carvalho-Ribeiro, P. H. Verburg, and A. Lovett. 2011. Identifying assets and constraints for rural development with qualitative scenarios: A case study of Castro Laboreiro, Portugal. Landscape and Urban Planning **102**:127-141.

Annex: Comparative analyses

This section contains a number of comparative analyses and discussion questions produced by the study team, as an input to the second-round scenario building workshops. These analyses were intended to stimulate group discussion about desired and undesired events or features in the first round stories, as well as how those events may be supported or opposed by events occurring in stories from elsewhere in the region.

Analysis of Regional first round scenarios

DISCUSSION QUESTIONS – FOR ALL REGIONAL GROUPS

Use these questions to stimulate revising your story.

1. How does the region's relation to the global economy change during the next 30 years? How might some of these changes enable or inhibit the things you desire in your story?
2. Group One and Three imagine that the cost of transport will be higher in future because of higher carbon and energy prices. Will this be a net benefit to society?
3. Several scenarios (including Groups One and Three) want to see cooperative upstream-downstream water regime negotiated among the Mekong countries. If this is part of your vision, can you imagine more about when and how will it emerge?
4. Several scenarios (local and regional) see urbanization as a trend. However, they contain the belief that overall quality of life will be better if people can stay in rural areas and avoid the instability of work, especially low skilled wage-labour, in cities. Several have a vision where people do well running their own farm or business which is linked to environmental quality (e.g. organic farming, aquaculture, forest restoration). Furthermore, they imagine that these farms or businesses co-exist near industry, if environmental governance improves. Is this overall vision one that you share, or not? How difficult is it to achieve?
5. Can you add more structure to your story by adding details about when key events happen?

Table 48 Definitions and abbreviations

	Refers to:	***Stories from other places, selected for 2nd Regional workshop***
Thailand	Story from Second Huai Sai Bat Basin Futures Workshop, Khon Kaen province, Thailand, June 2011	Thailand 1, 2
China	Story from Second Xishuangbanna (China) Futures workshop, Kunming, May 2011	China 1
Cambodia	Story from Second Tonle Sap Futures workshop, July 2011	Cambodia 1, 3
Vietnam	Stories from Second Vietnamese Mekong Delta Futures workshop, August 2011	Vietnam 1, 2
Potential Enabler	Something from another story which supports *desired* elements in a story of interest OR opposes *undesirable* elements in a story of interest	
Potential Inhibitor	Something from another story which opposes *desired* elements in a story of interest OR may support *undesirable* elements in a story of interest	

STORY FROM REGIONAL GROUP ONE

Story of Mr Kong and his family

Discussion Questions:

1. How does Kong, a rice farmer who is forced to move to HCM City, do so well in life? Is he assisted at any time by the government or other actor?
2. This story has a mix of top-down (e.g. regional targets) and bottom-up (e.g. PES, carbon credits) mechanisms that work together to reduce carbon emissions and increase forest conservation. Please clarify *when* these start to be implemented. Do they lead to higher cost of living e.g. as businesses pass costs onto consumers. What is the impact of these policies on cost of living as a whole?

Suggested other stories to read: Regional 2, 3; Thailand 2; Vietnam 1; China 1

Table 49 Story from Regional Group One

This story		*Relevant events in other stories*		*Questions & comments*
Desirable elements	Undesirable elements	Potential inhibitors	Potential enablers	
Resilience to sea level rise occurs in the final years of the story as result of developing new rice varieties that use 50% less water and are much higher in salt water resistance	In 2020, sea level rise in the Mekong Delta forces people to out-migrate, increasing demands on HCM City		Rice-shrimp farming model (Vietnam 2; also imagines new varieties)	What factors have enabled the development of new varieties in Vietnam?
Urban liveability is maintained by adequate investment in city planning	Urban quality of life is reduced by pollution, also slums Society harmed by natural disasters (e.g. flash floods) Underinvestment in city planning, and local climate adaptation planning more generally		Community consultation & planning (Thailand 2, Vietnam 3)	Can you imagine better planning responses?
People with business ideas (e.g. Kong and his son) can pursue them successfully across the region	Lack of suitable employment for young people (Kong's son has to start in a garment factory)		Policies promote small scale industrial clusters in rural areas (Vietnam 1). Civil society movements (Regional 2)	How serious is the lack of employment problem (given that 66% of population assumed to be urban by 2041 with 100% literacy)? What can be done to provide jobs & protect workers from exploitation?
Road, electricity & irrigation infrastructure extended to rural areas (e.g. Savanakhet)				What opportunities are created by this improved infrastructure?
A significant carbon tax is put in place; applies to transport fuel as well, making driving conventional vehicles much more expensive; but stimulates investment in solar energy			20% RE targets established (Regional 3)	When does this occur? What impact of the carbon tax on farmers and other low income segments?
	By 2041 only a few people drive hybrid cars			
Regional carbon market + PES schemes create new business opportunities, incl, strong incentives to plant & restore forests. Hornbills return to restored forest. Remaining forest islands started to get connected, funded and implemented by local conservation-driven committees	Biodiversity & forest cover decline significant during the course of the story		New institutions to promote RE and organic agriculture (China 1) Agro-forestry management training (China 3)	
Demand exists for organic food	Water in many areas is too polluted for green investments (especially during dry season). Tonle Sap fish highly polluted by ag & industrial chemicals		Integrated farming supported by water diversions (Thailand 1)	Do you find the visions expressed in Thailand 1 coherent?
Agriculture in the region has become large-scale and input-intensive				
Mekong Council – supranational institution with mandate to look after social welfare across the region. The Council's policy decisions appear to be market-friendly, but social democratic	Economic inequality increases			When was this organisation established? What are its powers? How did the countries agree to it? A regional governance framework extended to social welfare may require progressive taxation of richer citizens of richer states (e.g. Thailand, China).
NAMA Committee is established, it decides to reforest 40% of the land and reduce the Mekong region emissions by 20%				When does this occur? What is the impact on upland rural people?
Cost of energy increases because of climate change and increasing consumption, leading to impacts on poor				

Source: Editors. Note: Event in brackets is assumed based on other events in the story

Table 50 Story from Group Two of Ms. Bopha and her family

This Story (2011 – 2041)		*Relevant events in other Stories*		*Questions &comments*
Desirable elements	Undesirable	Potential inhibitors	Potential enablers	
At beginning of story, severe problems with corruption & governance. Later, lots of improvement occurs. Governments invest in poverty reduction.	Government officials underpaid forced to collect money from rural villagers			What are the drivers for this improved commitment by governments?
Bopha saves enough to send remittances home; life seems getting better and better day by day	Fisheries decline forcing Bopha to migrate out			
After disaster, civil society increases in number and gets stronger. More and more people get activated and they participate in trying to bring some changes to the country and to the community. Government becomes more democratic. By 2027 government joins regional law enforcement regime.	Bopha loses her parents in 2024 flood disaster		New institutions to promote environmentally sustainable development (China 1)	Policies exist in writing but are not being implemented because of weaknesses in rule of law. Regional action is necessary. Please confirm.
Environment undergoes increasing negative impacts until 2025, but degradation is halted by 2040 (U-shaped trajectory)			Mixture of policy instruments (Regional 1) Local knowledge sharing & learning networks (Thailand 1)	Can you give more details? E.g. examples of appropriate initiatives?
Bopha's brother gets university education and joins emerging middle class	Widening gap between rich and poor			Is university education enough? What can be done about the gap?

Note: Event in brackets is assumed based on other events in story

Suggested other stories to read: Regional 1, Regional 3; China 1; Cambodia 3, Thailand 1

Table 51 Story from Group One of Ms. Bopha (daughter of Sophanna)

This story		*Relevant events in other stories*		*Questions & comments*
Desirable elements	Undesirable	Potential inhibitors	Potential enablers	
2012 – Lao reforms hydropower governance, implementing payments for environmental services (PES) and benefit sharing throughout the country				What are drivers of this? How was resistance overcome? How were human resource capacity limitations overcome?
2015 – World Bank and ADB fund a solar & biomass power plant is built in Bopha's village, allowing her family to buy & process fish using lower cost energy	Fish processing business profits vulnerable to increases in fresh fish prices and oil prices		Regional carbon reductions target (Regional 1) New institutions to promote RE (China 1).	
'System of rice intensification' generates benefits for farmers			Integrated farming model (Thailand 1)	
2016 – A wonderful regional energy deal is negotiated allowing construction of a physical grid; the biomass plant is connected to the grid				How is it wonderful?
2018 - Regional electricity dispatching centre dispatches hydropower from Yunnan & Myanmar		Civil society mobilization (Regional 2)		What about environmental and social standards?
	Free trade makes processed fish from Vietnam more competitive & family's fish business no longer viable			Does this mean that aquaculture fish from Vietnam becomes cheaper than capture fish? What are implications of this? What about competing based on quality?
Land becomes scarce, prices increase, leading to pressures to sell land to investors				Is there a need for better land tenure?
	2025 - Compensation paid for road and upstream hydropower development not enough; forces out-migration		Civil society movements (Regional 2)	
2030 – Family re-establishes in Siem Reap; Bopha's brother makes a living as a technician servicing solar hot water and PV		Urban quality of life challenges (Regional 1)	Regional carbon reductions target (Regional 1)	What about the rest of the family? How are they doing making a living in Siem Reap? [Siem Reap economy tied to international tourism and therefore strength of global economy]
2030 – The question of whether to build additional hydropower dams is debated by experts at regional level (i.e. it is not just a private decision) 2040 – Trans-boundary community consultation occurs as well on this question. [Dams do not go ahead without consent.]	Vietnam experiences water shortage and loss of fisheries. Vietnam sends a delegation to Cambodia and Laos to negotiate limitation of planned dams and upstream rubber plantations, but this is unsuccessful Community rejection of large hydropower -> pressure to build more coal power stations.		Cooperative agreements negotiated for regional water & environmental governance (Regional 2; Regional 1; Vietnam 4)	Is there public and community consultation around coal & other energy options as well?
2030 - Governments decide that some upstream watershed areas [e.g. in 3S Basin] are critical for conservation; promote indigenous species timber plantations. PES available; community tree enterprises established				Where does the support for capacity necessary to implement come from?
2035 – Stresses in Mekong Delta force people to migrate to Cambodia,		Vietnamese	Government investment in	Is this a net benefit because of

to areas where hydropower construction is occurring	immigration may not be welcome because of land shortages etc. (Cambodia 2)	capacity of rural people (Vietnam 2, Cambodia 1)	opportunities to work in construction, or net negative because of increasing shortages of ag land?
2035 – 20% of energy is from RE including large hydropower. Carbon sequestration is viable leading to expansion of coal-fired power (esp. in Vietnam).			What is the impact on energy costs of using carbon capture and sequestration technology?
People are able to move and live freely in the GMS			How to overcome domestic political resistance against people of different ethnicities? Is this right extended to all (e.g. people of Myanmar?)
Increases in the price of carbon (150% since 2011) opens up opportunities for agro-forestry; Export niches for sustainable & organic agro-forestry also develop		Carbon tax (Regional 1) New institutions to promote RE and organic agriculture (China 1). Agro-forestry management training (China 3) Free trade (Thailand 2) Urban middle class (Regional 1 & 2)	
Increase in cost of transport means that local value-adding becomes more viable			Is the higher cost of transport (because of higher carbon and energy prices) a net benefit to society?
Small holder rice production declines, some farmers exit; aquaculture increases in the Vietnam Mekong Delta Vietnam promotes casinos along Vietnam-Cambodia border to create opportunities for displaced Mekong Delta farmers		NGO investment in sustainable rural livelihoods (Cambodia 3) Government investment in capacity of rural people (Vietnam 3; Cambodia 1)	
Cambodia uses oil revenue money to invest in new rail lines from Siem Reap to Thailand; tourism continues to prosper in Siem Reap; markets for eco-tourism also doing well	Changes to local environmental quality as result of economic growth and resource exploitation (e.g. loss of Tonle Sap flood pulse) Resistance from Cambodian people to oil drilling in Tonle Sap (Cambodia 3 framework)	Investment in culture & eco-tourism (China 1) Community-scale action to restore river health (Thailand 2) [Future of Siem Reap as tourist destination]	

Suggested other stories to read: Regional 1, 2; China 1; Cambodia 1; Thailand 1; Thailand 2

Cambodia – Tonle Sap

ANALYSIS OF FIRST-ROUND SCENARIOS FROM TONLE SAP, CAMBODIA

Table 52 Definitions and abbreviations

	Refers to:	*Stories from other places, selected for 2nd Tonle Sap workshop*
Thailand	Story from Huai Sai Bat basin, Khon Kaen province, Northeast Thailand, June 2011	2
China	Story from First Xishuangbanna Futures workshop, Yunnan province, China, May 2011	(Available in English)
Regional	Story from First Mekong Futures Regional Working Group workshop, March 2011	3
Tonle Sap	Story from First Tonle Sap Futures workshop, March 2011, Kompong Thom	3
Vietnam	Stories from Vietnamese Mekong Delta, March 2011	1
Potential Enabler	Something from another story which supports *desired* elements in a story of interest OR opposes *undesirable* elements in a story of interest	
Potential Inhibitor	Something from another story which opposes *desired* elements in a story of interest OR may support *undesirable* elements in a story of interest	

DESIRABLE ELEMENTS COMMON TO ALL DISCUSSION GROUPS

Coordinated international decision making, leading to more informed hydropower development upstream of Tonle Sap

Table 53 Story from Group One

This Story		*Relevant events in other stories*		*Notes*
Desirable elements	Undesirable	Potential inhibitors	Potential enablers	
Large scale plantations established in response to new government rice policy attracting investors			Physical & economic integration (Thailand 2)	
Transition out of subsistence agriculture and small scale farming				
[Decrease in land tenure problems]	Increase in land tenure problems		Strong NGO sector (Tonle Sap 3) Civil society movements emerge -> pressure to enforce rule of law (Regional 2) Integrated policies for sustainable development in rural areas lowers gap between poor farmers and rest of society (Vietnam 3)	Plenary discussion in Kompong Thom: 'implementation of land certification.' Corruption and how to reduce it also discussed: see ref. to "stomach's problem" in Minutes. In Tonle Sap 3, NGOs help with individual problems and community development, not clear if can help with more political problems
Local people become specialized in their skill			Integrated policies for sustainable development in rural areas (Vietnam 3) Mekong Council – supranational institution with mandate to look after social welfare across the region. The Council's policy decisions appear to be market-friendly, social democratic (Regional 1) Civil society movements (Regional 2)	
Government forms policies to protect wage workers				
Diversity in work alternatives			Physical & economic integration (Thailand 2)	
Improved access to market and social facilities as result of infrastructure development				
Cheaper electricity from hydropower; hydropower design improves	Negative impact on ecology and change of livelihood activities; decrease of forest and floodplain		Payments for Environmental Services and Carbon markets develop, allowing new rural livelihoods (Regional 1 & 3)	

Suggested other stories to read: Tonle Sap 3, Regional 1, Regional 2, Regional 3, Thailand 2, Vietnam 3

Table 54 Story from Group Two

This Story (2011 – 2041)		*Relevant events in Other Stories*		*Notes*
Desirable elements	Undesirable	Potential inhibitors	Potential enablers	
[Sustainable forest use]	Forest destruction		Civil society movements emerge -> pressure to enforce rule of law (Regional 2)	
[Sustainable flow regime for Tonle Sap]	Lower water levels in Tonle Sap; eventual loss of lake		New crop varieties need less water (Vietnam 2 & 4) Integrated policies for sustainable development in rural areas lowers gap between poor farmers and rest of society (Vietnam 3)	
[No major conflicts between fishers]	Conflicts between fishers		Mekong Council – supranational institution with mandate to look after social welfare across the region. The Council's policy decisions appear to be market-friendly, social democratic (Regional 1)	
Forest management policy adopted	Un-coordinated infrastructure development resulting in loss of forest; lack of integration of forest policy into other policies		Payments for Environmental Services and Carbon markets develop, allowing new rural livelihoods (Regional 1 & 3) Civil society movements (Regional 2)	
High in- and out-migration			Diversity in work alternatives (Tonle Sap 1) Mekong Council (Regional 1) Physical & economic integration, free trade bring economic prosperity (Thailand 2)	

Note: Desirable event in brackets is inferred based on undesired events

Suggested other stories to read: Tonle Sap 1 + Regional 1, Regional 2, Regional 3, Vietnam 2

Table 55 Story from Group Three

This story		*Relevant events in other stories*		*Notes*
Desirable elements	Undesirable	Potential inhibitors	Potential enablers	
[Eco-tourism succeeds]	Ecotourism initiative in village fails due to marketing and facility issues		Strong NGO sector (Tonle Sap 3)	
Strong NGO sector provides appropriate education for unemployed factory worker	Poor government social safety net		Mekong Council – supranational institution with mandate to look after social welfare across the region. The Council's policy decisions appear to be market-friendly, social democratic (Regional 1)	
Floating and receding rice farming and rice-field fishery and aquaculture allows sustainable rural livelihood	Hydrological change with negative impacts on aquatic ecosystem	Lower water levels in Tonle Sap -> eventual loss of lake (Tonle Sap 2)	Integrated policies for sustainable development in rural areas lowers gap between poor farmers and rest of society (Vietnam 3) Community leadership makes a difference: individuals establish centre of agricultural learning (Thailand 1) Payments for Environmental Services and Carbon markets develop, allowing new rural livelihoods (Regional 1 & 3) New technology development helps (China 1 & 3) Civil society movements emerge -> pressure to enforce rule of law (Regional 2)	China 1: Pro-social and environment policy will help secure community livelihoods

Suggested other stories to read: Tonle Sap 1, Tonle Sap 2, Regional 1, Thailand 1, Vietnam 3

China – Xishuangbanna

ANALYSIS OF FIRST-ROUND SCENARIOS

Table 56 Definitions and abbreviations

	Refers to:	*Number of stories from other places, selected for 2nd Xishuangbanna workshop*
Thailand	Story from Huai Sai Bat basin, Khon Kaen province, Northeast Thailand, June 2011	Two
Xishuangbanna	Story from First Xishuangbanna Futures workshop, Kunming, May 2011	Three
Regional	Story from First Mekong Futures Regional Working Group workshop, March 2011	Three
Vietnam	Stories from Vietnamese Mekong Delta, March 2011	One
Potential enabler	Something from another story which supports *desired* elements in a story of interest OR opposes *undesirable* elements in a story of interest	
Potential inhibitor	Something from another story which opposes *desired* elements in a story of interest OR may support *undesirable* elements in a story of interest	

Table 57 Story from Group One of Yi Xiang and her family

This story		*Relevant events in other stories*		*Other comments*
Desirable elements	***Undesirable***	***Potential inhibitors***	***Potential enablers***	
[Resilience to natural disasters]	Vulnerability to natural disaster		Could civil society movements improve governance with respect to disaster management? (Regional 2)	
National standards set for hydropower and mining industries which attach great importance to local participatory consultation	Poor environmental regulation -> severe negative impacts of many small hydropower and mining projects; unreliable water resources; landslides affecting villages; soil erosion, water pollution		Does standard setting in other places help development of standards in China? (Regional 3)	Should such standards apply not just nationally for local hydropower and mining but also across the regional for large scale projects?
Connectivity and trade with neighbours. ASEAN Free Trade Area allows profitable opportunities to export and import agricultural products		Will competition with neighbours pursuing similar strategies lead to financial losses? (Thailand 2)		
Ecological tea garden: successful environmentally friendly business: zero emissions tourist resort is popular New eco-tourism based on cooperative relations between government and private sector		Water shortages (Xishuangbanna 2). Will water shortages make tourism more difficult to develop?	Small scale renewable energy (Regional 3)	Tourism adds value to agriculture; eventually allows restructuring of industrial agriculture
Education is valued; quality of education becomes regionally competitive				
Pride in local culture				
[Carefully planned land use change]	Rapid land use change without environmental planning: real estate development; golf courses		Civil society movement (Regional 2)	
[Preservation of biodiversity]	Loss of biodiversity			Will expansion of free trade lead to more rapid loss?
New institution for regional environmentally friendly development “Greater Mekong Region Environment & Development Cooperation Committee"			Regional 1: Mekong Council	How much authority are countries willing to give to regional organizations

Note: Event in brackets is assumed based on other events in story. Suggested other stories to read: Thailand 2; Regional 1, 2, 3; Xishuangbanna 2 and 3

Table 58 Story from Group Two

This Story (2011 – 2041)		*Relevant events in other stories*		*Other comments*
Desirable Elements	***Undesirable***	***Potential Inhibitors***	***Potential Enablers***	
Financial security for small rubber farmers				In the past, A-Meng's father became financially secure growing rubber plantation on 5ha
New strains of rubber allow great improvements in productivity; including highly drought resistant and GMO varieties Also efficient technology: Drip irrigation for 5 ha of rubber used to adapt to drought				Stories from Vietnam also express hope that new plant varieties and good agricultural practices can help adapt to drought (Vietnam 2). But exactly how these new strains will be developed (in terms of incentives for developers) has not been explored yet.
Rubber cooperative helps farmers with a rubber cooperative, online trade, processing and technological training				
Cross-border migration for education and work Temporary employees from outside Xishuangbanna need to be hired High speed rail allows long distance travel for work	Shortage in local labour		Mekong Region Council (see Regional 1) Thailand 2 story also supports high speed rail	
	Climate change leads to drought and water shortages for agriculture Other natural disasters: hurricanes			
[Stability in government policies]	Instability in government policy (in this case Myanmar) regarding access to land generates risk to investors			Domestic political stability helps stabilize decision making (cf. Thailand)
Diversification away from rubber (flowers; fruit) A management approach which provides both profit and environmental protection Financing becomes available for ecological restoration of rubber plantations (through taxes and loans) in Yunnan and Myanmar			Integrated small holder farming model (Thailand 1) Carbon finance (Regional 1, Regional 3)	Public-private partnerships deliver capital to entrepreneurs

Note: Event in brackets is assumed based on other events in story

Suggested other stories to read: Xishuangbanna 1 and 3; Thailand 1; Regional 1 and 3; Vietnam 2

Table 59 Story from Group Three Yu Xiang and her family

This Story		*Relevant events in Other Stories*		*Other Comments*
Desirable Elements	***Undesirable***	***Potential Inhibitors***	***Potential Enablers***	
[Lack of water is not a constraint]	Lack of water constrains rubber production (village reservoir does not help)		Are long-distance water diversions a good idea? (Thailand 1)	
Farmers have diversified and secure livelihoods under 'Return Rubber to Forest' Policy: based on payment for environmental services, also linked to international carbon finance			Carbon finance and PES (Regional 1, Regional 3)	
Policies and programs that are initially unsuccessful can be improved over time			Participation and social learning (Regional 2)	The 'Return Rubber to Forest' policy starts with a low subsidy and is not popular but people have capacity to improve policies and programs over time (Sloping Land Conversion Program improves)
[Avoid use of chemical inputs]	Need to use chemical fertilizer and pesticide to improve rate of sapling survival	Lack of rural labour to make organic fertilizer	Can organic fertilizers be developed? (Xishuangbanna 1)	Need to consider rural social change.
Sustainable rubber demonstration project teaches mixed cultivation and better management -> better quality and output			Centre for learning organic agriculture established (Thailand 1) How important are new varieties (Xishuangbanna 2)	
High prices for rubber	[Severe price fluctuations]			
Preservation of local culture through Minority Villages		Connectivity and trade with neighbours (Xishuangbanna 1)	Community activities preserve culture (Thailand 2)	

Note: Event in brackets is assumed based on other events in story

Suggested other stories to read: Xishuangbanna 1 and 2; Regional 1, 2 and 3; Thailand 1

Laos – Nam Ngum

One combined workshop - no analysis of the first round narratives was produced as input to the second stage of the workshop because of time constraints.

Thailand – Huai Sai Bat

ANALYSIS OF FIRST-ROUND SCENARIOS FROM HUAI SAI BAT, NORTHEAST THAILAND

Table 60 Definitions and abbreviations

Abbreviation or keyword	*Meaning*
HSB	Huai Sai Bat
C	China
R	Mekong Futures Regional Working Group
TS	Tonle Sap
V	Vietnamese Mekong Delta
Potential Enabler	Something from another story which supports *desired* elements in a story of interest OR opposes *undesirable* elements in a story of interest
Potential Inhibitor	Something from another story which opposes *desired* elements in a story of interest OR may support *undesirable* elements in a story of interest

DISCUSSION QUESTIONS

In Story 1 and Story 4, the desirable element (small scale integrated farming) is noticeably different to the desirable element of Story 2 and Story 3, where prosperity comes as a result of regional integration, increased trade flows, and fiscal decentralization. Are these different visions compatible?

Table 61 Story from Group One of Mr Keng and Mr. On

This story		***Relevant events in other stories***		***Notes***
Desirable elements	*Undesirables*	*Potential inhibitors*	*Potential enablers*	
	Vulnerability of commercial agriculture to global economic cycles (in this case, sugar cane and other bio-energy crops)	[Globalization features in many other stories] C1: regional railway will help regional integration	R1: Mekong Council – supranational institution with mandate to look after social welfare across the region. The Council's policy decisions appear to be market-friendly, social democratic C1: pro-social and environment policy will help secure community livelihoods	A regional governance framework extended to social welfare would presumably require progressive taxation of richer citizens of richer states
Small scale integrated farming model is viable: Integrated farming / self-sufficiency economy practices allows a brother with modest formal education to make a sustainable living, and a brother who becomes bankrupt after commercial farm investments go bad, to pay off his debts		HSB2: Significant industrialization and urbanization; economic integration R1: Significant water pollution makes 'green' businesses difficult to establish C1 & C3: demand for crop or crop price increase or agriculture commercialization	R1, R3: Payments for Environmental Services and Carbon markets develop, allowing new rural livelihoods. Also new technology development (C1, C3) V2: technology development V4: new varieties introduced	Any element that undermines the viability of smallholder integrated farming depending on institutional arrangements e.g. from R3: Involuntary resettlement with unfair compensation (for road building)
Supportive family: lets members pursue business ideas, willing to share risks and burdens			C1 & C3: assets of family can help members to try business ideas	
Community leadership makes a difference: individuals establish centre of agricultural learning			TS3: Nary sets up an NGO that supports smallholder rice farming, rice-field based aquaculture. Allow sustainable rural livelihoods V4: new rural commune model	
Education improves for the next generation, allowing more choices leading to empowerment		C1, C3: new generation of rubber farmers lose interest in higher education	V2: high education	

Suggested stories to read: Thailand 2, Regional 1 and 3; China 1 and 2

Table 62 Story from Group Two of Mr Den and Mr Jaidee

This Story		*Relevant events in other stories*		*Notes*
Desirable elements	*Undesirable*	*Potential inhibitors*	*Enablers*	
Education improves for the next generation, allowing more choices, leading to empowerment [but quality education remains expensive for farming households]		C1, C3: new generation of rubber farmers lose interests in higher education		
	Dilution of family ties. Investment of parents' generation (sold farmland to pay for education) not recouped as support for elderly. Family support for elderly replaced by non-family managed care systems. Mr Jaidee ends up neglected by upwardly mobile son		V2: out-migration of young generation	
Water diversion scheme constructed to HSB [not in story but in Group's framework]	Agricultural vs. industrial competition over water; new water pricing regimes	[Anything that prevents construction of new water diversions e.g. civil society environmental movements] V2 and V4: new varieties need less water	R1 – Mekong Council C3: water scarcity in production	All three groups at Tonle Sap workshop included upstream dams on the Mekong. Much discussion about need for coordinated international decision making, Civil society resistance to large infrastructure is not an element of any story. But in R2 civil society movements emerge outside of Thailand after an imagined severe flood - > pressure to enforce NR management laws, international cooperation
Physical & economic integration, free trade bring economic prosperity	[Free trade means Thailand's neighbours may have increasing competitive advantage, e.g. in rice? See TS1]	C2: Neighbouring country change land policy.		Civil society movements that challenge neo-liberal integration – not in any story – possibility of emergence because of new waves of cross-border migration?
Urbanization		Many stories assumed urbanization and industrialization as trends. V2: rural out-migration		
Industrialization		V2: rural out-migration		TS3: Discussion on expected increase in labour rights demonstrations
Political & fiscal decentralization giving more autonomy to local areas	Auditing systems not modernized allowing corrupt practices by local officials		C2: Local Ecology foundation establishment	Would need to harmonize with R1's imagined Mekong Council
Trans-national migration of farm labour			C3: cross-bordering marriage. R2: Internal (Cambodia) + cross-border migration of poor farmers (Vietnam to Cambodia..R1: Migration of skilled labour .TS2: High in & out migration imagined partly through drying up of Tonle Sap	

Suggested stories to read: Regional 1 and 2; China 1

Table 63 Story from Group Three of Jintara

This story			***Relevant events in other stories***	***Notes***
Desirable elements	*Undesirable*	*Potential inhibitors*	*Potential enablers*	
High education		C1,C3: new generation of rubber farmers lose interest in high education		
Trans-national migration of skilled labour			C2: cross-border investment R1: Migration of skilled labour	Not clear if unskilled migration is desired or not
Khon Kaen / NE Thailand remains an attractive place to return		R1: Cities increasingly congested and polluted	R1: Mekong Council has a social welfare mandate which apparently provides some level of benefit to urban slum dwellers	
Development of renewable energy powered personal vehicles, including some renewable electric vehicles		TS3: Criticizes upstream countries' plans to develop mainstream dams because of impact on Tonle Sap livelihoods	**C1: technology development for renewable knowledge R3: Expansion of GMS power networks including massive increase in hydropower as RE	
Value added: local sugar cane is refined into ethanol in the region allowing a profitable livelihood for Jintara		HSB1: Vulnerability of commercial agriculture (in this case sugar cane and other bio-energy crops) to global economic cycles C1, C2: diseases and extreme weather events	R3: RE targets for whole region [Ldemands for local :1C resources]	
Maintains home garden and also sells some 'organic' to market -> would this allow diversification		C1: mining and hydropower development	C1: ecotourism development R1: Also sees bright future for niche markets supplying urban consumers	

Suggested stories to read: Thailand 1; Regional 1 and 3; Cambodia 3

Table 64 Story from Group Four of Mr Ah Pao, Ms Annie, children of Mr Nathan

This story		***Relevant events in other stories***		***Notes***
Desirable elements	*Undesirable*	*Potential Inhibitors*	*Potential enablers*	
High education (Mr. Ah Pao, Mr. Film)	Dilution of family ties	C1, and C3: new generation of rubber farmers lose interest in high education		
Success of small scale (10 rai) commercial agriculture, especially organic agriculture; Small scale agriculture persists and is socially valued even though not as stable or lucrative as other livelihoods		V2: land concentration HSB2: Significant industrialization and urbanization; economic integration R1: Significant water pollution makes 'green' businesses difficult to establish	Drivers which lead to consumer preferences for organic or pesticide free	
Nathan's ability to make an adequate living as a rural civil servant	[? Inequality in family investment in children]			
Community leadership makes a difference: individuals establish centre of agricultural learning		[V4: new rural commune model]	TS3: Nary sets up an NGO that supports smallholder rice farming, rice-field based aquaculture. Allowing sustainable rural livelihoods C2: farmers' association	

Suggested stories to read: Thailand 2; Regional 1 and 3; China 1

Vietnam - Analysis of First-Round Scenarios from Vietnamese Mekong Delta

Table 65 Definitions and abbreviations

	Refers to:	*Number of stories from other places, selected for 2nd Vietnamese Mekong Delta workshop*
Thailand	Story from Huai Sai Bat basin, Khon Kaen province, Northeast Thailand, June 2011	Two
Xishuangbanna	Story from First Xishuangbanna (China) Futures workshop, Kunming, May 2011	One
Regional	Story from First Mekong Futures Regional Working Group workshop, March 2011	Three
Cambodia	Story from Second Tonle Sap Futures workshop, July 2011	One
Potential enabler	Something from another story which supports desired elements in a story of interest OR opposes undesirable elements in a story of interest	
Potential inhibitor	Something from another story which opposes desired elements in a story of interest OR may support undesirable elements in a story of interest	

Table 66 Story from Group One of Ms Diem Xua and family

This story		*Relevant events in other stories*		*Questions & comments*
Desirable elements	***Undesirable***	***Potential inhibitors***	***Potential enablers***	
[At beginning of story] It is possible to subsist on 0.2 ha rice-shrimp farming, collecting wild fish for additional income				Do you imagine this to be still sustainable in 2041? If so, how? Will small systems continue to be competitive?
[Resilience to sea level rise]	Sea level rise causes damage to life, schools, houses, agriculture Diem Xua forced to leave school at age 11		Could civil society movements improve governance with respect to disaster management? (Regional 2)	
	Environmental pollution			
[Ability to control salinity intrusion]	Salinity intrusion	More water use upstream	Hydropower governance improves (Regional 3)	
	Working in garment industry does not pay enough for Diem Xua to save money		Mekong Council: supranational institution with mandate to look after social welfare across the region. The Council's policy decisions appear to be market-friendly, social democratic (Regional 1) Civil society movements (Regional 2)	Integrated policies for sustainable development in rural areas (Vietnam 3)
Irrigation for aquaculture projects provide better living conditions				What is the water source for new irrigation? How is it financed?
Industrial development projects provide better living conditions			Physical and economic integration (Regional 1, Thailand 2)	How can industry develop in the VMD if it is subject to sea level rise? What other projects could make a difference (see Cambodia 3, Thailand 1)
[Government policies respond successfully to environmental challenges -> control of industrial pollution and disease]	Water pollution makes shrimp farming unsuccessful		Integrated policies for sustainable development in rural areas (Vietnam 3)	Give examples of what kinds of policies
	Disease and abnormal weather makes shrimp farming unsuccessful			
Government policies improve a poor family's living conditions				Give examples of what kinds of policies
[At end of story] It is possible to combine wage work in an industrial zone with shrimp farming				What happens to the financial security of families that don't combine wage work with shrimp farming? Do they stay poor?

Note: Event in brackets is assumed based on other events in story

Suggested other stories to read: Vietnam 2, 3, 4; Regional 1, Thailand 1 and 2, Cambodia 3

Table 67 Story from Group Two of Mr Nguyen Tuong Lai and family

This story (2011 -2041)		*Relevant events in other stories*		*Questions & Comments*
Desirable elements	***Undesirable***	***Potential inhibitors***	***Potential enablers***	
[Near beginning of story] Sixty percent of young people from the Delta leave Vietnam to work overseas		Poverty and natural disasters (Vietnam 1)	Quality of education improves (Thailand 2) Regional and international policies allow migration of workers (Regional 1)	Is out-migration from the VMD an inevitable component of the story? By the end of the story Mr. Tuong Lai becomes a 50 ha farmer, but not everyone can.
By 2020 most rice production protected by dikes [Ongoing investment in the dike system]	Dike failure increases (+80% by 2041)		Pro-rural infrastructure investment (Vietnam 3?)	
Development of drought resistant varieties and varieties with low irrigation water requirement	Water shortages increase (+40% by 2041) -> conflicts and production challenges			What factors have enabled the development of new varieties in Vietnam? Would institutional changes improve water management: if so what changes are needed?
	Earthquakes increase (+20% by 2041)			
Good agricultural practices (+60% by 2041): by 2020 pesticide and fertilizer rarely used GAP allows Tuong Lai to cope with salinity intrusion Widespread adoption of GAP			Organic farming systems (Thailand 1) Physical and economic integration (Regional 1, Thailand 2) Farmers' knowledge sharing & learning networks (Thailand 1)	
Advanced agricultural technology is applied in 60% of the Delta by 2030				Can you give more details?
Mr. Tuong Lai accumulates land up to 50 ha				This is desirable for Mr Tuong Lai, but how are negative social impacts managed? Is there resistance to this?
Mr. Tuong Lai learns English, computer and internet			Farmers' learning networks (Thailand 1)	
Improvement to irrigation system				What improvements are needed?

Note: Event in brackets is assumed based on other events in story

Suggested other stories to read: Vietnam 1, 3, 4; Thailand 2; Regional 1

Table 68 Story from Group Three of Mr Nguyen Van A

This story		*Relevant events in other stories*		*Questions & Comments*
Desirable elements	***Undesirable***	***Potential inhibitors***	***Potential Enablers***	
By 2040 Vietnam is an industrial country with better living standards than in 2010		Ability to compete against China, Thailand (etc.) in key industries (see Thailand 1, 3)		How confident are you that Vietnam's national planning system can achieve this? What changes if any do you suggest?
Good cooperation between different countries MRC acting to reduce potential conflicts -> Better use of fresh water in the Mekong Basin; International awareness of importance of appropriate use for Vietnam	Full use of water resource by upstream countries (e.g. expanded agricultural production in Thailand and Cambodia) Misuse of water resources makes it very likely there would be no chance for the VMD to be developed		Stronger regional organization (e.g. Mekong Council – Regional 1)	
Hydropower dams upstream operated well: store water during the flood period and release in the dry season	Hydropower dams cause reduction in peak flooding		Hydropower governance improves: e.g. consultations with affected people; benefit sharing (Regional 3)	On balance, do you think this pattern of operation, is more desirable than undesirable?
Integrated policies for sustainable rural development -> Gradual reduction in the gap between rich and poor local residents				Can participants provide more detail?
After 2030: Gradual reduction in environmental pollution caused by: (1) increasing awareness; (2) improved government policy; (3) use of more advanced technology	Environmental pollution increasing to maximum level in 2030		Farmers' knowledge sharing & learning networks (Thailand 1)	Can participants provide more detail?
Protection of Mekong Delta through (1) adjusting the cropping calendar; (2) Raising dykes along main river mouths; (3) Building local reservoirs				What factors enable ongoing and increased levels of investment in rural infrastructure and policy improvement?

Note: Event in brackets is assumed based on other events in story

Suggested other stories to read: Vietnam 4; Thailand 2; Regional 1

Table 69 Story from Group Four of Mr Dang Hoang Minh and family

This story		*Relevant events in other stories*		*Questions & Comments*
Desirable elements	***Undesirable***	***Potential inhibitors***	***Potential Enablers***	
[At beginning] Dang's father cultivates 2 ha rice-shrimp farming system which is considered sustainable		Consolidation of farm holdings (Vietnam 2)	Integrated policies for sustainable development in rural areas (Vietnam 3) Integrated and organic small scale farming systems (Thailand 1)	Do you imagine this to be still sustainable in 2041? If so, how? Will small systems continue to be competitive?
Increase in adaptive crop varieties (200% increase 2011-2041): ongoing development necessary				What factors have enabled the development of new varieties in Vietnam?
[After 2031, groundwater condition improves, but at the end of the story it is still 50% worse than in 2011]	Groundwater becomes more saline and polluted 2011-2031			How will groundwater quality improve?
By 2041, only a slight reduction in production occurs, because of successful adaptive responses	Reduction in agriculture -> food insecurity, poverty & socio-political instability, lower incentives for ag. technology development			
Increased water use efficiency + adaptive varieties + change in cropping calendar allow Mr. Dang (a farmer and an official) to adapt to salinity intrusion [Livelihoods resilient to changes in annual flood regime]	Decrease in annual flooding -> soil degradation, water shortages, negative effects on aquaculture, increase in salinity intrusion, livelihood insecurity			How much investment is required of farmers in order to use new varieties and to achieve improved water efficiency?
Dang's new ideas allow him to be promoted as an official	[Inability of organizations to recognize & reward merit]		Support from farmers through networks and other communication channels (Thailand 1)	
New adaptive strategies are developed Regional planning to improve responsive capacity occurs in the VMD				How can the capacity for integrated planning be improved?
[Next generation continues to be interested in agriculture]	Next generation more interested in informatics and economics than agriculture		High prices for key crops (Thailand 3) Government investment in rural development (Vietnam 1-3)	

Suggested other stories to read: Vietnam

CONTACT US

t 1300 363 400
+61 3 9545 2176
e enquiries@csiro.au
w www.csiro.au

YOUR CSIRO

Australia is founding its future on science and innovation. Its national science agency, CSIRO, is a powerhouse of ideas, technologies and skills for building prosperity, growth, health and sustainability. It serves governments, industries, business and communities across the nation.

FOR FURTHER INFORMATION

Climate Adaptation Flagship
Tira Foran
t +61 2 6246 4308
m +61 448 539 051
e Tira.Foran@csiro.au
w www.csiro.au/cliamte adaptationflagship