Project Acronym: HighARCS

Project Title:

Highland Aquatic Resources Conservation and Sustainable Development

Deliverable 8.1

Title: Report concerning lessons learnt regarding adoption and implementation of actions (process) and actions achieving goals (impacts) with country reports (results of I & M) included as annexes

By

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Section 1: Introduction

1.1 Background and purpose of the report
During 2012, the elaboration of integrated conservation, livelihoods and policy action plans for four HighARCS project sites were completed. The action plans retained for implementation were the outcomes of the earlier years’ situational analysis and subsequent more focused in-depth studies of the state of the aquatic resources, stakeholders, uses and users, policies, rules and regulations. These studies were undertaken in dialogue with local authorities and the most relevant stakeholder groups at each site. Various participatory communication and planning tools and methodologies were applied during these phases (please cf. with HighARCS D3.2, D4.3, D5.2, reports). The overall action planning processes and their outcomes in terms of site specific agreed implementation and monitoring strategy reports for the Integrated Action Plans were reported in HighARCS Deliverable 7.1 (December 2012).

The implementation of the retained integrated action plans started at the sites in September 2012. This report (Deliverable 8.1) reports on the process, the results and the lessons learnt during this first year of implementation. The report is composed of the four country/site reports received from the local host institutions in China (SCAU); India (CDHI and CEMP); and Vietnam (RIA-1; preliminary version) attached in sections 2, 3, 4, and 5 respectively.

At the time of this reporting (end of August 2013), activities are still going on in the sites. The last field visits to collect additional data on the process and results before the end of the project are planned to take place during the coming two months (September and October 2011). Results will be included in the final project reporting and used for subsequent scientific publications.

1.2 Methodology and structure of the country reports
The country/site reports were made according to a common framework proposed by the lead institution for Work Package 8 and modified after receiving comments from the other work package leaders and the country/site teams (Annex 1). The teams were asked to produce a 15-25 pages report describing and reflecting on (a) process: the step-wise implementation of the activities planned (or necessary) to achieve the action plans, and (b) outcomes: the impacts achieved through these actions.

The proposed structure of the country reports includes the following elements:

1. An introduction: purpose of the report, brief summary of process leading to the selection of the selected action plans, brief summary of the I&M strategies (making reference to the D7.1 I&M strategy reports from 2012), brief summary of the contents of the D8.1 report, and a brief summary of the methodologies used for collecting the data used in the report.

2. A presentation of the main actions retained for implementation from 2012 at your site and impacts targeted: This section gives an overview of the main actions retained for implementation at the sites as reported in D7.1. The main specific biodiversity and ecosystem services conservation problems and livelihood issues addressed by these actions are presented and the expected impacts on livelihoods, biodiversity and the state of the aquatic resources are stated. This section also informs
about who the main responsible institutions are, and which monitoring indicators have been retained for the actions.

3. A description & reflections on the implementation processes: In this section, the process of implementation (including how and by whom) of the actions is narrated, structured chronologically into major steps. Included in this section, you will find a description of the approaches and methods used in organizing and implementing the activities, as well as the communication strategy applied. The reports also contain some reflections on “how it went”, including the teams’ own assessment of it on a scale from 1 (poorly) to 5 (excellent).

4. A description & reflections on impacts: The process section is followed by a presentation and a discussion of the impacts achieved by the actions with particular focus on the selected indicators (including the indicators on related ecosystem services). This presentation is followed by a discussion on the need for corrective action and a “self-assessment” of how successful the actions in reaching the expected levels of impact.

5. A summary of findings, next steps, and recommendations for changed actions if relevant: In this final section, the teams sum up across all the actions being implemented at their respective sites, stating how far in the planned process they have come, what main activities have been covered, what is left to be done, impacts observed, challenges met, lessons learned and future perspectives.

1.3 Overview of the site reports
In the following sections, you will find the site reports from Shaoguan, China (section 2), Nainital, Uttarakhand, India (section 3), Buxa, West Bengal, India (section 4), and Dakrong District, Quang Tri Province, Vietnam (section 5). Each team has reported according to the proposed common framework, but the teams have been left with a free hand on the specific style and level of detail.

Each of the sites represents a unique situation of action planning for aquatic resource management. The HighARCS sites differ on parameters such as: altitude (upstream or further downstream location); urbanization of local area; existing economic structure of the area and local livelihood situations; and governance systems.

In addition, the institutional set-up, the size, and the disciplinary competences present for each of the implementing HighARCS teams also are not comparable. Taken all together, this accounts for the quite different type of actions and volume of actions engaged, as well as different reporting styles and volumes produced for this deliverable.

The teams have pursued the same overall biodiversity conservation and sustainable livelihoods objectives, and applied the same overall wetland assessment and integrated action planning procedure. Given the very different contexts and team compositions, the types and numbers and state of progress of the implementation of the selected integrated action plans at each site also vary considerably.
1.3.1 The Shaoguan site, China

The Shaoguan site is situated upstream the “North River” (Beijiang River), which is one of the major tributaries to the Pearl River in Guangdong Province, Southern China. Shaoguan City is located where two minor tributaries (north east and North West branches of the Beijiang River) merge together to form the Beijiang River. The HighARCS project selected three fishing villages of which two are located upstream from Shaoguan City at the banks of each of the two merging branches, and one is located downstream from Shaoguan City on the banks of the Beijiang River. The Shaoguan site is the lowest of the four selected “upland” project locations of HighARCS. It is situated in a river valley which is not highland in elevation, but is considered ‘highland’ due to the fact that Shaoguan is officially classified as a ‘highland’ prefecture, and constitutes the upland region of the Guangdong Province at the frontier of the Nanling mountains.

The site represents the most populated and urbanized setting of the HighARCS sites. Shaoguan City itself has more than 1.2 million inhabitants. The area has many industries and agricultural lands are intensively cultivated. Yet the area lies at the foot of a range of mountains and within a zone classified as Ecological Development Zone by current Chinese legislation. The river is providing multiple ecosystem services such as hydropower generation (dams), transportation, sand mining, outlet as a waste water recipient, and fisheries, to mention some.

The river has been strongly affected by the economic development of the area, and biodiversity and some ecosystem services have declined drastically over the years. The HighARCS team from South China University has facilitated the identification and selection of 26 actions in collaboration with local authorities and communities. Many of these action plans address the issues of reducing the various pressures on the river (pollution, sand mining, etc.) and restoring and rebalancing competing needs for ecosystem services.

As a result of the degradation of the water resource, artisanal fisheries along the river have declined drastically, and the provision of fish has been taken over by adjacent systems of aquaculture. In this situation, local artisanal fishers have been marginalized and their livelihoods have deteriorated. The HighARCS project therefore decided to focus on reducing the pressures on biodiversity and ecosystem services, increasing conservation capacity and awareness and the sustainable livelihoods dimension of the project on supporting the improvement of the livelihoods of these three fishing communities.

An account and an assessment of the implementation of these actions and the results produced so far, is presented in Section 2.

1.3.2 The Nainital site, Uttarakhand, India

The Nainital site, situated in the “Lake District” of India in the State of Uttarakhand in the Kumaon foothills of the outer Himalayas, is the most ‘upland’ of the four sites, located at 1800-2200 meters above sea-level. The main water resources at the sites are constituted by three lakes bordered by forests, fields and increasingly, urban dwellings and infrastructure, driven mainly by the tourism. The main focus of the proposed actions at this site is to improve the management and conservation of aquatic resources in the lakes as well as providing benefits to the local people. The actions thus mainly aim at improving the biological, chemical and physical components of the lakes and adjacent wetlands.
through measures of desiltation and a reduction of pollution of the lake from sewage and rubbish; maintaining the ecological balance between the components of the wetlands through the promotion of a fish release programme; and to protect the livelihoods of the local people who are directly or indirectly dependent on these aquatic resources.

The planning phase of HighARCS resulted in the selection of six actions to be undertaken:

1. Desiltation of Bhimtal Lake
2. Prevention of garbage disposal in and around the lakes
3. Promotion of fish release programmes
4. Support for proper marketing of Handicrafts
5. Support for proper marketing of agricultural products
6. Crop protection from wild animals

An account and an assessment of the implementation of these actions and the results produced so far, is presented in Section 3.

1.3.3 The Buxa Site, West Bengal, India

The Buxa Project Site is located within and right outside the Buxa Tiger Reserve in the foothills of the Bhutan Himalaya Mountains in West Bengal, India. The Buxa Tiger Reserve is a protected area in a region of rich forest and aquatic biodiversity with many seasonal and perennial rivers flowing down from the hills. The Buxa Tiger Reserve is the home to marginalised communities most of whom are from minority ethnic groups and whose presence and rights within a Tiger Reserve is an issue of political discussions. It is a region of growing tourism but also vulnerable to natural disasters such as flooding, landslides and soil erosion. Climate change may also influence the situation.

As it is the tiger which is the main concern of the measures of protection enforced in the area, the management of the aquatic resource of the reserve from the perspective of biodiversity conservation have only come into focus with the arrival of the HighARCS project. The findings of the project have shown a certain degradation of some of the biodiversity of the aquatic ecosystems in the area. This has been observed in spite of the fact that the area is already having the legal status as a protected area. The pressures on the aquatic resources may intensify if tourism increases. Inappropriate land management practices, deforestation and increasing activities of gravel and sand digging upstream in Bhutan may also play a role.

The local HighARCS team has identified five main actions in collaboration with the local communities and authorities.

One of the tasks identified for the HighARCS action plans is raising the awareness and improving capacity amongst local authorities and stakeholders of the importance of the aquatic resources and the ecosystem services which they provide. Other tasks include:

- capacity-building of existing self Help groups to enable them to proactively engage in promoting, monitoring and conserving biodiversity;
• setting up community owned ‘Farmers Club’ / Innovation forum
• reorientation of local government/panchayats; and
• livestock promotion and insurance programme

An account and an assessment of the implementation of these actions and the results produced so far at the Buxa site is presented in Section 4.

1.3.4 The Dakrong site, Quang Tri Province, Vietnam

The Dakrong site in the north of Central Vietnam is located in the highlands close to the border to the Lao PDR. The key features of the study site are aquatic resources in high gradient streams running through forested mountains, characterized by seasonal floods. It is home to marginalised or low income communities that are dependant to some level upon aquatic resources.

The key findings of the project concerning existing problems related to wise use and conservation of aquatic resources in the area were that there is a declining aquatic biodiversity at the site, but also due to surveys conducted through the HighARCS project there may potentially exist new fish species not previously scientifically described. There is a diverse set of stakeholder groups having competing or conflicting interests in the aquatic resources of the Dakrong site.

The main actions selected for implementation were the following:

• Raise awareness and knowledge of local people and local authorities on the conservation of biodiversity and aquatic resources
• Establishment of sustainable local management structures for better conservation and wise use of aquatic resources,
• Improving livelihoods and living conditions by expanding the use of mini hydropower generators, construction of water tanks and water filters, and training and setting up cooperative of brooms making, handicraft, textile produce for tourism
• Development of more adequate policy and legal framework addressing the pressures on the aquatic resources
• Supporting more efficient enforcement of management rules and regulations

An preliminary account and an assessment of the implementation of these actions and the results produced so far at the Dakrong site is presented in Section 5.
Section 2: Site report from Shaoguan, China
HighARCS D6.2, D7.3, D8.2

Report on
The Implementation and Assessment Results of Actions for Beijiang River Watershed, Shaoguan, China

by
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Second Revision in July, 2013
Report on the Implementation and Assessment Results of Actions for Beijiang River Watershed, Shaoguan, China

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1. Introduction

This report covers the implementation and assessment result of the 26 actions proposed in the second phase of HighARCS. The actions were selected through a participatory approach with major stakeholders. The compatibility of these actions with the goals of conservation and development, the priority of these actions analyzed by SMART method (Specific, Measurable, Achievable, Realistic and Time-based), the feasibility analysis by STEPS (Social, Technical, Ecological, Policy and Sustainability) method and the SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of these actions were conducted before the implementation and assessment. The results of these analyses have been reported in the “Report on Implementation and Monitoring Strategy Agreed for IAPs’ in Beijiang River Watershed, China” (Luo Shiming, Cai Kunzheng, et. al., 2012). The 26 actions are divided into three categories. There are 12 actions in the first categories which have been taken by local government before this project and will be encouraged by HighARCS team and hope to be carried out continuously in the next stage. There are 8 actions identified for the second category which are proposed by HighARCS and can be implemented within the project period of 2010-2013. There are 6 long term actions in the third category which are also proposed by HighARCS. However, they can not be finished within this project and can only be proposed and started before 2013 (see Table 1 below).

The implementation and assessment of these actions were taken mainly within 2012 and 2013. The stakeholders in charge of these actions included government departments (all 26 actions), industrial enterprises (6 actions), farmers (5 actions) and fishers (3 actions) in Shaoguan and our team members (4 actions). Besides direct implementation, the roles of the HighARCS research team played during implementation included the motivation, explanation, communication, and education with/for different stakeholders. In order to have more objective evidence and to understand the real situation for assessment, we collected information through diversified resources which included water sampling, site visit, government statistic data, log book record from three sampling fishing villages, fishing record for 4 years from 12 fixed fishing boats along Beijiang River, and discussion with stakeholders. When judgment is conducted through a 1-5 score system, 7 actions were implemented very well (score 4-5) and reached all the goals designed (score 5), 15 actions were implemented quite well (score 4) and most of the anticipated results have been achieved (score 4), 3 actions were partly implemented (score 3) and could only meet part of the set goals (score 3), 1 action has not been carried out very well (score 2) and the goal has not achieved (score 2).

After a brief review of those actions proposed during the second phase of this project, the implementation and assessment result of these actions will be presented in a table form. The summary of our findings, experience accumulated and suggestions for next steps will presented in the last part of this report.
2. Actions taken in the implementation and assessment stage

2.1 The overall implementation strategy

The action plans which are already proposed and implemented by Shaoguan government will be encouraged by this project. Team members of HighARCS will discussed in detail with government officers from different departments in order to improve the actions and ensure the continue implementation of those actions.

Table 1 The integrative action plans for protection and sustainable use of aquatic resources in Beijiang River Watershed, Shaoguan China

<table>
<thead>
<tr>
<th>Objective*</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2-3</td>
<td>EcoBio</td>
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<tr>
<td>1</td>
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<td>1</td>
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<td>3</td>
<td>+</td>
</tr>
</tbody>
</table>

* In the “objective” column, “1-2-3” means (1) Those actions which have already been accepted by local government; (2) New Actions will be taken in the next two years, (3) New Actions in a period longer than this project. “EcoBio” refers to ecology and biodiversity. “Livelihood” refers to livelihood of the fishers in the region. “Management” means management and policy improvement. When an action relates to the specific object, “*:*” will appear in that column.

The action plans which are suitable to be put into practice within the scope of this project will be implemented by active communication with stakeholders through idea and information exchange,
education program, and in-depth discussion. The priority will be paid to the three research sites including Lishi fishing village which is located in the northwest branch of Beijiang, Kengkou fishing village which is located in the northeast branch of Beijiang and Zhoutian fishing village which is located in the south of Shaoguan city. By this reason, dams, pollutions, sand mining activities and township governments related to these fishing villages will be our focus. The action plans which are related to much longer term or much larger scope than this project will be implemented by the discussion with different bureaus of provincial government, the motions proposed in the provincial congress and the public media appeared in newspaper or television.

2.2 The effects of proposed actions on ecosystem services provided by Beijiang River

As indicated in Table 1, actions are related to the improvement of ecosystem service and biodiversity, livelihood of the people, or watershed and social management in a different way. Here more detail description of each action on the specific ecosystem services is presented. Modified from China report in WP3, ecosystem services provided by Beijiang River can be identified as in Table 2 below.

Table 2 Ecosystem Services Provided by Beijiang River, Shaoguan, China

<table>
<thead>
<tr>
<th>Provisional Services</th>
<th>Regulation services</th>
<th>Supporting Services</th>
<th>Cultural Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 irrigation</td>
<td>1. flood control</td>
<td>1. soil development</td>
<td>1. tourism</td>
</tr>
<tr>
<td>2 daily water use</td>
<td>2. soil conservation</td>
<td>2. circulation of materials</td>
<td>2. game fishing</td>
</tr>
<tr>
<td>3 industrial water supply</td>
<td>3. pollution buffering capacity</td>
<td>3. buffering mechanism for climate change</td>
<td>3. boating</td>
</tr>
<tr>
<td>4 aquatic products</td>
<td>4. clean environment</td>
<td></td>
<td>4. swimming</td>
</tr>
<tr>
<td>5 sand for construction</td>
<td>5. nutrient cycling</td>
<td></td>
<td>5. education</td>
</tr>
<tr>
<td>6. wood</td>
<td>6. wildlife habitat and biodiversity</td>
<td></td>
<td>6. research</td>
</tr>
<tr>
<td>7 transportation</td>
<td></td>
<td></td>
<td>7. religious</td>
</tr>
<tr>
<td>8 hydro-electricity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 agricultural food products</td>
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</tr>
</tbody>
</table>

Some of the actions are only directly related to the livelihood of the fishers such as Action 1.9 to continue government subsidy for fishers, Action 1.10 to continue the subsidy policy for diesel price, Action 1.12 to continue provide low rent house and job training for fishers, Action 3.4 to guarantee fishers pension and medical insurance. Some of the actions are only directly related to management such as Action 2.7 better communication between fishers and hydropower stations, Action 2.8 to strengthen management organization for fishing communities. However, it is no mean that these actions do not have indirect effects on ecosystem services of Beijiang River. For example, better livelihood of fishers supported by government will encourage them to observe the government’s regulation on no-fishing season and on abandon of explosive method for fishing.

Most of the actions are directly related to the ecosystem services provided by Beijiang River. It can be seen in Table 3 and will be further explained here.
Table 3 The relationship between action and ecosystem services in Beijiang River, China

The number listed in ecosystem services are as shown in Table 2. The X denotes that there is a direct relationship of the action listed in the left column and the ecosystem services listed on the top row. The red X indicates that this ecosystem service is also used as an indicator for evaluation of this action.

<table>
<thead>
<tr>
<th>Actions</th>
<th>Provisional Services</th>
<th>Regulation services</th>
<th>Supporting</th>
<th>Cultural Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Ecological development strategy in Shaoguan</td>
<td>X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
</tr>
<tr>
<td>1.2 to protect and expand forest cover in Shaoguan</td>
<td>X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
</tr>
<tr>
<td>1.3 to improve the management of aquatic conservation zones</td>
<td>X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
</tr>
<tr>
<td>1.4 to control water pollution from industry sector</td>
<td>X X X X X X X X X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
</tr>
<tr>
<td>1.5 to reduce non-point pollution from rural family</td>
<td>X X X X X X X X X X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
</tr>
<tr>
<td>1.6 to release fish fry</td>
<td>X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
</tr>
<tr>
<td>1.7 to stop cage culture for fish in reservoirs</td>
<td>X X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
</tr>
<tr>
<td>1.8 to have better management of sand mining activity</td>
<td>X X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
</tr>
<tr>
<td>1.9 to continue government subsidy for fishers</td>
<td>X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
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<tr>
<td>1.10 to continue the subsidy policy for diesel price</td>
<td>X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
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<tr>
<td>1.11 to continue 9 year compulsory education program</td>
<td>X X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
</tr>
<tr>
<td>1.12 to continue provide low rent house and job training for fishers</td>
<td>X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
</tr>
<tr>
<td>2.1 more financial support for conservation of aquatic resources</td>
<td>X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
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<tr>
<td>2.2 to implement the no fishing season from 2011</td>
<td>X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
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<tr>
<td>2.3 to reduce water pollution from iron ore mining</td>
<td>X X X X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
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<tr>
<td>2.4 to reduce water pollution from rural area.</td>
<td>X X X X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
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<tr>
<td>2.5 to adjust the policy for eucalyptus forest development</td>
<td>X</td>
<td>X</td>
<td>X X X X X X X X X X</td>
<td>X X X X X X X X X X</td>
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<tr>
<td>Long term new actions</td>
<td>X</td>
<td>X</td>
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<td>2.6 to have more public educational activities</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>2.7 better communication between fishers and hydropower stations</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2.8 to strengthen management organization for fishing communities</td>
<td>X</td>
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<td>3.2 to popularize green production technique in agriculture</td>
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<td>3.3 to set up more sanitary facilities for rural villages</td>
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<td>3.4 to guarantee fishers pension and medical insurance.</td>
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<td>3.5 to improve the current eco-compensation program</td>
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<td>3.6 to revise two critical laws related to aquatic resources</td>
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(1) For those existing actions which will be strengthened

Since Action 1.1 Ecological development strategy in Shaoguan is a long-term development strategy of the society, it could relate to every aspect of the ecosystem services. Since forest has its fundamental importance in the watershed, Action 1.2 to protect and expand forest cover in Shaoguan affects almost all aspects of ecosystem service. Action 1.3 to improve the management of aquatic conservation zones affects mostly on aquatic resources. The change of wildlife habitat and biodiversity situation is also used as an indicator of this action. Action 1.4 to control water pollution from industry sector and Action 1.5 to reduce non-point pollution from rural family both have positive effect on water quality of Beijiang River, hence also have positive effect on aquatic resources. The change of water quality is used as indicator for these two actions. Action 1.6 to release fish fry will greatly affect directly the fish population in the river. So, it is the change of fish harvest is used as the indicator for this action. Action 1.7 to stop cage culture for fish in reservoirs will have negative effect on fish production in a short term. However, the improvement of water quality in the reservoirs used as drinking water resources will greatly improve the health of the people and also directly to the aquatic resources down stream. Action 1.8 to have better management of sand mining activity can help to stabilize the habitat for aquatic resources in the important section of the river, especially in the conservation zones for aquatic species. Action 1.11 is to continue 9 year compulsory education program. The better education for the people will be helpful for them to appreciate the unique function of ecosystem and hence to have their action for protection and sustainable development.

(2) For short term actions which will be finished the implementation within project period

The action 2.1 to have more financial support for conservation of aquatic resources is designed to encourage provincial government for policy change. If it is implemented, it will be very helpful to the increase of aquatic resources and increase biodiversity. Action 2.2 to implement the no fishing season from 2011 is directly related to protect aquatic resources during their breeding season from April 1 to May 31 in the whole Pearl River Watershed including Beijiang River. The effect of this action on the fish harvest will be used as an indicator for this action. Action 2.3 to reduce water pollution from iron ore mining is designed to change the iron ore washing operation close to Kengkou Fishing Village. The reduction of pollution and increase of water quality will be good for the fishers living in Kengkou Fishing Village. The change of water quality is chosen as an indicator for this action. Action 2.4 to reduce water pollution from rural area have similar effect as action 2.3 on many types of ecosystem services, but in a much larger scale in agricultural production and rural area. Action 2.5 to adjust the policy for eucalyptus forest development will be good to increase local tree species. Hence it is good for water and soil conservation, for increasing biodiversity and for better view of the hilly and mountainous region. In a long run, it also helps to improve wood production. Action 2.6 to have more public educational activities will improve the knowledge and information of the public. The public awaken on environmental consciousness will affect their actions. Hence it will indirectly affect almost every aspect of the ecosystem services.

(3) For new actions which will not be able to finish implementation within project period

Action 3.1 to re-establish food chain and habitat for aquatic resources will be good to improve biodiversity and increase aquatic products. Action 3.2 to popularize green production technique in agriculture and Action 3.3 to set up sanitary facilities for rural villages both are similar to the short term Action 2.4 and have multiple effect on ecosystem services by reducing pollutants and increasing water quality. Action 3.5 to improve the current eco-compensation program will cover
the compensation for forest development, conservation of aquatic resources, and various environmental protection activities. Hence it will affect almost all aspects of ecosystem services. Action 3.6 to revise two critical laws (Environment Assessment Law, Wild Life Protection Law) related to aquatic resources and environment will be good to improve the regulation services and supporting services provided by Beijiang River.

2.3 The detail description of the actions

The three categories of our action plans are described here with the same order as in table 1.

1) Actions which have already been accepted by local government

(1-1) The development strategy in Shaoguan will follow the national ecological planning This will cover the whole watershed area governed by Shaoguan City. The 12th five year planning should be done at the beginning of 2011-2015 and will be implemented in the whole period from 2011 to 2015.

Objectives: Shaoguan city has been listed as areas of ecological buffering zone and restrictions for industrial development. According to the regionalization planning of Guangdong Government, Shaoguan (Beijiang River Watershed) is assigned as the “Ecological Development Zone”. That means that ecological protection is put into the first priority by provincial government. The development plan in Shaoguan for the 12th Five Year Planning (2011-2015) should follow the principle and guide of “Ecological Development Zone”.

Implementer: The Reform and Development Committee of Shaoguan (RDC) is in charge of the development planning in Shaoguan.

Indicator: After we discuss with the officers in RDC, the conservation of aquatic resources and ecological services, the improvement of the livelihood of fishers, and the reduction of discharged pollutant should be included in the 12th Five Year Planning of Shaoguan.

(1-2) To protect and expand forest cover in Shaoguan

This action covers all hilly and mountainous area in Shaoguan. The time frame of this action within this project is from 2010 to 2013. However, this action will continue after this project.

Objectives: There are 22 nature reserves zones in Shaoguan City, which include 3 national conservation sites, 13 provincial conservation sites and 6 municipal conservation sites. There are 11 forest parks in Shaoguan, including 3 national forest parks, 2 provincial forest parks and 6 county forest parks. They are the important habitats for native animals, plants and wetland resources. So far, the forests within the Nature Reserves are strictly protected by law. According the forest planning, more forests for ecology and water conservation along Beijiang River will be established in the next few years.

Implementer: The Shaoguan Bureau of Forest is in charge of the forest protection and development in the area.

Indicators: The statistic of forest cover by native species will increase in the next few years.

(1-3) To improve the management of aquatic conservation zones

This action only relates to the preservation zones for aquatic resources in Shaoguan. The time frame of the action within this project is from 2011 to 2013. However, this action will
continue after this project.

**Objectives:** There are 9 aquatic resource protection zones set up along Beijing River within Shaoguan. However, sand dredging is still quite active within the zones. It is illegal. For a provincial forest conservation zone, an office in charge of the protection and conservation is set up with officers and financial budget. However, there is no such office for provincial conservation zone for aquatic biological resources in Shaoguan. Most of the jobs are taken by the Fishing Monitor Team of Shaoguan. There are not enough officers in this team. So, sand mining activity has not been totally stopped in the conservation zones.

**Implementer:** Guangdong Provincial Fishing Monitor Team and Shaoguan Fishery Monitor Team are in charge of protection zone and the Bureau of Water Affair is in charge of sand mining management.

**Indicator:** We will visit Guangdong Provincial Fishing Monitor Team and explore the possibility to set up an office for aquatic conservation zone. Beside, the sign for protection zones should be set up at the starting point and the end point for each protective zone. Regulation should be written on this sign and let the public know about what can do and what can not do in the protected zone. We hope that the illegal activity in the protection zone will be able to stop within two years. Communication with the Bureau of Water Affair should be strengthened. The sand mining activity should be stopped within few years.

(1-4) To control water pollution from industry sector

The scale of this action mainly focuses on industrial sector in Shaoguan City. The time frame of the action within this project is from 2010 to 2013. However, this action will continue after this project.

**Objectives:** Water pollution prevention and control measures have been taken seriously, which include the implementation of the "principle of three synchronization " which means that pollution control facilitate should be designed, constructed and put into operation simultaneously with production facilitate, the establishment of the water quality monitoring network, the closing down of a number of enterprises with heavy pollution. The closed industries include small-scale iron and steel enterprise, 8.3 million tons of cement production capacity, and 8.8 million tons of pulp production capacity. Enterprises such as bleaching, dyeing, electroplating, food processing have also been carefully screened and selected according to the quality of discharged water. Through improving wastewater treatment techniques and optimizing the water circulation system, industrial wastewater released by Shaoguan Smelter reached the standard and water reuse rate reached 96.3%. The discharge volume of industrial wastewater was reduced from 2,412 m³/h in year 2000 down to 300 m³/h in year 2009. However, heavy pollution from iron ore mining and transportation is still existing (Fig. 12). Some complaints from fishing villages near the industrial parks about water pollution also exist. Heavy metal pollution is quite serious in Beijiang River watershed because of the mining industry and metal smelting industry in that area. “Prevention and Treatment Plan for Heavy Metal Pollution in Shaoguan” is being made by Shaoguan Bureau of Environment Protection. Many more restrict regulation will be put into that plan such as daily pollution monitoring system, report requirement for the change in raw material used and output level of production, the public announcement requirement about pollutant discharge, and more detail waste treatment requirement.
**Implementer:** The Shaoguan Bureau of Environment Protection, Dabao Shan Mining Cooperation and other factories in the industrial parks are in charge of this action.

**Indicators:** All industrial development should more restrict follow the "principle of the three synchronizations". The yellow colour of the river caused by iron ore mining should disappear in the next few years. The complaints about water pollution should be reduced. “Prevention and Treatment Plan for Heavy Metal Pollution in Shaoguan” will be made and implemented.

(1-5) To reduce non-point pollution from rural family

The action will be taken in the farming villages within Shaoguan City. The time frame of the action within this project is from 2011 to 2013. However, this action will continue after this project.

**Objectives:** Eco-agriculture and biogas application are emphasized in rural area of Shaoguan. Because more than 100 thousand biogas digesters have established before 2010, 6,566 t COD (Chemical Oxygen Demand) from animal husbandry and households has been cut off annually from being discharged into rivers. Although more than 100 thousand families in rural area have installed biogas tanks within 400 thousand families, about 30% of the biogas tanks are not working very well. It is because some families no longer raised pigs due to the disease problem, and also because the lack of maintaining and repairing support. The financial support for biogas tank building will continue in the next two years. We discussed this with the leaders from Shaoguan Bureau of Agriculture. They agreed that on the one hand maintaining and repairing support should be strengthened, on another hand biogas tank development will focused on the medium and large tanks in livestock farms instead of small 8-10 m³ family tanks.

**Implementer:** Shaoguan Bureau of Agriculture is in charge of biogas tank activity.

**Indicators:** More biogas tanks will be set up in the next two years in medium and large livestock farms and the maintenance system will be improved. The workable biogas digesters will increase from about 65% to about 80%.

(1-6) To release fish fry

The action will be taken within the major river and branches of Beijiang River in Shaoguan City. The time frame of the action within this project is from 2011 to 2013. This action will continue after this project.

**Objectives:** Since 2006, the fish releasing activity have being carried out under the principle of “leadership from government, and join effort from the public”. An Association of Releasing Life was established in 2010. Recently, Shaoguan Fishing Monitory Team has set up a special website which is opened for the public to join the releasing activities. This is a good beginning to let more people to be involved and join this activity. There are 10 fish fry releasing stations in Shaoguan recently. The amount of fish fry released is about 50 thousand to 100 thousand each year. Most of the fish species are carps and other low value fish fry. This activity should be strengthened in the next few years.

**Implementer:** Shaoguan Fishery Monitoring Team is in charge of this releasing activity.

**Indicators:** The money donated by public or spent by government for fish fry releasing will increase. The number of released fish will be increased and even doubled in the next two year. Some of the high value species will also be raised and released.
To stop cage culture for fish in reservoirs
The action will be taken mainly in the reservoirs within Beijiang River Watershed area especially in Lanshui reservoir which is the resource for drinking water. The time frame of the action within this project is from 2010 to 2013. This action will continue after this project.

Objectives: The fish cage culture method in reservoirs can cause heavy water pollution in water resources. This activity has been stopped by the government of Shaoguan in 2009 because of the bloom of blue and green alga in Nanshui reservoir. This type of fish culture should be prohibited in the future.

Implementer: Shaoguan Bureau of Fishery

Indicators: There should be no fish cage culture in reservoirs in Beijiang River watershed in the future.

To have better management of sand mining activity
The action will be taken mainly for sand companies who are active in Beijiang River for sand mining. The time frame of the action within this project is from 2011 to 2013. This action will continue after this project.

Objectives: Measures to control sand mining in Beijiang River such as public tender for license, mining zone restriction, mining monitoring and inspection, resource taxation have been taken by Shaoguan Bureau of Water Affair. Sand mining is one of the major reasons of environment and resources damage in Beijiang River. According to “The Law of the People's Republic of China on Evaluation of Environmental Effects” (2002) and “Management Catalog of Construction Projects for Environmental Effects Evaluation” (2008), sand mining should have environmental assessment for sand mining activity whenever sand mining reaches 100 thousand m³/yr, or wherever is within the range of natural egg laying, feeding, migration path and winter shelter for important aquatic species. Sand mining activity should not be put into operation before the approval of environment assessment report by the Bureau of Environment Protection, and then the issuing of mining permission certificate by the Bureau of Water Affair. However, no environment assessment reports have been made for many mining sites. So, these sand mining activities were illegal. Officers of Shaoguan Bureau of Water Affair told us that illegal sand mining companies were not care about paying the very low penalty fee. The standard of penalty fee and the responsibly is going to be raised in the newly revised edition of “Guangdong River Sand Mining Management Regulation”. Shaoguan government should revise related local policies and also raise the penalty standard and responsibility accordingly.

Implementer: We will communicate with officers from the Bureau of Environment Protection and the Bureau of Water Affair, and take necessary steps to implement the environment assessment for sand mining activity in Shaoguan and increase the penalty standard in Shaoguan for illegal sand mining.

Indicators: Every sand mining site has environmental assessment before put into production. The penalty level of illegal sand mining will be increased in the next two years.

To continue government subsidy for fishers
This action will be taken by government and benefit fishers. The time frame of the action within this project is from 2011 to 2013. This action will continue after this project.
Objectives: Government subsidize for the poorest fishers. The old fishers without any family member or relatives are entitled to the welfare of “five guarantees” (guarantees for their food, clothing, housing, medical care and funeral), hence can get subsidize about 200 RMB per month from local government. The poorest households who are identified by the government can also get subsidize from the local government. However the standard for supporting the poorest are very hard to meet and only a very few households can get this subsidize.

Implementers: Shaoguan Bureau of Human Resources and Social Security is in charge of this.

Indicators: all the poor meet the standard will continue to get living subsidize from government.

(1-10) To continue the subsidy policy for diesel price
This action will be taken by government and benefit fishers. The time frame of the action within this project is from 2011 to 2013. This action will continue after this project.

Objectives: Because of the increase of diesel price, the local government began to subsidize the fishers from 2007, but only benefit those fishers who own the fishing license. Most of the fishers do not own the license because they did not renew their licenses. The total number of licenses that can be issued is less than the total number of fishers. A suitable way to issue these licenses has not been worked out.

Implementer: Shaoguan Fishery Monitory Team

Indicators: At least those with fishing license can continue to get diesel subsidize from government. We hope that a solution for those fishers without license will be found.

(1-11) To continue 9 year compulsory education program
This action is mainly the duty of Shaoguan Education Bureau. We will use the three sampling fishing villages (Lishi, Zhoutian and Kengkou) to see the result. This action will be implemented from 2011 to 2013 in this project and will be continuously carried out after this project.

Objectives: The education in primary and junior high school is free for all the children in China, including those from fishers’ households in Shaoguan. Occasionally, we can see few children drop off school. We hope this will be totally eliminated and every child will be able to finish 9 year education in the future.

Implementer: Shaoguan Bureau of Education.

Indicators: All children in fishing villages can enjoy 9 year free education in the future.

(1-12) To continue provide low rent house and job training for fishers
This action relates to all fishing villages. However it will focus on fishers along the river section in Shaoguan city and in Kengkou Fishing Village during this project period from 2011-2013.

Objectives: Nowadays, the local government provides some low-rent-houses to the fishers who are living on boats in the urban area. Training is also provided to these fishers to help them find a job in the urban. At the end of 2010, there are 20 households moved to those low-rent-houses and most of them find a job in the urban. About 130 households will move to those low-rent-houses within 2011. The housing plan should be implemented as schedule.
Implementers: Shaoguan Bureau of Fishery and Shaoguan Fishery Monitory Team.

Indicators: All boat families in river section of Shaoguan urban area will move to the new houses provided by the government by the end of 2011. Most of the adults can get job training and find their new job position in the city.

(2) New Actions will be taken within the project

(2-1) To increase financial resources for protection and conservation of aquatic resources

This action will be accepted by provincial government and city government within the period of 2011-2013.

Objectives: Shaoguan government has budget every year for this purpose. For example about 100 thousand Yuan for fish fry releasing each year. But it is not enough. According to the law, sand mining companies and hydropower stations have to pay compensation for the lost and damage of aquatic resources. However, there is no standard for the amount they should pay for the conservation and proliferation of aquatic resources. Compensation fund collected by the government is used for other purpose. So, we are going to propose a motion for Guangdong People’s Political Consultative Conference about setting a compensation standard for fish resources and using them for aquatic resources conservation and protection. We would like also to pursue related Guangdong government departments who have the power to make necessary regulation and policy on this. We hope that some change will happen in related policy or regulation in the next two year.

Implementers: Guangdong People’s Congress, Guangdong People’s Political Consultative Conference, Guangdong Bureau of Fishery, and Guangdong Bureau of Finance have the potential power to make regulation and law for compensation.

Indicator: Detail standard for collection of compensation fund will be set up and begin to be implemented for conservation of aquatic resources.

(2-2) To implement the no fishing season from 2011

This action will be implemented from April 1 to June 30 each year in all major branches of the Pearl River from 2011 on.

Objectives: According to the new regulation “A unified no-fishing season regulation along the Pearl River Watershed” from the Ministry of Agriculture and the Department of State last year, the no-fishing season scheme will be implemented from April 1 to June 1 each year from 2011 in the major courses and branches of Pearl River including Beijiang River. The most difficult part for the implementation of this regulation is the life of fishers during this period. A subsidy plan has been proposed by the related provincial department. We hope that will be finally passed by the government and provincial people’s congress. Leader from Shaoguan Fishing Monitory Team expressed that there will be difficult to monitor such a large area. So, education and propaganda conducted by the government will become very important. It will let the fishers know that it will be good for them eventually, and also let the public know about this event and form a much larger monitory force from the public. We hope that the no-fishing season regulation will be implemented at least in the major part of Beijiang River, and the fish population will be able to recover after that.

Implementers: Provincial government will be in charge of in subsidy plan for fishers during the no-fishing season. The Shaoguan Fishery Monitory Team will be in charge of the
education and monitoring activity. The HighARCS research team will also help to educate the stakeholders.

**Indicators:** We hope that the no-fishing season regulation will be strictly implemented at least in the major part of Beijiang River, and the fish population will be able to recover after that. The fish harvested by fishers will be increased.

(2-3) To reduce water pollution from iron ore mining

The action plan will focus on the mining enterprise near Kengkou along Beijiang River. It will be implemented from April 2012 to March 2013.

**Objectives:** Iron ore mining activity caused a lot of pollution in the area. Government and the mining industries have taken many steps to check the pollutants running away from the mining sites. However, we found that the pollution also comes from the storage and transportation stage. When there was heavy rainfall, yellow water which came from the storage sites along railroad, run into Beijiang River and half of the river became yellow. Fishers in Kengkou complained about this acid polluted water which not only destroy fish in the river, but also destroy their boats. According to the leaders from Kengkou Township Government and Shaoguan Bureau of Environment Protection, they will be able to stop this pollution activity if it is reported. So, we will report about the pollution situation including the detail chemical test result of the yellow water running into Beijiang River and the possible treatment method to them and ask for action this year. New regulation which will encourage people to report cases of water pollution and the lost of aquatic resources to the Fishing Monitoring Team of Shaoguan government should be made within next two years.

**Implementers:** Kengkou Township Government, Shaoguan Bureau of Environment Protection will be in charge of enforcement of environmental law. Iron ore companies involved are in charge of pollution control.

**Indicators:** Water running through Beijiang in rainy days will not be contaminated and in yellow color again. More direct indicator should be waste water control facilities are set up.

(2-4) To reduce water pollution from rural area.

This action plan will cover the whole agricultural area within Shaoguan and will be implemented from 2011 to 2013 in this project and will be continuously carried out after this project.

**Objectives:** Besides biogas tank construction in rural area, no newly built livestock farm will be allowed by the government within 1 km along Beijiang River, and even within 5 km along the drinking water resources. Waste water treatment facility will be forced to build for those existing livestock farms in this critical zone. In order to reduce nitrogen and phosphorous pollution from agriculture, it is necessary to reduce excessive use of fertilizer in crop production in Shaoguan. The labels of “green food” and “organic food” are issued only the production site and production process strictly follow the guidance and regulations. The amount of fertilizer used is usually much less than farmers’ practices today. There are several production companies producing “green food’ or “organic food” in Shaoguan now. According to statistics in 2008, there were 89,360 tones, 43 types of agricultural products have been labeled with “green food “which were produced in 5,802.6 ha land and 3,300 ha fishpond. It will be expanded in the next two years. Because the market prices for these healthy foods are usually 30% to 100% higher than common prices, many big companies would like to accept
the technique to produce “green food” or “organic food”. Rice is one of the important crops in Shaoguan. Rice production area in North of Guangdong Province reached 36.5% (441 thousand hm²) total rice production area in Guangdong (Zhang Chao, Zhang Luxiang, et. al., 2010). There is a more reasonable rice fertilization scheme. More effective extension and education process like training class, poster, and handbook and TV program will be able to let more farmers to know and accept this. We will cooperate with Shaoguan Agriculture Bureau to implement this action plan.

**Implementers:** Shaoguan Agriculture Bureau is in charge of this.

**Indicators:** Less chemical fertilizer amount is used in crop production. More amount of “green food” or “organic food” will be produced in the next two years.

(2-5) To adjust the policy for eucalyptus forest development

The action will cover all hilly and mountainous area in Shaoguan area. The action will begin from 2011 and last for a very long period after this project.

**Objectives:** In recent year, eucalyptus developed very quickly in Shaoguan and other regions in Southern China. It is good to get more economic return from this fast growing tree species. However, the large scale displacement of this tree with local vegetation, and unsuitable management method such as very high planting density can cause biodiversity lost and soil erosion (Qian Guoqin, 2007). Some reservoir also suffered from the toxic running off water from nearby eucalyptus forest in Shaoguan. So, it is necessary to protect natural forest and native tree species and control the development of eucalyptus in Shaoguan. More dialogue between HighARCS and Shaoguan Forestry Bureau will be taken place in the next two year and more reasonable development strategy of eucalyptus will be formed in the next two years.

**Implementers:** Shaoguan Forestry Bureau is in charge of this action.

**Indicators:** A new policy for the development of eucalyptus forestry will be made and the quick growing rate of eucalyptus forest will be slowed down.

(2-6) To have more public educational activities

This action plan will be pushed forward by HighARCS China team and will cover the main stakeholders in the region. The major activities will be in the first half of 2013.

**Objectives:** Through the research in these two years, we found that more education for the public to understand the importance of aquatic resources and ecosystem services is needed in Shaoguan. For example some government officers didn’t know about the actual situation of the fishers and they didn’t care about the fish species. The important value of water pollution given by the industries leaders was significantly lower than other stakeholders. The average important value given by farmer and fishers for ecosystem services was lower than the value given by government officers and industrial leaders. Electricity and toxic methods are still illegally being used by farmers and even fishers today in some places. Various methods can be considered to adopt for public educational activities, such as public media including news paper and local television program, education materials such as CD, poster, booklets, training activities including short introduction course and technical training. The topic for public education may include:

- What are ecosystem services? How can we protect and increase ecosystem service?
- Why it is so important to preserve fish species and other aquatic species?
- How heavily the fishers rely on aquatic species? Is it important to preserve this fishing
culture in the future?

- How important are the aquatic plants to the life of fish species?
- Why dam, sand mining, and water pollution can damage aquatic resources? How do we can reduce its negative impact?
- How do we implement the law about the preservation zone for aquatic species?
- Why electricity method and toxic method are so harmful to aquatic species and the life of fishers?
- What should we do for the no-fishing season from April 1 to June 1?
- Where does the running water from iron ore go? And how does it affect the aquatic ecosystem?
- What is a suitable scheme for eucalyptus development?
- What is the right method for rice fertilization and pest control?

**Implementers:** Research team of HighARCS can help to make some reports to the media, and prepare some education and training materials. The activities can be held by cooperation with Shaoguan Bureau of Agriculture, Shaoguan Bureau of Forestry, Shaoguan Bureau of Fishery, Shaoguan Fishery Monitory Team etc.

**Indicators:** More than 5 reports will appear in the public media. More than 5 training will be held in Shaoguan for different stakeholders. More than 5 posters or booklets will be designed, printed and delivered to the public and stakeholders.

(2-7) To notice the fishers about the water gate operation by hydropower stations on time

This action will be mainly implemented in the three sampling fishing villages, Kengkou, Lishi and Zhoutian. We hope that the communication channel will be set up within 2012.

**Objectives:** The sudden drop of water level and strong current caused by gate opening operation for irrigation or flood control could cause severe lost of fishing tools, and sometimes even threatened the lives of fishers working in their small boats. The fishers hope that the hydropower station notices them the time of water gate opening beforehand. It is the duty of hydropower station to let every one affected knows about the gate operation beforehand. It seems that there is no difficulty for the hydropower station to send the message to all the fishers via mobile phone. Township leader of Zhoutian said that they could coordinate this between hydropower station and fishing village. Township leader of Wushi also expressed that they can collect cell phone numbers from fishers and give them to the power station. We will further contact township government to improve the communication process between hydropower station and fishers.

**Implementers:** Township governments in charge of the management of fishing villages will collect cell-phone numbers from fishers and send them to the hydropower stations.

**Indicators:** The communication system between fishers and hydropower stations are set up. Gate operation can be informed on time.

(2-8) To strengthen government management organization for fishing communities

This action will also focus on the three sampling villages. The management will be improved before the first half of 2013.

**Objectives:** Although fishers in general belong to non-farmer statute, many women married to fishing communities were from farmer’s families and hence still belong to farmer in terms of management status by government legislation system. According to law, non-farmers are
managed under city residents’ committee, and farmers are managed under rural villagers’ committee. It is so confused that fishers said that they could not even find suitable government departments in charge to issue birth certificate or death certificate for them. Considering that most of the fishing villages are very close to town, it is possible to unify the management system for fishing communities by nearby city residents’ committees in Shaoguan. The township government should urge the resident’s committees to listen to the voice of fishing communities and help them to solve problems.

**Implementers:** Township governments and city resident’s committee with fishing villages are involved in the improvement of the leadership.

**Indicators:** A better organized fishing communities will appear in the next few years. Most of their affair can be effectively treated by local government.

(3) New Actions proposed for long term consideration

(3-1) To re-establish food chain and stabilized habitat for aquatic resources

This will be a long term action which may begin from a small demonstration site in one of the conservation zone in Shaoguan during the project period in 2013.

**Objectives:** To recover river ecosystem by re-establishing food chain beginning from recovery of aquatic plant community and by releasing endangered or locally disappeared aquatic animal species in Beijiang River. In order to achieve this goal, it is necessary to do some basic research for artificial reproduction and cultivation of those target plant and animal species. It is also necessary to do research on the structure of fish migration channel, because no migration channel which can help fish successively across water dams has been set up so far along Beijiang River. This goal may be achieved by research and demonstration efforts for about 5-10 years.

**Implementers:** Universities research institutions including, local government including South China Agricultural University, Municipal Government of Shaoguan will be able to fulfill this task.

**Indicators:** At least 20-30% sections of the river will be stabilized with good aquatic plant communities and rich biodiversity. Migration fishes will find their way going through dams and shallow waters. Some endangered aquatic species appear again in Beijiang River.

(3-2) To popularize green production technique in agriculture

This action will cover most of the crop land in Shaoguan. This will be implemented from 2011 to 2013 in this project and will be continuously carried out after this project.

**Objectives:** To reduce non-point resource pollution by enforcing green production technique in agriculture. Small farmers are mostly part time farmers today and not care about their land and crop enough to adopt advance technique. To organize farming activity in a much larger scale is essential to reduce chemical fertilizer and pesticide pollution and produce more healthy food.

**Implementers:** Shaoguan Agriculture Bureau, various farming companies and farmers’ associations will play important role in this aspect. Research institutes and universities also can develop more practical green technique for the region.

**Indicators:** More than half of the crop land will use “green production technique”. The chemical fertilizer used per unit crop land area will be decrease about 10-20%.
(3-3) To set up more sanitary facilities for rural house refuse and domestic sewage
This action will benefit most of the rural families in Shaoguan. The action will be implemented from 2011 to 2013 in this project and will be continuously carried out after this project.

Objectives: At present, most villages in rural area do not have sanitary facilities such as sewage pipe, or artificial wetland, or septic tank to reduce pollution from farming villages. Most of the wastes are discharged directly to the drainage ditches and to the river. It is necessary to extend public sanitary facility from urban area to rural area. The collection, storage, transportation and treatment system for rural house refuse and domestic sewage should be set up with the implementation of the “new rural construction plan”.

Impel mentor: Shaoguan Bureau of Environment Protection and Shaoguan Agriculture Bureau are in charge of this.

Indicators: More villages have good sanitary facilities.

(3-4) To treat the fishers as a special group to guarantee their pension and medical insurance
This action mainly refers to the policy change which will cover all fishers in the region. The policy change may happen within the project period from 2011 to 2013. The continue improvement may last long after the project.

Objectives: There are already such policies to treat the person who are working in the coal mine and forestry firms. Along with the decline of fish stock, the fishers could be treated as a special group to resolve their pension and medical insurance issues.

Implementers: Guangdong Provincial Government has the power to make such decision.

Indicators: fishers will be happy to get pension and medical insurance with lower cost which they can afford.

(3-5) To improve the current eco-compensation program
This action mainly focuses on policy change which will benefit the region to get more financial support from the provincial government. The improvement process begins from this project and may last for a long time.

Objectives: Shaoguan city is one of the ecological areas of Guangdong Province, which is limited for its economic development. But the current eco-compensation provided by the government of Guangdong Province is not enough for its natural resource conservation. If the provincial eco-compensation program can be improved, Shaoguan local government may get more financial support for supporting environmental conservation and sustainable development.

Implementers: Guangdong Provincial Government and Guangdong People’s Congress can make such regulation and law for eco-compensation.

Indicators: More financial support will be channeled to Shaoguan for eco-compensation purpose.

(3-6) To revise two critical laws related to aquatic resources
This will be a long term action which can only be implemented in national level. It is hard to be realized within this project period, but some of the basic work related to that can be done.

Objectives: Article 3 of “The Law of the People's Republic of China on Evaluation of Environmental Effects” (2002) stipulate: “Any projects that have negative impact on environment within the territory under the jurisdiction of PRC shall conduct environmental
integrative assessment (EIA)”, and according to article 25, “any project that fails environmental impact review shall not be permitted to begin construction”. However, article 31 states that any construction builder who start his project without prior EIA qualification license from the related governmental agencies shall be required to halt the project and apply for EIA license immediately. Actually this article 31 is contradictory to article 25 of the same law and open an escape door for construction builders. It makes it possible for construction builders to start their projects first and make it legal later while article 25 absolutely forbids such maneuvers. So, it is important to improve this law. It is also important to revise “the Law of the People’s Republic of China on the Protection of Wild Life” to include important species supporting life and ecological functions in the protection lists no matter weather those species are endanger and rare or not.

**Implementers:** National People’s Congress has the authority to revise these laws.

**Indicators:** The above mention weak points are amended.
3. The Result of Implementation and Assessment

The results of implementation and assessment of the actions are presented here according to the order appear in Table 1. The 12 actions already accepted by government will be described first in section 3.1. Then, the 8 short term actions proposed by this project follow in section 3.2. The 6 long term actions proposed by this project are described in section 3.3. In each action plan, we describe first how the action was implemented, and then what the results achieved by the implementation of this action. The satisfaction score of implementation ranges from 1 (very unsatisfied) to 5 (very satisfied). The satisfaction score for the result of the action also ranges from 1 (very unsatisfied) to 5 (very satisfied). Reasons for the score and suggestion for future improvement are briefly stated for each action.

3.1 Action Plan 1. The Actions had been accepted by government

Action Plan: 1-1 Development strategy in Shaoguan will follow the national ecological planning

1. Description & reflections on the implementation processes

a. Implementation situation:
Under the effort of Shaoguan Municipal Government, especially the Shaoguan Committee of Development and Reform, the People’s Congress of Shaoguan passed “the “The 12th Five Year Plan of Shaoguan Economic and Social Development” where the ecological principle and sustainable idea for the development in the next 5 years is clearly stated.

b. Communication strategy and tools
Under the effort of Shaoguan Municipal Government, especially the Shaoguan Committee of Development and Reform, the People’s Congress of Shaoguan passed “the “The 12th Five Year Plan of Shaoguan Economic and Social Development” where the ecological principle and sustainable idea for the development in the next 5 years is clearly stated.

c. Discussion and assessment (1-5): 4
A well social economic planning of a region is important to guide the future direction of the society. It is good to talk with the government leaders and officers about the actual situation and our concern before they made their decision. It can reinforce their impression about the importance of a sustainable development strategy. We are satisfied with the implementation of this action plan by Shaoguan government.

2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action
A good five year planning which can coordinate the conservation and sustainable development.

b. Why to use and how to get these indicators
The detail development indexes of the region will balance the environment, ecology, economic and livelihood of Shaoguan city.

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)
“The 12th Five Year Plan of Shaoguan Economic and Social Development” (2012-2015) expresses the development strategy of Shaoguan Municipal Government. There are some statements which
are related to the highland aquatic resource protection and sustainable development. In the part of “Guiding Ideology”, it states that “The economic development path will be changed more quickly and follow the path of ecological civilization firmly”. In the part of “Development Principle”, it states “Our attention must be paid for ecological development and an ecological civilization model city will be our goal”. In the part of “Development Goals”, it lists “an excellent ecological and residential environment” as one of the six goals. The detail indexes for achieving this goal in 2015 include: (1) Energy consumption rate and cultivated land area will reach the required level proposed by provincial government, (2) Forest cover rate will reach 72%, (3) Quality of surface water will reach good level, (4) 95% of air quality measures will reach the requirement of different functional zonations, (5) 100% of the drinking water resources will reach the quality standard, (6) Area of green parks and gardens within cities and towns will reach 12 m² per person, (7) Central sewage water treatment in cities and towns will reach 75%, and (8) Clean garbage disposal rate will reach 90%. In the part of “Major Tasks”, 10 major tasks are proposed. The 5th task is “According to the ecological zonation (called main functional zone), push forward the development of model city of ecological civilization.” The natural preserved regions, national parks, wetland parks are listed as protected zone. Four counties including Le Chang, Nan Xiong, Ren Hua, and Shi Xing in Nanling Mountain area are listed in ecological development zone which means ecological situation should be the first priority to be considered during social and economic development. Increase forest area, extension of biogas, circular economy, resources saving measures and clean production are all mentioned.

Since it is only a development planning, the actual result will appear gradually in the next few years. According to the experience before, most part of the planning will be implemented. For example, “The 12th Five Year Plan of Shaoguan Environment Protection and Ecological Development” was designed at the same year. More detail actions have been listed in that report. The implementation of these plans will benefit the whole society including different stakeholders.

d. Make suggestions for corrective action if needed

We hope that the “The 12th Five Year Plan of Shaoguan Economic and Social Development” (2012-2015) will be implemented exactly as it states in the coming few years by the joined effort of the whole society in Shaoguan City.

e. Conclusion and assessment (1-5): 5

The goal of this action plan has been successfully achieved.

Reference
Shaoguan Municipal Government, 2011, The 12th Five Year Plan of Shaoguan Economic and Social Development.

Action Plan: 1-2 To protect and expand forest cover in Shaoguan
1. Description & reflections on the implementation processes
a. Implementation situation:
The Forest Bureau of Shaoguan is in charge of leading this action. The major actions include the follows. (1) Those protected forest including natural reserves, national forest parts, forests for water resource and forest along critical geological sections are clearly defined. Total protected forest area is 44266 ha. It is about 31.14% of the total forest and covers 24.0% of the land area in
Shaoguan. (2) Subsidy which is 270 RMB Yuan/hm² each year is provided to those who own the protected forest by government. Although it still not covers the entire shadow price which is around 375 RMB Yuan, it helps to stabilize the protected forest area. (3) Financial input for forestation from central government and provincial government has increased in terms of strengthening carbon sink forest, Pearl River Watershed forest system, re-vegetation of rocky area etc. (4) It is required to hire one forest guard for each 300 hm² of protected forest from forest fire and illegal cutting activity. There are now 1538 forest guards in Shaoguan. (5) The forest along the major branches of Beijiang River is under protection in principle. Any cutting activity must be approved by government. If it is approved, only low intensity cutting like thinning or selective cutting is allowed.

b. Communication strategy and tools from our team
To have a discussion with officers from Shaoguan Bureau of Forest.
To conduct observations to 2-3 typical forest sites.

c. Discussion and assessment (1-5): 4
The system to protect and expand forest cover in Shaoguan has set up quite well. However, it is still very fragile. The major challenge comes from the low subsidy level. It is far below the real forest shadow price estimated by the forest land leasing price in market. Since the right of using collective forest land has been assigned to individual farmers since 2008, their behavior tends to maximize the economic return of their forest land. Action of increasing subsidy level has been implemented in other area like Guangzhou. Due to the relatively poor financial situation in Shaoguan, Shaoguan government could not increase subsidy level at present.

2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action
The goal is to improve the forestry cover for people in Shaoguan and down stream. The ecological effects and biodiversity of forest are maintained and maximized.

b. Why to use and how to get these indicators
Indicators: The forestry cover rate increases. More native forest communities appear in the region.
Method: Annual Statistics of Shaoguan Forestry Bureau. Site visits and review of some academic research papers

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)
The forest cover in Shaoguan was 68.9% in 2008. It increased up to 73.25% in 2012. The wood stock increased 5.8% from 72.15 to 76.33 million m³. Investigation of some typical forests also indicated the general healthy situation of forest management.

Case 1. National Forest Park of Shaoguan
Total area is 2746 hm². Major tree species using in forestation are local broad leaf tree species like *Michelia chapensis* (乐昌含笑), *Mytilaria laosensis* (米老排), *Myrica rubra* (杨梅), and *Liquidambar formosana* Hance (枫香). These tree species grow healthily and become the major tree species in the forest community (see Table 4 and Fig.1-3). The introduced eucalyptus tree is only appear along walk way or highway (Fig.4).
Table 4 Growth parameters of the 4 major tree species in Shaoguan National Forest Park

<table>
<thead>
<tr>
<th>Tree Species</th>
<th>Planted Year</th>
<th>Stem Base Area (m²/hm²)</th>
<th>Average Density (individual/hm²)</th>
<th>Average DBH (cm)</th>
<th>Average Tree High (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. laosensis</em></td>
<td>1988</td>
<td>50.96</td>
<td>1300</td>
<td>20.9</td>
<td>13.6</td>
</tr>
<tr>
<td><em>L. formosana</em></td>
<td>2000</td>
<td>17.75</td>
<td>2200</td>
<td>10.0</td>
<td>9.9</td>
</tr>
<tr>
<td><em>M. chapensis</em></td>
<td>2004</td>
<td>20.93</td>
<td>1400</td>
<td>12.7</td>
<td>11.3</td>
</tr>
<tr>
<td><em>M. rubra</em></td>
<td>2004</td>
<td>9.22</td>
<td>700</td>
<td>12.7</td>
<td>7.6</td>
</tr>
</tbody>
</table>

**Case 2. Xiaokeng Forest**

Total area is 4000 hm². Among them, 3400 hm² including primary forest and 1300 hm² secondary forest is protected and within Xiaokeng National Forest Park. The secondary forest with major tree species from Fagaceae (壳斗科), Lauraceae (樟科), and Theaceae (山茶科) grew quite well (figure) Commercial forest area is only 333 hm². Major commercial tree species are fir and pine. Illegal cutting activity still could be found in the removed edge of the forest farm.

**Discussion:** Because the improvement of forest coverage will be very helpful to improve water quality, to stabilize water quantity and to increase biodiversity, not only fishers will get the benefit, farmers relying on irrigation, city resident using tap water and travelers visiting natural environment are all benefit receivers.

**d. Make suggestions for corrective action if needed**

We would like to suggest that the government increases the subsidy level for the owners of those protected forest gradually to improve their life standard.
e. Conclusion and assessment (1-5): 4

We are generally satisfied with the result of the implementation. The anticipated result has achieved. However the life standard of the forest people is still needed for further improvement.

Reference

Chen Xianying, Han Qifei, The analysis of present situation, difficulties and solving approaches of Shaoguan ecological forest management, General Sciences, 2010,(3). (陈先营，韩其飞，韶关市生态公益林管理现状存在问题分及解决方法之探析，大科技)


Other Related Photos

Fig.5 Discussion with Staffs of Shaoguan Forest Farm and Xiaokeng Forest Farm

Fig.6 After discussion with staffs of Linmao Forest Farm in Shaoguan

Fig.7 Forest under protection for water resources in Jingjiang, one branch of Beijiang in Shaoguan

Fig. 8 Secondary forest in Shao Keng Forest Farm

Action Plan: 1-3 To improve of aquatic conservation zones

1. Description & reflections on the implementation processes

a. Implementation situation:

Shaoguan Fishery Monitoring Team is in charge of this action plan. They enforced the petrol activity along conservation zones in Beijiang River and effectively stopped illegal fishing activities. There are 11 aquatic conservation zones in Shaoguan so far and 28% of the river section is under protection theoretically. The conservation zone for Mystus guttatus(斑鳠) has been upgraded from a local conservation zone to a provincial conservation zone according to the requirement of the 5th Ocean and Fishery Conference of Guangdong Province. The length of
Beijiang river within this conservation zone reaches 110 km. During 2011 to 2012 period, they send out monitory boat 313 times and stop illegal fishing 16 times. There will be 24 conservation zones in Beijiang River within Shaoguan according to “The 2004-2015 development plan for fishery conservation zone in Guangdong”. Shaoguan Water Management Bureau has strengthened the regulation on sand mining activity in Beijiang River including the conservation zones in the last two years which will be presented in a more detail way in Action Plan 1-8. The waste water control will be presented in Action Plan 1-4.

b. Communication strategy and tools
Discussion face to face with officers from Shaoguan Fishing Monitoring Team and Water Management Bureau about the action.

c. Discussion and assessment (1-5) 3
The actions taken were included only within the routine duty and activities of Fishing Monitoring Team and Water Management Bureau. No specific action has been adopted. The major difficulties included two aspects. The requirement for more management persons for conservation has not been met due to the restriction on the scale of government employees. The coordination activities among Water Management Bureau, Fishery Bureau and Fishing Monitory Team in Shaoguan for stopping sand mining and fishing activity in the conservation zones has not become routine activity. Sand mining and fishing activities have not been effectively stopped within those conservation zones.

2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action
- No sand mining activity in conservation zones.
- No waste water discharge outlet opens directly in the protection zones.
- The populations of the protected aquatic species in conservation zones increase.

b. Why to use and how to get these indicators
- Discussion with Shaoguan Fishing Monitoring Team and Water Management Bureau about the action.
- To get fishing records from 12 fixed fishing boats along Beijiang River from 2009-2012

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)
The sand mining activity was better managed in the last two year and the waste water treatment capacity has increased in Shaoguan. However the direct protection activity is not so ideal. The fish species *Psychedio jordan* is listed in category CR (critically endangered species) in IUCN red list. The 12 fishing boats did not get any harvest record of this species in the past 4 years.

Table 5 The harvest records for high value species from 12 fishing boats in Beijiang River during 2009-2012

<table>
<thead>
<tr>
<th>Species #</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>677.525</td>
<td>172.35</td>
<td>69.35</td>
<td>108.3</td>
<td>0</td>
<td>0</td>
<td>253.3</td>
<td>70.95</td>
<td>16.1</td>
<td>24.2</td>
<td>276.5</td>
<td>223.6</td>
<td>20.55</td>
<td>0</td>
</tr>
<tr>
<td>2010</td>
<td>690.975</td>
<td>693.45</td>
<td>310.2</td>
<td>172.45</td>
<td>0</td>
<td>0</td>
<td>156.58</td>
<td>96.925</td>
<td>13.5</td>
<td>4.05</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2011</td>
<td>721.125</td>
<td>705.55</td>
<td>250.8</td>
<td>219.3</td>
<td>0</td>
<td>26</td>
<td>154.105</td>
<td>63.25</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>687.95</td>
<td>702.4</td>
<td>384.15</td>
<td>219.3</td>
<td>0</td>
<td>0</td>
<td>144.05</td>
<td>85.45</td>
<td>0</td>
<td>33.95</td>
<td>0</td>
<td>1.55</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

# 1. Pelteobagrus fulvidraco 黄颡鱼, 2 Squalidus argentatus 银鲍, 3 Culter recurvipes 海南鲌, 4 Megalobrama
Table 5 shows that there were 6 species with high price from 40-80 RMB Yuan/kg. Total harvest of these 6 species was 12.02% of the total fish harvest. There were 2 species (Spinibarbus denticulatus 光倒刺鲃，Megalobrama terminalis 三角鲂) increased significantly and other 3 species (Pelteobagrus fulvidraco 黄颡鱼，Squalidus argentatus 银鲴，Culter recurviceps 海南鲌，Siniperca kneri 大眼鳜) remained in stable situation in 2011 and 2012 by comparing with those in 2009 and 2010. There are 8 aquatic species with very high market value which is more than 80 RMB Yuan/kg. The total weight of these 8 species was only 2.72% of the total harvest in the past 4 years. There were 2 species (Siniperca kneri 大眼鳜，Sinilabeo decorus 桂华鲮) increased, 4 species (Mastacembelu sarmatus 大刺鳅，Macrobrachium nipponense 日本沼虾，Anguilla japonica 日本鳗鲡，Eriocheir sinensis 中华绒螯蟹) decreased and 1 species (Mystus guttatus 斑鳠) remained in stable situation (Table 1) in 2011 and 2012 by comparing with those in 2009 and 2010.

d. Make suggestions for corrective action if needed
Since conservation work needs human power and salary, and Shaoguan government could not solve this issue, the action from provincial authority should be taken in the future. More coordination among different departments including Environment Protection, Fishery, Water Management and Fishing Monitory in Shaoguan should be strengthened in the future.

e. Conclusion and assessment (1-5) 3
This action is not implemented very well and should be improved in the future.

Reference
2. 赵俊, 陈湘彝, 蓝昭军, 李强, 卿小芳, 陈龙秀, 李伟靖, 樊晓红. 广东北江鱼类资源现状评估. 中国鱼类学会 2008 学术研讨会论文摘要汇编, 中国江西南昌.
3. The 2004-2015 development plan for fishery conservation zone in Guangdong

Other Related Photos

Fig.9 Post for provincial conservation zone in Beijiang River in 2011(a) and in 2013(b)
**Action Plan:** 1-4 To control water pollution from industry sector

### 1. Description & reflections on the implementation processes

#### a. Implementation situation:

Environment Protection Bureau of Shaoguan and industry companies in Shaoguan were in charge of taking this action.


(2) Increase of waste water treatment capacity: 29.3 km waste water collection pipe in Shaoguan has been upgraded. Total waste water treated in the 11 cities and towns in Shaoguan was 8013 tons, which increased 8% comparing with 2010.

(3) Shut down pollution factories: 15 factories which caused heavy pollution have been forced to close in 2012. Another 73 factories were forced to reform their waste treatment system at the same year.

(4) Higher standard: The standard for the approval of industrial companies has been tightened by the Guangdong Bureau of Environment Protection in Shaoguan region because of one pollution accident happened there in February 2012.

(5) More Monitoring activities: In 2012, 10668 persons*time were sent to investigate 3246 industries*time for their pollution discharge situation. Those violated regulation got totally 712.5 thousand RMB Yuan fine. Two bad pollution discharge systems were shut down. 28 cases of pollution treatment systems were enforced to be improved.

#### b. Communication strategy and tools

We had a slide show to tell different stakeholders about the importance of waste water control and discussed with them about the actions. The stakeholders included key stakeholders including the government officers from the Shaoguan Bureau of Environment Protection and Shaoguan Committee of Development and Reform, the major factories in Shaoguan such as Shaoguan Iron and Steel Cooperation and Dabaoshan Mining Company, and the fishers fishing along the river. It was a two way communication. No matter in general meeting with different stakeholders or in specific conversation with only one type of stakeholders, we not only talked about the collected information and our opinion, but also listened carefully for their complain and suggestion. In general, this communication made stakeholders understood much better with each other about their situation faced, their suggestions, the measures already taken and actions for the next step. Those right actions got a lot of supporting voice and encouraged by the majority of stakeholders. It helped to make the right decisions by government leaders and industrial leaders.

#### c. Discussion and assessment (1-5)

Shaoguan is an industrial city with many heavy industries. Pollution also became a hot topic of the public in the past two years. This has become a pressure for the government and industries to improve their pollution control capacity. Our activity of this project also help to increase the awareness of this issue. The government of Shaoguan had a very clear policy for water pollution control from industries. In the 12th Five Year Planning of Shaoguan government, the following goals and policies have been proposed. (1) “Green Development Strategy” has been adopted, (2)
Central treatment facilities for waste water from industry will be accelerated including the waste water treatment plant in the industrial park, the waste water treatment centers in major towns and channel network for waste water collection in big city like Shaoguan, (3) Environment monitoring facility in 60% of the towns will be installed before 2015, (4) 75% of the waste water from cities and towns will be treated in central treatment plants before 2015. Since the financial situation in Shaoguan is considered not very well among all regions in Guangdong Province, how to channel enough budgets to support this plan will be a big challenge.

2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action

To reduce pollution in Beijiang River and improve the biodiversity and ecosystem services.

b. Why to use and how to get these indicators

- The water quality data shows the improvement. Local government and Shaoguan Bureau of Environment Protection strictly enforce the environment laws, and help industry enterprises to manage waste water.
- To improve and strengthen the water environment monitoring networks and water quality announcement system.
- Local government and Shaoguan Bureau of Environment Protection closing and stopping the operation of heavy water pollution enterprises and encouraging local people to report cases of water pollution.

We got data of these indicators from government reports, discussion with stakeholders, websites and papers.

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)

The environmental monitoring information can be easily found in the website of Shaoguan Bureau of Environmental Protection. For example, weekly report on water quality can be found from http://www.sgepb.gov.cn/hjzl/dbsszzb/, and waste water quality from major industries can be found from http://www.sgepb.gov.cn/hjzl/zdwryjc/.

The water quality of 100% water samples from the drinking water resources reached the required standard in the past two years.
In the 17 monitoring points in Beijiang River, water quality in 11 points reached the level 2 standard. Water quality in 1 point reached the level 3 standard. Other 5 points reached the level 4 standard. The water quality in Beijiang before leaving Shaoguan reached level 3 standards. In general, water quality reached the functional requirement in Shaoguan in the past two year.

d. Make suggestions for corrective action if needed

To continue the effort in the future.

e. Conclusion and assessment (1-5) 4

In general this action plan has been implemented quite well and got good result. However, long term environmental pressure is still there in Shaoguan because the existing of heavy industries. We hope that those measures will be implemented better in the future in Shaoguan.

Reference
http://www.sgepb.gov.cn/hjzl/
“Plan for the reduction of major pollutants in Shaoguan 2011-2015”
“Actions for reducing pollutants in Shaoguan in 2011”
“Plan for the development of monitoring system for reducing pollution discharge within 2011-2015”

Other Related Photos

Fig.10 Discussion with officers from Shaoguan Environment Protection Bureau

Fig.11 Discussion with officers from Shaoguan Water Management Bureau

**Action Plan: 1-5** To increase biogas and renewable energy resources in rural area

1. **Description & reflections on the implementation processes**

   a. **Implementation situation:**

   The action was mainly implemented by the Agriculture Bureau of Shaoguan. They have been taken many ways to increase rural biogas tank and solar energy use in the past two years.

   1. More biogas tank: Besides small family size biogas tank (10 m³), more middle size and big size biogas tanks were built in the past two years. There are 90 middle and big biogas tank projects. 174 thousand rural households (about 2/5) using biogas in Shaoguan. Government gave farmer 800-1500 RMB Yuan subsidy for building biogas tank.

   2. More effective maintenance system for biogas: In the past few years, 2249 biogas technicians have been trained and 1482 of them have got licenses from the Ministry of Agriculture. More than 10 thousand farmers were trained on how to use and repair biogas tank. 1.5 thousand Technical Manuals about biogas have been delivered to the farmers.

   3. More solar water heating system installed on the roof in villages in Shaoguan. For example, Qujiang Region Government subsidy 700 RMB Yuan for each rural family who installed solar heating system from 2008. In 2012, there were 500 households in Qujiang installed the solar systems. In Renhua County, 4,000 solar system have been installed which could reduce the cutting of 600 ha of fire wood. There are 15,000 families in rural Shaoguan using solar heating systems today.

   4. The production systems such as pig-biogas-fruit system and silk worm-biogas-mulberry were also extended in Shaoguan to make good use of biogas waste.

   b. **Communication strategy and tools**

   Discussion with officers and technicians from Shaoguan Agricultural Bureau and Fishery Bureau. Get statistic data from government reports and websites.

   c. **Discussion and assessment (1-5)**

   In order to separate clearly about this action plan with 2-4 and3-2, we concentrated this action plan on only renewable resources. Since the use of biogas can reduce water pollution and use of solar heating system can reduce the cutting of forest. Both of these actions are good for the watershed environment and water quality in Beijiang River. The implementation was generally good. Local government already took a lot of measures to extend these two energy systems. However due to
the financial situation, extension of solar system was still in small scale. Many farmers’ families no longer raised pigs and biogas tanks are no longer used. To develop collectively owned bigger biogas tank becomes a major challenge in terms of organization and management as well as construction technique.

2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action

In order to reduce pollution and enhance clean production in agriculture, the expected impacts include (1) More biogas tanks will be set up and the maintenance system will be improved; The workable biogas digesters will be increased. (2) More solar heating system will be used in Shaoguan.

b. Why to use and how to get these indicators

To assess the situation through site observation and statistic data analysis.

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)

The change of the indicators has been stated in section 1.a. above.

d. Make suggestions for corrective action if needed

The measures should continuously be taken and strengthened in the future.

e. Conclusion and assessment (1-5)

This action has been taken quite well. The challenge will be on more investment on larger scale of solar energy use and the organization and management bigger size biogas tank.

Reference

http://www.ycwb.com/ycwb/2008-01/13/content_1754110.htm

Shaoguan Agricultural Bureau, 2011, The 12th Five Year Plan for Agriculture and Rural Economy in Shaoguan, Guangdong Province.


Other Related Photos


![Fig.13 Solar heating system installed on the roof of a house in a village of Renhua County](http://news.sina.com.cn/o/2005-05-14/11385887103s.shtml)
**Action Plan:** 1-6 To release fish fry

1. Description & reflections on the implementation processes

   a. Implementation situation:

   The Shaoguan Fishing Monitoring Team was in charge of this action. In the past 4 years they continue to releasing fish fry.

   (1) Continue fish fry activity (Table 6)

   **Table 6** The fish fry releasing record in Shaoguan

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount of fish fry ($10^3$)</th>
<th>Investment (10$^3$ RMB Yuan)</th>
<th>Number of people join the releasing activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>10,645</td>
<td>2460</td>
<td>26000</td>
</tr>
<tr>
<td>2010</td>
<td>7000</td>
<td>1090</td>
<td>5000</td>
</tr>
<tr>
<td>2011</td>
<td>6500</td>
<td>1000</td>
<td>3775</td>
</tr>
<tr>
<td>2012</td>
<td>8000</td>
<td>1200</td>
<td>5800</td>
</tr>
</tbody>
</table>

   (2) A NGO organization called “Shaoguan life releasing association” was established in 2010. A new website (http://www.sgfsxh.com/default.asp) was opened to the public for participation of the releasing activity.

   ![Fig. 14 The front page of “Shaoguan life releasing association” website](image)

   (3) A new boat for fish releasing was bought in 2012 which enable releasing fish fry in any location along the river.

   ![Fig.15 The first day activity of the new fish fry releasing boat in Shaoguan in February 19, 2012](image)

   (4) Old fish releasing platform was still actively used for releasing activity.
(5) The major fish fry species released were local species which included common carp, grass carp, silver carp, big head carp, Barbell chub (*Squanliobarbus curriculus*), black amurbream (*Megalobrama terminalis*) and *Spinibarbus hollandi*. No introduced species were used in releasing activity.

b. Communication strategy and tools
To exchange idea with Shaoguan Fishing Monitoring Team about the action.
To monitor the fish harvest record in the sampling sites

c. Discussion and assessment (1-5) 5
Actually two of our research team joined the “Shaoguan life releasing association” and help them to establish the association. Some foreign friends of this project also joined the releasing activity. The officers in Shaoguan Fish Monitoring Team linked the fish releasing activity with the deep Buddhism culture prevailing in the region. The fish releasing has become a public supported activity.

2. Description and reflections on impacts:
a. Expected impact towards solving the problem provided by each action
We expect that the fish harvest will increase downstream because of the fish fry releasing activity.

b. Why to use and how to get these indicators
We have got 4 year fish harvest data of the 12 observation boats which were randomly selected by Shaoguan Fishing Monitoring Team and found that the fish harvests in Wushi and Kengkou were much higher than the normal increasing trend of the fishing harvest of the whole river. The most possible reason was the fish fry releasing activity upstream in Shaoguan city (0 km in Fig. 17 and Fig. 18).
Fig. 17 The Wushi and Dakengkou fishing harvests during 2009-2012 (within red circle) were significantly higher than the regression line of the whole river from Wujiang to Beijiang.

Fig. 18 Wushi and Dakengkou fishing harvests during 2009-2012 (within red circle) were significantly higher than the regression line of the whole river from Zhenjiang to Beijiang.

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)

The analysis of harvest record of the 12 fishing boats in the past 4 years along Beijiang River shows that releasing activity could increase 12-38% of fish harvest which was about 120-380 kg fish each fishing boat in about 50 km downstream from the releasing point. Although the fishers whom we met in Dakengkou fishing village also told us that the fishing harvest increased in the past few years, the range of 12-38% increase overlapped with the annual fluctuation range (4.6%-35.3%) of the fish harvest. More observation is needed in the next few years.
Table 7 The estimation of fish fry releasing on fish harvest of each boat

<table>
<thead>
<tr>
<th>Boat number</th>
<th>Location from releasing point (km)</th>
<th>Wushi 12</th>
<th>Dakengkou 9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>45.9</td>
<td>50.9</td>
<td></td>
</tr>
<tr>
<td>Rate of increase (%) Max.-Min.</td>
<td>37.5</td>
<td>12.5</td>
<td>37.8</td>
</tr>
<tr>
<td>Actual increasing</td>
<td>2009</td>
<td>440.1</td>
<td>146.7</td>
</tr>
<tr>
<td>harvest increase</td>
<td>2010</td>
<td>461.4</td>
<td>153.8</td>
</tr>
<tr>
<td>(kg)</td>
<td>2011</td>
<td>299.5</td>
<td>99.8</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>298.7</td>
<td>99.6</td>
</tr>
<tr>
<td>Average for 4 years (kg)</td>
<td>374.9</td>
<td>125.0</td>
<td>377.9</td>
</tr>
</tbody>
</table>

It should be noticed that more economic return or more fish harvest exited beyond 50 km and further downstream.

d. Make suggestions for corrective action if needed

We suggest that the government invests more for fish fry releasing in the future while continue to let more public involvement. The stabilization and recovery of fish habitat in Beijiang River is also important in the future.

e. Conclusion and assessment (1-5) 5

The action plan has been well implemented and the result is also good.

Reference

http://www.sgfsxh.com/default.asp
http://roll.sohu.com/20120220/n335294992.shtml

Other Related Photos

Fig. 19 HighARCS member joined the fish fry releasing activity in August, 2011

Fig. 20 Fish fry which is ready for releasing activity in the new fish releasing boat

Action Plan: 1-7 To stop cage culture for fish in reservoirs

1. Description & reflections on the implementation processes

a. Implementation situation:

There was 176.2 thousand m² of net box method for fish production in Nanshui reservoir before 2009. The blue alga bloom of this reservoir in February, 2009 caused serious pollution problem. The cage culture was identified as the major sources of nutrition. Shaoguan government decided
to stop the activity in the reservoir before October, 2010. Actually, 2800 net boxes were closed before August, 2009. The owner got 45 RMB Yuan.m^{-2} subsidies for their lost.

In order to reduce alga population in Nanshui reservoir, bighead carp (Aristichthys nobilis) and silver fish (Neosalanx taihuensis) were introduced to the reservoir since 2008. The fish harvest reaches 200 tons and gets more than 3 million RMB Yuan per year. It can help those net box owners to improve their life.

b. Communication strategy and tools
We contacted the Shaoguan Bureau of Fishery, visited the major reservoirs and talked with the net box owners.

c. Discussion and assessment (1-5) 5
When environmental crisis appeared, it could become a significant driving force to call for action like this one.

2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action
The net box method for fish production will be abandoned in the major reservoirs which are drinking water resources.

b. Why to use and how to get these indicators
The number of net box existing in Nanshui Reservoir through site investigation.

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)
From our own observation and the report from the government, most of the net boxes were closed in Nanshui reservoir. No blue green alga bloom happened again after 2009 incident.

d. Make suggestions for corrective action if needed
There are still few net boxes in Nanshui reservoir in 2012, although this number is well below the self-cleaning capacity of the reservoir. To find alternative ways to improve the livelihood of those net box owners is important to totally eliminate them from the reservoir.

e. Conclusion and assessment (1-5) 5
This action has been well implemented.

Reference
http://v.ku6.com/show/WcGeCi-LHzh3j_tl.html?loc=youce_tuijian

Other Related Photos

Fig. 21 Net box fish production in Nanshui Reservoir
Fig.22 Investigation of net box fish production by HighARCS research team in Nanshui reservoir
**Action Plan:** 1-8 To reinforce management of sand mining activity

1. **Description & reflections on the implementation processes**

   **a. Implementation situation:**
   An amended “Regulation on sand mining in river channels in Guangdong” was issued in July, 2012. More restricted measures were proposed in this new regulation. In 2012, Guangdong provincial government strengthened the action to stop illegal activities. From January to August, 2012, Monitoring Team of Shaoguan Water Management Bureau sent out 620 person*time for monitoring activity. 15 cases of illegal sand mining were stopped. There is no sand mining activity along Zhoutian, Kengkou sections at present and only 1 sand mining boat is still operating in Lishi section of the river. Some bribery officials were identified and put to formal legal process.

   **b. Communication strategy and tools**
   To exchange idea with Shaoguan Water Management Bureau about the action and to monitor the result. We visited sand mining site and talked with the management persons in charge. They were invited to the stakeholders’ conference. Through the slide show and conversation among stakeholders, they began to aware the situation of aquatic bio-resources caused by sand mining. The improved sand mining regulation of Guangdong Province in August, 2012 was published and educated the mining company through public media.

   **c. Discussion and assessment (1-5) 4**
   Conflict exists between market demand for sand and aquatic resources conservation. Government has to take responsibility to balance the two aspects. The action is implemented better now than few years ago.

2. **Description and reflections on impacts:**

   **a. Expected impact towards solving the problem provided by each action**
   To improve the water quality of Beijiang River and the habitat of aquatic species. Illegal sand mining activity will be strongly suppressed and hence decrease greatly.

   **b. Why to use and how to get these indicators**
   To discuss with Water Management Bureau and meet with fishers in the sampling fishing villages.

   **c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)**
   The sand mining scale reduced greatly in Beijiang River. Illegal sand mining activity was also reduced. However sand mining at night is still there. Fishers complained for us about the noise caused by mining activities.

   **d. Make suggestions for corrective action if needed**
   We suggest that Shaoguan government can issue a regulation to stop sand mining activity from all aquatic conservation zones in the future.

   **e. Conclusion and assessment (1-5) 4**
   The sand mining activity has been controlled well now. Its effect on fish population has not been studied since it is hard to be separate from the influence from other factors affecting fish population.

   **Reference**
   “Regulation on sand mining in river channels in Guangdong” 2012
Other Related Photos

Fig.23 Sand Mining Activity in Beijiang River

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**Action Plan:** 1-9 To continue government subsidy for fishers

1. **Description & reflections on the implementation processes**

   **a. Implementation situation:**

   (1) **Elderly Security System**

   In September, 2009, State Department announced a policy quite for a New Social Pension System for Rural Elderly. One year later in October 2010, this policy was formally listed in the amended “Social Security Law” in China. The rural residents can pay 100, 200, 300, 400, and 500 a year for elderly security saving until their 60. Village and local government can subsidy a person who pays the elderly security saving according to the financial ability. A person older than 60 can get his/her pension in amount of $55 + (elderly security saving) / 139$ (RMB Yuan/month).

   Urban residents pay their elderly security saving by selecting one suitable levels which include 120, 240, 360, 480, 600, 720, 840, 960, 1080, 1200, RMB Yuan/month. Local government subsidy 30 RMB Yuan/month for each person. For those disable persons, local government pay 120 RMB Yuan/month for them in their account. The employment institution also can subsidy a person to his/her account according to its financial situation. A person older than 60 can get the pension with $55 + (elderly security saving) / 139$ (RMB Yuan/month).

   Due to low population, there is no special pension policy toward fishers. Fishers can join an elderly security system according weather they registered as urban resident or rural resident.

   (2) **Medical Security System**

   In September, 2007, Shaoguan government announced “Implementation Method about the Medical Security for Urban Resident in Shaoguan”. Each person pays 120 or 320 RMB Yuan for his/her basic medical security saving each year. Government subsidies those disables and low income families for this basic medical security saving. Government supports another 240 RMB Yuan each year for each person from 2012. All these money will form a medical foundation. The minimum medical fee level which can get subsidy (200-1500 RMB Yuan), the maximum level of subsidy each year (40-80 thousand RMB Yuan) and the ratio of payment for each case (40-60%) by medical foundation are listed clearly. Rural Cooperative Medical Security System was set up from 2003 in China. Each rural resident pay 60 RMB Yuan/year. Government pays each person 240 RMB Yuan/year.

   There is no special medical security system designed for fishers. Fishers can join a medical security system according weather they registered as urban resident or rural resident.

   **b. Communication strategy and tools**
Discussion with Shaoguan Social Security Bureau about this action.

c. Discussion and assessment (1-5) 3

The percentage of fishers who join the social security system is now increasing although no special policy towards them. It is good to improve their livelihood, especially for those weak and poor. However the entering level is still too high for many of them especially the elderly security system which required at least 15 years of payment for his/her elderly security account. If they paid less than 15 years and reached his/her 60, they could pay the rest of this money at one time. This is quite a big amount for many fishers.

2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action

More elderly can get their pension. More fishers can join the cooperative medical care system.

b. Why to use and how to get these indicators

Discussion with Shaoguan Social Security Bureau about this action.

Visit the sampling villages about the percentage of fishers join the pension and medical care systems.

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)

(1) In Shaoguan, 70.3% residents including urban and rural residents join the elderly security system according to the record in Shaoguan Social Security Bureau. However, only few fishers joined the pension system according to our investigation in the three sampling villages. The major reason is the fee collected as basic elderly security saving is too high for most of the fishers and the return benefit is not high enough. The few who joined the system were rich families with young people working outside. However, elderly over 70 can get 55 RMB Yuan elderly subsidy each month. From 2012, the high age elderly can get more according to the new policy announced in March, 2012. (Table 8, Table 9)

Table 8 The situation of fishers who joined the medical security or elderly security system in the three sampling villages in Shaoguan

<table>
<thead>
<tr>
<th>Name of the fishing village</th>
<th>Number of Families</th>
<th>Type of Medical security</th>
<th>Covered rate for medical security</th>
<th>Type of elderly security system</th>
<th>Number of people joined elderly security</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zhoutian</td>
<td>15</td>
<td>rural</td>
<td>98 %</td>
<td>rural</td>
<td>0</td>
</tr>
<tr>
<td>Lishi</td>
<td>30</td>
<td>urban</td>
<td>95 %</td>
<td>urban</td>
<td></td>
</tr>
<tr>
<td>Kengkou</td>
<td>60</td>
<td>urban</td>
<td>100 %</td>
<td>urban</td>
<td>6</td>
</tr>
</tbody>
</table>

Sources: investigation with fishers in these fishing villages

Table 9. High age elderly subsidy standard in Shaoguan from 2012

<table>
<thead>
<tr>
<th>Age</th>
<th>80-90</th>
<th>90-99</th>
<th>&gt;100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsidy (RMB Yuan/month)</td>
<td>240</td>
<td>360</td>
<td>2400</td>
</tr>
</tbody>
</table>

(2) According to our site investigation more than 95% of fishers join the medical security program (Table2). One example is from Luo Dinggui in Lishi fishing village, he paid 30 thousand RMB Yuan by himself for heart stent operation before he joined the system. The same operation after he joined the system, he only paid 45%. The reason for those who still did not join the medical security program included: that they could get cheap medical treatment from informal doctors.
nearby and the hospital was too far away. The pay back percentage was too low and the procedure for reimbursement was too tedious.

d. Make suggestions for corrective action if needed

We would like to suggest that more direct contact towards the fishers’ families to explain the elder and medical security policy by township government officers. It would be nice if some special policy can be worked out for the specific situation of fishers in Shaoguan.

e. Conclusion and assessment (1-5) 4

The social security system which includes the pension and medical security is improving in China. More fishers joined the security system today. However, attention should be paid for clearer explanation and easier assessment.

Reference

Social Security Law of People’s Republic of China (October, 28, 2010)
Guide for the Implementation of New Rural Social Elderly Security System by State Department ( September 1, 2009)
Implementation Method about the Medical Security for Urban resident in Shaoguan (2007) (关于印发韶关市城镇居民基本医疗保险实施办法的通知)

Other Related Photos

Fig. 24 Discussion with Bureau of Social Security and Human Resources in November, 2012

Fig. 25 Site investigation in Lishi Fishing Village in November, 2012

Fig. 26 Poster in Zhoutian Fishing Village about how to join the pension system

Action Plan: 1-10 To continue the subsidy policy for diesel price

1. Description & reflections on the implementation processes

a. Implementation situation:

The diesel subsidy policy began from 2007. In 2011, only 64% of the fishing households got their fishing license and diesel subsidy. It is nice to know that all fishing households will be able to get
their license in 2013. Shaoguan Fishing Monitoring Team has got license quota from provincial department for them. All of them also can get diesel subsidy from 2013.

**b. Communication strategy and tools**
Discuss and exchange idea with the Fishing Monitoring Team of Shaoguan.

**c. Discussion and assessment (1-5) 5**
In the past, the major difficulty was that the quota was not enough for all fishing families and only those who totally relied on fishing could get the license. So, the goal of this action now has reached.

2. Description and reflections on impacts:

**a. Expected impact towards solving the problem provided by each action**
To help all fishers who are depending on fishing can get fishing license and diesel subsidize.
To issue fishing license to all the fishers who are depending on fishing. Diesel subsidy will continue be provided to all fishing families.

**b. Why to use and how to get these indicators**
To monitor the result of diesel subsidy and fishing license in the sampling fishing villages.

**c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)**
All fishing family will get their fishing license in 2013 and the diesel subsidy policy will continue in the coming years.

<table>
<thead>
<tr>
<th>Fishing assets</th>
<th>Wealth group</th>
<th>Lishi</th>
<th>Kengkou</th>
<th>Zhoutian</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of households with fishing license (%)</td>
<td>Poor</td>
<td>30</td>
<td>10</td>
<td>10</td>
<td>16.67</td>
</tr>
<tr>
<td>Medium</td>
<td>45.45</td>
<td>10</td>
<td>80</td>
<td>45.16</td>
<td></td>
</tr>
<tr>
<td>Rich</td>
<td>50</td>
<td>45.45</td>
<td>40</td>
<td>45.16</td>
<td></td>
</tr>
<tr>
<td>Average size of diesel subsidy of each HH of last half year (RMB Yuan)</td>
<td>Poor</td>
<td>2033.33</td>
<td>3000</td>
<td>1000</td>
<td>2020</td>
</tr>
<tr>
<td>Medium</td>
<td>2700</td>
<td>3000</td>
<td>1981.25</td>
<td>2310.71</td>
<td></td>
</tr>
<tr>
<td>Rich</td>
<td>2368</td>
<td>3000</td>
<td>2075</td>
<td>2510</td>
<td></td>
</tr>
</tbody>
</table>

Data sources: from household survey in the 3 selected fishing communities

**d. Make suggestions for corrective action if needed**
No further suggestion here.

**e. Conclusion and assessment (1-5) 5**
The goal of the action has reached. It is good to see better situation for the fishing community in the coming years in Shaoguan.

**Reference**

王淼、秦曼, 从渔民经济行为看渔业管理制度安排, 中国渔业经济, 2008 (5)

**Other Related Photos**
Fig. 27 A Notice of the name list for those who could get diesel subsidy in 2010 in Zhoutian Fishing Village

Action Plan: 1-11 To continue 9 year compulsory education program

1. Description & reflections on the implementation processes

a. Implementation situation:
The Shaoguan Education Bureau is in charge of this action. They successfully reached the standard set up for compulsory education from 2011.

b. Communication strategy and tools
To discuss with the Shaoguan Bureau of Education about the matter.

c. Discussion and assessment (1-5) 5
Since compulsory education is a nation wide policy, Shaoguan government implemented it very well in spite of relatively poor government income from taxation.

2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action
All the children from fishing village can get the nine-year compulsory education.

b. Why to use and how to get these indicators
To discuss with the Shaoguan Bureau of Education about the matter.
To visit the three sampling villages and interview with households about this matter.

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)
Nine-year compulsory education in Shaoguan reached almost 100% from 2011. According to statistic data in 2011, 100% of children reached 7 went to primary school. 99.62% of children reached 12 went to junior high school and 96.71% graduated from junior high school could enter senior middle school. The children from all 117 fishing families moved to the new house on land have also been arranged to the school nearby. Actually there only 41 families among these 117
fishing families had children within the age for compulsory education.

d. Make suggestions for corrective action if needed
Since the government tax income is low, it would be better that provincial government gives them more financial support for education in order to raise the quality of education in Shaoguan.

e. Conclusion and assessment (1-5) 5
This action has been implemented very well and had a good result.

Reference
《转发市农业局关于韶关市区沿江住家船整治工作实施方案的通知》（韶府办[2009]54 号）
《关于协助做好住家船民子女转学入学等教育工作的函》（整治住家船函[2011]2 号）
《关于 2012 年秋季韶关市义务教育阶段学校招生工作意见》（韶市教[2012]54 号）
《广东省城镇免费义务教育实施办法》

Other Related Photos

Fig.28 Children in Lishi fishing village

Fig.29 Two girls in Lishi fishing village

<table>
<thead>
<tr>
<th>Action Plan: 1-12 To continue providing low rent house and job training for fishers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Description &amp; reflections on the implementation processes</td>
</tr>
<tr>
<td>a. Implementation situation:</td>
</tr>
</tbody>
</table>
The Bureau of Housing and Construction is in charge of construction of new buildings. The Bureau of Labor is in charge of job skill training. The Fishery Monitoring Team is in charge of moving fishers to the new houses.

According to Shaoguan Government’s decision, all boat resident in the river section within urban Shaoguan region should be moved to new houses and the boats should be eliminated. New apartments were built in Tianziling, Wujiang Region and Shiliting, Zhenjiang Region of the city in 2009. The relocation of fishers began from March 2009 to December 2011. Government set a policy for this relocation which included 10,000 RMB Yuan as compensation for each family for relocation and another 10,000 RMB Yuan for each family for job change. Government also provided job training for young immigrants. The first training class opened in March, 2010. 60 young people selected electricity, welding and gardening as their major.

b. Communication strategy and tools
Discuss with Shaoguan Bureau of Housing and Construction, Bureau for Labor and Fishery Monitoring Team about this action.

c. Discussion and assessment (1-5) 4
This action has set an example of how to move fisher on land. Government can not only think about new house, but also job training, schooling and financial subsidy. Since financial
situation of Shaoguan government is not so good as other region, fishers in other part of Shaoguan have to wait quite a long time for their turn.

2. Description and reflections on impacts:
   a. Expected impact towards solving the problem provided by each action
   Low rent houses can provide for the fishers. If they want to work in the city, job training can be provided. Within this project period, some of the fishers can move to new houses and set an example for future actions.
   b. Why to use and how to get these indicators
   To get data from the government departments and to meet with the fishers moved to new houses.
   c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)
   Up to the end of 2011, 156 families with 550 residents relocated to the new apartments. Among them, 61 families moved to Wujiang Region and 95 families moved to Zhengjiang Region. Each family got an 80-90 m² house. All children had chance to go to schools nearby. 62 young people got free job training opportunity. About 3/4 of the households switched their job from fishing to gardener, factory workers, and residential security etc. Another 1/4 remained in fishing for their life. Most of them were older than 40. They paid only 100 RMB Yuan/month for renting house. The price for the same size of room in the market is about 500-1000 RMB Yuan/month. There were 101 cement boats for living destroyed and most small wooden boats remained for fishing.
   The big change in their lives has caused different feeling. On one hand, most of them felt happy to live in a more secure and cheap house although some large families complained about the small size of the house. Most of the children and young people were happy to have a new opportunity to study or work in urban area. However, older people complained that they were not used to the new life style and they had to do more to take care of their grandchildren. Many families felt financial pressures because they had to pay many bills and pay more for foods.
   d. Make suggestions for corrective action if needed
   On one hand, we hope that government should consider earlier about the relocation of other fishers on land. On another hand, we suggest that policy set for relocation should consider more about the diverse situation among families and family members.
   e. Conclusion and assessment
   In general the result is good. However there were still some complain for different reasons.

Reference
Chen Fengbo, Samantha Punch, 2013, Moving from boats to land: Intergenerational transformations of household livelihoods in southern China (draft)
http://epaper.nfdaily.cn/html/2010-05/29/content_6847948.htm
Other Related Photos

**Fig. 30** New apartment for relocation of fishers in Shiliting, Shaoguan

**Fig. 31** Ole fishers are taking care with their grandson in their new home and happy to talk with us about the change

**Fig. 32** Cement boats within urban Shaoguan which were dissembled one year later (January, 2011)

**Fig. 33** Some fishers in Kengkou Fishing Village are still living in small wooden boats today.

### 3.2 Action Plan 2 –Short term New Actions

**Action Plan:** 2-1 To increase financial resources for conservation of aquatic resources

**1. Description & reflections on the implementation processes**

**a. Implementation situation:**

The HighARCS China team wrote a proposal to the Guangdong Province Political Consultative Conference in the Spring of 2011 through PPCC members from South China Agricultural University. The proposal entitled “Proposal for strengthen conservation of aquatic resources in Beijiang River” suggested that (1) to increase financial and personal input to those aquatic conservation zones, (2) to invest more for fish fry releasing activity, (3) to better control sand mining in the river, (4) to collect ecological compensation fee from hydropower stations and sand mining companies for conservation usage, (5) to provide more opportunity to young fishers to have job training for non-fishing position, (6) to enhance biodiversity education in the society. The Proposal Committee of Guangdong PPCC gave us a reply in June, 2011.

The Shaoguan Fishery Monitoring Team and Shaoguan Life Releasing Association set up a website ([http://shop35058233.taobao.com/?spm=a1z0b.7.w17950676883.1.N765Nb](http://shop35058233.taobao.com/?spm=a1z0b.7.w17950676883.1.N765Nb)) which can get donation from the public in 2011.

**b. Communication strategy and tools**

To have a proposal in the Guangdong People's Political Consultative Conference

To have a website to collect public funding for conservation and fish fry releasing.
c. Discussion and assessment (1-5) 4

Shaoguan is economically underdeveloped area comparing with the Pearl River region in Guangdong Province. It is hard for local government to invest a lot to conservation. The policy about ecological compensation can not made by local government. It is why we made proposal to Guangdong PPCC. To use website to collect public donation for conservation is another good way to increase investment for conservation.

2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action

Ecological compensation policy will become a formal policy in Guangdong Province. Some new policy will come out for financial support the conservation of aquatic species. Donation for conservation will be able to collect from a website.

b. Why to use and how to get these indicators

The proposal committee of Guangdong PPCC is in charge directly to handle our proposal. We believed that the proposal had been handed to the Guangdong Bureau of Fishery. They had a very serious consideration and careful review of the related suggestions before they gave their reply. Public donation from website could be easily got from Shaoguan Fishing Monitory Team.

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)

The reply from provincial government departments about our proposal promised to take the following actions: (1) to implement the “Action Outline for Conservation of Aquatic Resources in China”(2006) and the “Implementation Plan for Conservation of Aquatic Resources in Guangdong” (2010) more firmly, (2) to set up more than 150 aquatic conservation zones and to have a better management system, (3) to better cooperate with environmental department for water quality control and waste treatment, (4) to strengthen fish fry releasing activity by pushing forward the “fish releasing festival”, improving fish hatching technique, training more people engaging in fish fry releasing work, (5) to improve the ability to monitor water quality, (6) to restore natural habitat for wild life including wet land, aquatic plant community, and coastal forest system, (7) to form “the 12th five year plan for aquatic conservation zones in Guangdong” soon. In the reply, it also described the achievements on aquatic conservation in Guangdong. The achievements included (1) 3.83 million RMB Yuan investment for fish fry releasing in 2010, (2) 58.85 million fish fries have been released in the past 5 years, (3) no fishing season has set up along the Pearl River from 2011, (4) 11 national conservation zones and 86 provincial conservation zones for aquatic species have been set up with 118 management persons and some basic hardware, (5) environmental assessment for those projects related to aquatic resources had been tightened and required for ecological compensation and ecological restoration if any damage could be identified.

The website for the public to buy fish fry has been set up (see below) in 2011. It is convenient for anyone who wants to buy and release fish fry. According to the discussion with Shaoguan Fishing Monitoring Team members, there were many people in Shaoguan liked to release fish fry during their wedding day, birth day or other important festivals and occasions. They also took photos or video for those who could not attend the releasing activity. The web record showed that there were only 44 customers their.
d. Make suggestions for corrective action if needed

A more top-down methods are needed to push the setting up of ecological compensation system in China, because it is a new concept for many leaders working in government departments. The good news appeared recently. The vice minister of Ministry of Water Management in March 22, 2013 held a meeting to discuss about the setting up of ecological compensation system related to aquatic and water resources. The Standing Committee of People’s Congress held a meeting to discuss the setting up of ecological compensation system in Beijing in April 24, 2013.

e. Conclusion and assessment (1-5)

Our proposal has stimulated the concern about the input for the conservation of aquatic resources from provincial level, however a top-down approach is needed for the setting up of a well designed ecological compensation system in China in the future. The website set up for fish fry releasing is an innovation. However it is linked to a website for commercial selling and buying, it may be misunderstood by some people.

Reference

http://shop35058233.taobao.com/?spm=a1z0b.7.w17950676883.1.N765Nb

“Action Outline for Conservation of Aquatic Resources in China”(2006) (中国水生生物资源养护行动纲要，国务院)

“Implementation Plan for Conservation of Aquatic Resources in Guangdong” (2010) (广东省水生生物资源养护行动实施方案， 广东省海洋渔业局)
### Action Plan: 2-2 To implement the no fishing season from 2011

1. **Description & reflections on the implementation processes**

   a. **Implementation situation:**

      The no fishing season from April 1 to May 31 each year in the Pearl River was approved by the Ministry of Ocean and Fishery and implemented all over the Pearl River including Beijiang River from 2011. The announcement was put forward to let everyone know about no-fishing season. All fishing boats were required to park together for the convenient of monitoring. The fishing activity stopped in the major courses of Beijiang River during the no-fishing season in both 2011 and 2012. Guangdong Provincial Government decided to have a compensation policy from 2013 and give each fishing family 1100 Yuan/month during the two month of enforced no fishing season. Half of the compensation money will be from provincial financial support, and the rest will be paid by local government. Fishers could follow the no-fishing requirement so far in Shaoguan. However some violation report could still be found from other part of the province ([http://www.chinanews.com/df/2012/06-01/3932159.shtml](http://www.chinanews.com/df/2012/06-01/3932159.shtml)). It was hard to monitor all small tributaries along the watershed, so they were not listed in the no-fishing sections at this stage.

   b. **Communication strategy and tools**

      We discussed with the officers from Shaoguan Fishing Monitory Team and the Fishers from sampling villages about the implementation of the action.

   c. **Discussion and assessment (1-5) 5**

      In China, the determination of government is important for this no-fishing season. It required a series of work such as public education, organization among fishers, monitoring activity, and economic compensation etc.
2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action

The fish population will be able to recover and it will be good to the fisher and the public eventually, and be good for the biodiversity. The no-fishing season will be implemented well.

b. Why to use and how to get these indicators

Discuss with Shaoguan Fishing Monitoring Team about this action.

To visit fishing village during the no-fishing season and analysis fishing harvest record from the sampling boats.

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)

From the data collected from 12 fishing boats from year 2009-2012 showed that the no-fishing season is very effective to increase fish stock in the river and hence increase fishing harvest. In Fig.37, the Adjusted Harvest Index (AHI) was calculated from Harvest Index (HI) as follow.

\[
HI_{ij} = \frac{\text{harvest in month } i}{\text{average harvest per fishing month in year } j}
\]

\[
AHI_{ij} = \frac{HI_{ij}}{\text{average } HI_{ij} \text{ in the first 3 months of year } j}
\]

The Harvest Index (HI) can eliminate the effect of annual harvest fluctuation. The Adjusted Harvest Index (AHI) uses the average harvest of the first 3 months of each year as a standard reference point for comparison. Fig.37 shows that the AHI were mainly between 120 - 80 % from June to December before the implementation of no-fishing season policy. However they changed to between 120-160% in 2011 and 2012 after no-fishing season implemented. In Table 8, both average HI or AHI show the increasing trend after no fishing season policy implemented.

![The Change of Adjusted Harvest Index from 2009-2012](image)

Fig.37 The change of Adjusted Harvest Index each month from 2009 to 2012 in Shaoguan
(Data from fishing record of 12 fixed fishing boats)

<table>
<thead>
<tr>
<th>Year</th>
<th>AHI from Jun. to Dec.</th>
<th>HI from Jun. to Dec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>0.89 c</td>
<td>0.95 b</td>
</tr>
<tr>
<td>2010</td>
<td>1.05 b</td>
<td>1.01 a</td>
</tr>
<tr>
<td>2011</td>
<td>1.36 a</td>
<td>1.09 a</td>
</tr>
<tr>
<td>2012</td>
<td>1.46 a</td>
<td>1.10 a</td>
</tr>
</tbody>
</table>

* Different alphabet behind the number shows the significant difference by Duncan method
* HI=Harvest Index ,AHI=Adjusted Harvest Index
According to a report of fish harvest in Foshan City which locates in the lower reach of the Pearl River, the fish harvest was 6,780 tons in 2010. It reached 7,296 tons in 2012. The fish harvest increased 7% after the no-fishing season policy (Liu Xin, 2013). The composition of fish species also changed. Those low value species decreased from 84.9-87.8% to 78.0-83.1% and the high value species increased from 12.2-15.1% to 16.9-22.0% according to the record from the 12 sampling boats (Table 12). The name of those fish species are listed in Table 13.

<table>
<thead>
<tr>
<th>Table 12 The change of low value and high value harvest in Beijiang from 2009-2012 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No fishing season</td>
</tr>
<tr>
<td>year</td>
</tr>
<tr>
<td>Low Value Species</td>
</tr>
<tr>
<td>High Value Species</td>
</tr>
</tbody>
</table>

Although the fish stock increase, the fishers complained to us about their life during the two months without fishing. Since some nearby area already had a policy of compensation for no fishing season, they hoped that the government in Shaoguan also could have the compensation policy. They are satisfy with the situation now that they can get that compensation money from this year on.

<table>
<thead>
<tr>
<th>Table 13 The market value of major fish species in Shaoguan 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Species</td>
</tr>
<tr>
<td>Cyprinus carpio</td>
</tr>
<tr>
<td>Carassius auratus</td>
</tr>
<tr>
<td>Ctenopharyngodon idellus</td>
</tr>
<tr>
<td>Hypophthalmichthys molitrix</td>
</tr>
<tr>
<td>Aristichthys nobilis</td>
</tr>
<tr>
<td>Cirrhinus molitorella</td>
</tr>
<tr>
<td>Hemiculter leuciscus</td>
</tr>
<tr>
<td>Tor brevifilis brevifilis</td>
</tr>
<tr>
<td>Mylopharyngodon piceus</td>
</tr>
<tr>
<td>Xenocypris davidi</td>
</tr>
<tr>
<td>Megalobrama terminalis</td>
</tr>
<tr>
<td>Squaliobarbus curriculus</td>
</tr>
<tr>
<td>Noemacheilus fasciolatus</td>
</tr>
<tr>
<td>Pseudogobio vaillanti</td>
</tr>
</tbody>
</table>

d. Make suggestions for corrective action if needed
How to efforce the implementation in small streams and creeks is worth for further consideration.
e. Conclusion and assessment (1-5) 5
It is a very well done action and has set a good example for other river systems.
Action Plan: 2-3 To reduce water pollution from iron ore mining

1. Description & reflections on the implementation processes
   a. Implementation situation:
      The illegal iron washing operation was finally forced to shut down in summer, 2012.
   b. Communication strategy and tools
      We talked with Wushi Township Government officers about the serious pollution situation caused by the iron ore washing operation in Kengkou Fishing Village. We also discussed the situation with Shaoguan Environment Protection Bureau. We encouraged fishers to report the pollution case to the government. We got water samples from the outlet which locates within Kengkou fishing village and tested the quality of the water sample in April 6, 2012 when iron wash site was still operating and in November 23, 2012 when iron wash site has been closed for about 3 months.

   c. Discussion and assessment (1-5) 5

Fig. 38 Fishing boats in Zhoutian fishing village were parked together during the no fishing season in April 11, 2011

Fig. 39 We could see fishing activity in small tributaries which was not within the designed no-fishing zone in Beijiang River area in April 7, 2011 during no fishing season.

Fig. 40 The discussion between HighARCS China team with Wushi Township Government offers about the pollution caused by iron ore washing operation in Kengkou Fishing Village
It was not easy to shut down a mine washing site by township government because a big mining company behind was very powerful in the society. Only when some heavy metal pollution case was disclosed in the newspaper and caused great attention by the public and provincial government, the local government made a firm decision to close all pollution sites immediately.

2. Description and reflections on impacts:

a. **Expected impact towards solving the problem provided by each action**

To stop the iron ore washing water to pollute Beijiang River in the Kengkou fishing village section and set an example for similar situations.

b. **Why to use and how to get these indicators**

To get sample of the iron ore washing water and analyze its chemical property. To check the situation in Kengkou Fishing Village.

c. **Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)**

The water quality test result in Table 14 shows that water was seriously polluted when iron ore washing site was operating in April 6, 2012 and it became much better after the site was closed.

<table>
<thead>
<tr>
<th>Sampling day</th>
<th>pH</th>
<th>Zn (ml/L)</th>
<th>Cu</th>
<th>Mn (ml/L)</th>
<th>suspended solids (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 6</td>
<td>4.16</td>
<td>3.28</td>
<td>0.253</td>
<td>91.43</td>
<td>40700</td>
</tr>
<tr>
<td>Nov.23</td>
<td>7.33</td>
<td>0.244</td>
<td>0.004</td>
<td>0.202</td>
<td>336</td>
</tr>
</tbody>
</table>

The fishers in Kengkou Fishing Village used to complain about the pollution and said that their boats rusted very quickly because of the acid run off water from the iron ore washing site. Now they are satisfied with the present situation. They are still worry about the return of the washing operation, because the machine are still there and has not been moved away or dissembled so far.

d. **Make suggestions for corrective action if needed**

The equipment should be permanently moved away from the site.

e. **Conclusion and assessment** (1-5) **5**

This action is implemented quite well. It set an example for other sites and for future actions.

**Reference**

Bulletin on Shaoguan Environment 2010 (2010 韶关市环境状况公报)
Bulletin on Shaoguan Environment 2011 (2011 韶关市环境状况公报)

**Other Related Photos**

**Fig.41a** Iron ore washing was still operating

**Fig.41b** Washing operation was stopped
The pictures in Fig 41-43a were taken in April 10, 2011 when iron ore washing site was operating.
Fig.4a was taken in January, 2011
The pictures in Fig4 1-43 b were taken in November 23, 2012 when iron ore washing site was closed for 4 months.

Action Plan: 2-4 To reduce water pollution from rural area

1. Description & reflections on the implementation processes

a. Implementation situation:
Shaoguan Agriculture Bureau was in charge of this action. The major steps included:
(1) Well planning: Shaoguan Municipal Government announced “The action plan for clean and beautiful villages in Shaoguan” in June 27, 2012. Rural waste treatment was listed as an important aspect for the annual assessment of the performance of local government. It required local government to strengthen leadership, to take responsibility, to have financial investment, to conduct monitoring and assessment, and to strengthen public participation.
(2) The effort to reduce waste from animal farm: According to the “Pig and Poultry Production Plan in Shaoguan in 2008-2020”, animal production is not allowed to be developed in environmentally sensitive area such as watershed for drinking water and the region within 1 km to Beijiang River. Animal waste was encouraged to be recycled through pig-biogas-fruit or pig-biogas-fish patterns.

b. Communication strategy and tools
Exchange idea with Shaoguan Agriculture Bureau about the action.

c. Discussion and assessment (1-5)
The waste treatment in rural Shaoguan is just at its beginning. The collection of rural garbage system is still on its trial stage. Much waste water from villages is still running directly to ponds and streams. The financial constrain become one of the limiting factors in Shaoguan. However the organization work needs to be improved. We hope that the planning for beautiful village will change the situation.

2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action
To improve the rural environment and water quality in Beijiang. To increase the percentage of waste water treatment in rural area. More biogas tank and septic tanks are built in Shaoguan.

b. Why to use and how to get these indicators
Exchange idea with Shaoguan Agriculture Bureau about the action
To get statistic data about the waste water treatment in rural area from government

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)
(1) More biogas tanks have been built in Shaoguan as stated in action 1-5.
(2) More effective use of chemical fertilizer: In the past 5 years, the advance technique called “chemical fertilizer application formula according to soil fertility test” has been widely used in agriculture. The increasing rates of chemical fertilizer used were much less than the increasing rate of agriculture production (Table 15).

Table 15. Chemical Fertilizer Use and Agriculture Production in Shaoguan.

<table>
<thead>
<tr>
<th>Year</th>
<th>Chemical fertilizer used (10^3 tons)</th>
<th>Annual increasing rate of fertilizer used (%)</th>
<th>Annual increasing rate of Agricultural Production (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>104.1</td>
<td>0.1</td>
<td>5.3</td>
</tr>
<tr>
<td>2009</td>
<td>106.5</td>
<td>2.3</td>
<td>3.3</td>
</tr>
<tr>
<td>2010</td>
<td>111.0</td>
<td>4.2</td>
<td>14.6</td>
</tr>
<tr>
<td>2011</td>
<td>113.0</td>
<td>1.8</td>
<td>18.4</td>
</tr>
</tbody>
</table>

d. Make suggestions for corrective action if needed
More investment and better organization will be the key steps in the future.

e. Conclusion and assessment (1-5)
Rural environment was usually neglected by decision makers. It is no longer tolerable at this stage. Environmental consciousness both of government and the public has risen to a new level. We hope that this action can be strengthened in the future.

Reference
Shaoguan Agricultural Bureau, 2011, The 12th Five Year Plan for Agriculture and Rural Economy in Shaoguan, Guangdong Province.
**Action Plan:** 2.5 To adjust the policy for eucalyptus forest development

1. **Description & reflections on the implementation processes**
   
a. **Implementation situation:**
   Shaoguan Forest Bureau did not make specific policy on control the development of eucalyptus forest so far. However, policy emphasizing on local tree species was made. A document “About the accelerating development of local high value broad leaf tree species” was issued by Shaoguan government in 2009. The goal is to develop 6600 hm² forest with local high value broad leaf tree species in Shaoguan within 5 years. Expanding indigenous tree species was also listed as one of the 100 key actions by Shaoguan government for local social and economic development. Shaoguan government invests more than 1 million RMB Yuan each year to support seedling cultivation of those local species since 2009.

b. **Communication strategy and tools**
   To have a face to face discussion on the suitable policy with Forestry Bureau.
   To check the planting plan of the whole city in Shaoguan Forestry Bureau
   To have site observation in 2-3 forest farms.

c. **Discussion and assessment (1-5):3**
   Eucalyptus forest development is a very sensitive topic. Driven by high economic return of eucalyptus, some people such as eucalyptus investors and some officers in the forest bureau are still arguing about weather there are negative impacts of eucalyptus on soil fertility and water balance. Since no regulation on the development of eucalyptus in provincial level so far, Shaoguan government didn’t want to take the lead on this. Because it may cause some opposition in the society. Instead, there is no dispute for the development of local broad leaf tree species with high value in Shaoguan. It is much easier to make this policy in Shaoguan without opposition. Although actual policy to control eucalyptus has not been made, to emphasize the development of local tree species actually will benefit the expansion of local tree communities.

2. **Description and reflections on impacts:**
   
a. **Expected impact towards solving the problem provided by each action**
   The goal of this action is to develop eucalyptus only in those suitable habitats and protect more native forests in order to reduce soil erosion and improve biodiversity and water quality in the region.

b. **Why to use and how to get these indicators**
   Indicator: the percentage of eucalyptus forestry decreases while the whole forest area increases.
   Method: Governmental statistic data and site observation.

c. **Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)**
   There are 1.16 million hm² of eucalyptus forest area in Shaoguan. It is 6.9% of the total forest area. The wood stock in eucalyptus forest reaches 3.85 million m³. It is 5% of the total wood stock in Shaoguan. The major distribution of eucalyptus forest is in the southern part of Shaoguan. According to the report of Shaoguan Forest Bureau, no large scale replacing local forest with eucalyptus has happened in recent two years.
   As a tropical tree species, eucalyptus can not grow very well in the northern part of Shaoguan. Investigation conducted in a 23000 hm² Lin Mao Forest Farm which located in the north part of Shaoguan showed that the 150 hm² eucalyptus forest was no so good as fir and pine (Pinus elliottii Engelm) which are more adapted to local soil and climate situation. In National Forest Park and
other protected forest area, eucalyptus is only planted along road side. The control of eucalyptus may negatively affect the income of land owner and forest company in southern part of Shaoguan. However, it will benefit the majority of residents in the area and people down stream. Benefit conflict is the major difficulty to make a control policy for the development of eucalyptus.

d. Make suggestions for corrective action if needed
We still would like to suggest Shaoguan Forest Bureau to make a more explicit policy to control the development of eucalyptus in the near future.

e. Conclusion and assessment (1-5): 4
The development of eucalyptus is restricted by climate situation and the policy for more local tree species. However, a clear attitude of government policy is still needed.

Reference

Other Related Photos

![Fig. 45 Eucalypts stand in Lin Mao Forest Farm](image1)
![Fig.46 Eucalyptus tree along road side in Shaoguan National Forest Park](image2)

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**Action Plan**: 2-6 To have more public propaganda and educational activities

1. **Description & reflections on the implementation processes**

   a. Implementation situation:
   The HighARCS China team and the public media played important role in this action. We held workshops, seminars with government officers, company leaders and farmer leaders. We discussed the situation with fishers and farmers in their homes. We delivered posters, rulers of flagship species to fishers and Shaoguan Fishing Monitoring Team. We invited reporters to join our fish fry releasing activity. We wrote news to public media. To cooperate with Shaoguan government, video tape and website also developed. One video is about the fish fry releasing activity, another video is about the biogas tank development. The website is for “Shaoguan Life Releasing Association” and fish fry releasing activity. Three slide shows are “The general ecological and social economic situation of Beijiang River watershed”, “The environmental issues related to Beijiang River Watershed”, and “The possible policy and legal steps to improve the conservation and sustainable use of aquatic resources in Beijiang River” by our team members.

   b. Communication strategy and tools
   To contact public media and appear in newspaper and in TV.
To hold workshop and training for stakeholders.

c. Discussion and assessment (1-5) 4

The effort from HighARCS concentrated on the public media, workshop and direct contact of the stakeholders. Since the effort from HighARCS was not alone, the effort from various parts of the country such as school teachers, universities, research institutes, scientific societies, environment agencies and reporters also contributed to the propaganda and education. The result of the joint effort for this action was significant. On the one hand, public concern about the clean river appeared very frequently in newspaper, TV, and internet. It became a positive pressure to government, industry and other stakeholders to improve the ecological environment. On another hand, more people knew how to protect the environment and use the resources wisely for sustainable development. For example, most of the people in Shaoguan knew the no-fishing season, and the fish fry releasing activity. The ruler and the poster for flagship species appeared in fishing villages let the fishers know what the right action for those fish species was.

2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action

To let the public understand the general aquatic resources conservation and sustainable development situation of Beijiang River, and let them give more support for relative actions.

b. Why to use and how to get these indicators

No less than 2000 stakeholders will attend the educational activities. More than 10 different video, booklet, poster or slide show will be made by research team members.

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)

More than 280 person*days of the HighARCS China team members entered the project sites and contacted with different stakeholders to discuss and talk about the subject. We have contacted stakeholders from three sampling villages with about 250 persons for more than 40 times. We held two workshops with about 60 stakeholders each time from major government department’s industrial companies and service companies in Shaoguan. We have delivered poster and information sheet on the flagship fish species in Shaoguan to the sampling villages and Shaoguan Fishing Monitoring Team. There were about 35 news appeared in the local news papers, websites, broadcast stations and television stations which were related to HighARCS activity and the actions for aquatic resources conservation and sustainable use. Some of the news appeared in webs were collected in the attached files.

d. Make suggestions for corrective action if needed

The internet communication is becoming a more important channel for young people to learn and to express themselves. The mature working class still likes to get their information through TV. Officers and industry management persons rely heavily on documents and newspapers. Children like to have more vivid activities. So, it would be nice to choose the right way to face the specific group of stakeholders in the society in order to achieve an ideal result.

e. Conclusion and assessment (1-5) 4

The public awareness of the environmental issue woke up very quick in the last few years. We believe that our work has joined the main stream of this environmental movement and plays an active role in the future.

Reference see Attached Material

1. News in China about HighARCS
News in South China Agricultural University about HighARCS

Other Related Photos

Fig.47 The ruler for flagship species

Fig.48 China project leader was receiving an interview by TV reporters after a fish fry releasing activity in 2011

Fig.49 A Situation analysis meeting with stakeholders by using slide show

Fig.50 Posters for flagship species

Fig.51 Video for biogas and fish fry releasing activity

Action Plan: 2-7 To notice the fishers about the water gate operation on time

1. Description & reflections on the implementation processes

a. Implementation situation:

We visited Zhoutian, Kengkou and Lishi fishing villages and learned about their complain about the lost of their fishing tools and even the risk of the boat and their life during the big current and sudden change of water level caused by gate operation. In the old warning system, warning of the gate operation was sent to the township government first and then township government turned the information to the leaders of the fishing village by telephone. Finally, the information reached fishers in boat by cell phone. It would be too late in many occasions. We then talked about the situation and discussion about the solution with leaders and officers from Zhoutian, Wushi and Lishi township government and the hydropower Stations nearby in 2011. Many of them agreed to
set up a direct hot line between hydropower station and the leaders in fishing villages. In 2012, the hot line has been set up between Yizhou Hydropower Station and Lishi Fishing Village, between Mengli Hydropower Station and Kengkou Fishing Village very well. However, the hot line between Xinzhuang Hydropower Station and Zhoutian Fishing Village has not been set up. Although information exchange would happened, fishers in Zhoutian still suffered from the gate operation in some occasions.

b. Communication strategy and tools
To contact township government and hydropower station for our idea exchange and pursuit them to set up the system.

c. Discussion and assessment (1-5) 4
It is not difficult to set up a hot line when every one owns his/her cell phone. The lack of understanding and responsibility was the reason. Our work could only solve the issue about understanding. Two among three of the sampling sites have solved the problem and the situation of the rest one has also been improved. So, we are still satisfied with the situation in general.

2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action
In order to reduce the lost of fishing tool of fishers and risk of life during the gate operation, it is necessary to set up hot line between hydropower station and the fishers in the fishing village nearby. This quick respond system set up for fishers will be able to avoid unnecessary lost during gate operation.

b. Why to use and how to get these indicators
To check the communication systems between hydropower station and fishers.

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)
When we discussed with fishers in these three fishing villages in November, 2012, fishers in Lishi and Kengkou were satisfied with the situation. While fishers in Zoutian felt the improvement of the warning, they still hoped that situation could be further improved.

d. Make suggestions for corrective action if needed
Even the hot line has been set up, the warning time should be long enough for fishers to get back their fishing tools and travel back to shore. According to fishers, it must be more than one hour beforehand.

e. Conclusion and assessment (1-5) 4
The result has been improved by this action. More effort should be paid by hydropower station in order to deliver the warning at least one hour ahead of gate operation.

Other Related Photos

Fig. 52 Discussion with officers from Lishi Township government and Yizhou hydropower station in January, 2011

Fig. 53 Investigation with fishers in Lishi Fishing Village about gate operation in January, 2011
**Action Plan:** 2-8 To strengthen government management organization for fishing communities

1. **Description & reflections on the implementation processes**

   **a. Implementation situation:**

   After we investigated the poor organization situation in the three sampling villages, we held coordination meetings in the Zhoutian, Wushi and Lishi Township Government in early 2012. Representatives of fishers could directly talk with government leaders and officers about the organization problems. Later in 2012, the situation improved. In Zhoutian Fishing Village, government of Renhua County helped them to form an economic organization which got formal registration. The fishers could manage their common property in this organization legally and changed the situation which the subsidy or compensation money for the village had to save in a personal bank account. In Lishi, there is a company for fishing and transportation which opened many years ago (Fig.1). However, the head of this company only earned his own money and not served the fishers in the village. We talked with township leaders about the situation (Fig.2). They now served the fishers through Lishi Township Residential Committee (Fig. 3) for social affairs such as marriage registration, new born baby registration, medical security, elderly pension, government subsidy and government compensation etc. It was also the same situation in the other two fishing villages now. Since fishers leave quite far away from town and also have a very special work and life style which are different from town residents, we suggested forming an independent fishers’ committee. However, the leaders of township government expressed their difficulty that the organization policy for residential committee in urban required at least 100 households. The fishing villages with usually 20-50 households are too small to form an independent one. The organization law for villagers’ committee is for farmers. However, the fishers register as urban resident rather than farmer except those women who grow up in farming villages and marry to a fisher. After the discussion and meeting, we noticed that directors of some residential committee did visit the fishing communities more often then before and could carefully hear the voice of fishers.

   **b. Communication strategy and tools**

   To discuss the organization affair with the three township government and representatives from the sampling villages.

   **c. Discussion and assessment (1-5) 4**

   The organization and management for fishing villages were improved in terms of providing better services. Some economic organizations had also been formed. Due to the organization regulation, independent fishers’ residential committee could not be formed at this stage.

2. **Description and reflections on impacts:**

   **a. Expected impact towards solving the problem provided by each action**

   Fishers are better organized and their voice can be better heard. Township government helps the fishers in the fishing village to have a formal organization with a formal leader. Fisher’s organization formed in the three sampling villages.

   **b. Why to use and how to get these indicators**

   To check the organization of the three fishing villages.

   **c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)**

   Just as stated above in 4.a section, the organization and management for fishing villages were improved in terms of providing better services. Some economic organizations had also been
formed. The fishers were satisfied with this progress in general. Due to the organization regulation, independent fishers’ residential committee could not be formed at this stage.

d. Make suggestions for corrective action if needed
Hope that the organization law for urban resident in 1989 can be amended and become more flexible about the minimum size of households to form an independent residential committee.

e. Conclusion and assessment (1-5) 4
The management and service have been improved. However, independent organization has not been able to form under the present environment.

Reference
The law for organization of urban residential committee, People’s Republic of China (1989)
The law for organization of villagers’ committee, People’s Republic of China (2010)

Other Related Photos

Fig.54 The license for Lishi Fishing and Transportation Company which was issued in 1992

Fig.55 Meeting in Lishi Township Government in April 11, 2012

Fig.56 The Residential Committee in Lishi Township

Fig.57 Discussion in Zhoutian Fishing Village April 12, 2012

3.3 Action Plan 3 -- Long Term New Actions

Action Plan: 3-1 To re-establish food chain and stabilized habitat for aquatic resources

1. Description & reflections on the implementation processes
a. Implementation situation:
This is one of the 6 long-term actions in our project. We found that the government both in central, provincial and local levels have taken correct steps toward this direction. The main steps include:
(1) More restrict control of sand mining activity in rivers: The “Regulation about Sand Mining in River, Guangdong Province (2005)” was amended in July, 2012. It is much clearer about how to manage the sand mining activity after 35 articles were revised.

(2) To begin the no-fishing season along Pearl River from 2011. The “Ministry of Agriculture bulletin about the implementation of no-fishing season in the Pearl River Watershed” (November 17, 2010) opened a chance for aquatic species to recover during the no-fishing season each year.

(3) More attention has been paid to green development in Shaoguan. According to “the 12th Five Year Plan of Shaoguan”, 90% of garbage generated from town and city will be well treated by year 2015. 90% of the solid waste from industry will be reused. 75% of the sewage will be treated by central sewage treatment plans. More than 90% of the water quality in rivers will reach their functional requirement.

b. Communication strategy and tools
To talk with different departments in Shaoguan about the idea.

c. Discussion and assessment (1-5) 4.5
In general, the development direction is right. Some steps already have been taken. We hope that the goal of green development will be carried on in the next few years within the 12th Five Year Plan period.

2. Description and reflections on impacts:
   a. Expected impact towards solving the problem provided by each action
In order to realize the recovery of river ecosystem in Beijiang River, the action will be to stabilize the physical environment, to set up normal aquatic plant communities and to let aquatic animal communities return eventually. The higher biodiversity and biomass in Beijiang River ecosystem will be the result.

   b. Why to use and how to get these indicators
To check the progress of government policy towards the right direction.

   c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)
   Some changes caused by those implemented actions have been described in Action 1 and Action 2 sections. For example, the sand mining activity has got more control now. Sand mining is no longer allowed to operate in some critical parts of the river. More fish fry releasing activities have been organized in Shaoguan in the past three years and public participation on releasing activities has increased.

   d. Make suggestions for corrective action if needed
   We did not see any plan on the recovery of the aquatic plant community so far. And hope that this will be included in their actions in the near future.

   e. Conclusion and assessment (1-5) 4.5
   We satisfied with this long term development direction happening in Shaoguan although some improvement is needed and future implementation will meet some difficulties.

Reference
Regulation about Sand Mining in River, Guangdong Province (2012)
“Ministry of Agriculture bulletin about the implementation of no-fishing season in the Pearl River Watershed” (November 17, 2010)
“the 12th Five Year Plan of Shaoguan”
http://wenku.baidu.com/view/aca412ebaaad1f346933f79.html
**Action Plan:** 3-2 To popularize green production technique in agriculture

1. **Description & reflections on the implementation processes**

   a. **Implementation situation:**

      The action is mainly taken by Shaoguan Agriculture Bureau.


      (2) More resources saving technique have been widely used in Shaoguan. These technique include “Fertilizer application according to soil nutrition test”, “Water saving irrigation”, “Pesticide saving technique” etc.

   b. **Communication strategy and tools**

      To discuss with Shaoguan Agriculture Bureau about this action and give them our suggestions.

   c. **Discussion and assessment** (1-5) 4

      The intention and attempt of government actions is on the right direction. However, the problem lies on how to educate and organize those isolated small farmers. Although some of the advance agriculture enterprises are willing to use green technique, it is hard to make that green technique become a common used technique. More effort should be paid to public education, training, market standard, and farmers’ organization.

2. **Description and reflections on impacts:**

   a. **Expected impact towards solving the problem provided by each action**

      Low carbon and cycling system set up in agriculture sector in Shaoguan. More secured and high quality food produced, better water quality achieved. Cleaner water output and less waste and pollution output from agriculture.

   b. **Why to use and how to get these indicators**

      To check the agricultural statistic data in Shaoguan

   c. **Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result**

      (1) Green food production: There are more than 100 agricultural companies in Shaoguan got “green food”, “organic food” or “safe food” identification for their products. There are 15.9 thousand ha of land involved in this “green production”. It is about 7% of 228.4 thousand ha of cultivated land in Shaoguan.

      (2) Biogas tank in rural area: As stated in Action Plan 1-5, there are 174 thousand (about 1/3) households with more than 800 thousand residents in rural area use their biogas tanks. More than 90 middle (20-100 m³) and big (more than 100 m³) size biogas projects have been implemented. The animal-biogas-crop/fruit recycling systems have been set up in many farms. Shaoguan government subsidized each family biogas tank (8-10 m³) with 800-1500 RMB Yuan. Each small tank can provide enough gas for daily cooking which can save 800 RMB Yuan for commercial energy or 0.3-0.4 ha of forest for firewood.

   d. **Make suggestions for corrective action if needed**

      We would like to see more land devoted to “green production” in the next few years. Some companies already expressed their interest to expand “organic food” and “green food” production in Shaoguan. The market demand for this healthy food is increasing. We also hope that large size biogas tank will become the major form used in rural area because less and less families grow
animals nowadays. Shaoguan Bureau of Agriculture already had a plan to develop large size biogas tank in the next few year. The difficulty will be the organization and coordination of the households in the same village on how to balance the cost and benefit among them.

e. Conclusion and assessment (1-5) 4
The development trend for “green production” is good. However it will face some serious challenge during expansion.

Reference
Development Plan for organic agriculture in Shaoguan” (2011)

Action Plan: 3-3 To set up more sanitary facilities for rural house refuse and domestic sewage

1. Description & reflections on the implementation processes

a. Implementation situation:
This action is to improve the waste disposal system and reduce pollution resources from village sites. This action mainly was taken by Shaoguan Agriculture Bureau, and Shaoguan Bureau of Environment Protection. In the last two years some measures have been taken.
(1) “Action plan for clean and beautiful village in Shaoguan” was announced in June 27, 2012 by Shaoguan Municipal Government. The garbage treatment situation was listed as one of the assessment standard for pushing this work.
(2) According to the 12th Five Year Plan in Shaoguan, 10% of the villages each year will be reformed according to the requirement for clean and beautiful village which includes better road, house, kitchen, lavatory, tap and water, better facilities for cultural and sport activity, sewage treatment, and garbage collection site. There will be 30-40% of the villages reformed in 2015.

b. Communication strategy and tools
To discuss with Shaoguan Agriculture Bureau and Environment Protection Bureau about this action.

c. Discussion and assessment (1-5) 4.5
Good plans and good demonstration sites have set up. It is needed to implement the plans and extend the experience of the demonstration sites in the next few years.

2. Description and reflections on impacts:

a. Expected impact towards solving the problem provided by each action
To greatly reduce the dumping of waste into river without treatment in rural area.
To improve the rural environment and the water quality of the river.
Fewer pollutants can reach the river.

b. Why to use and how to get these indicators
To visit demonstration sites and to check the statistic data.

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)
(1) In Shaoguan suburban area, there were 90% of the townships and 60% of the villages where the garbage treatment system have set up by a system of “collected at family, piled up in village, transferred to town, and treated in each county” since 2009. By the end of 2012, garbage treatment capacity will reach 1000 tons/day.
(2) In Shixing County of Shaoguan, the mode of “collected at family, piled up in village,
transferred to town, and treated in each county” has been implemented all over the county. There are five garbage collection pools in each village. A worker transports the garbage to town at least once a week. They also used artificial wetland and oxidation pond technique for waste water treatment in small town.

(3) It is planned that there will be 50,000 m$^3$ more biogas tank and 25,000 more households using solar heating system by 2015 in Shaoguan.

(4) In 2012, water quality from all drinking water resources in Shaoguan reached drinking water standard. Water samples from all 17 streams reached their functional required standards. Among them, 11 locations reached level 2 standards, 1 location reached level 3 standards.

(5) In 2012, 14 villages were named the “Shaoguan Eco-village” because of their excellent work to improve their environment and reach the standard set by Shaoguan government.

d. Make suggestions for corrective action if needed
Both education and organization are needed to strengthen the waste treatment in rural area.

e. Conclusion and assessment (1-5) 4.5
As a long term action, it already has a good beginning.

Reference
“Action plan for clean and beautiful village in Shaoguan” (June 27, 2012)
http://zwgk.gd.gov.cn/006946219/201206/t20120629_320084.html
http://www.sgepb.gov.cn/hjzl/dbsszzb/

Other Related Photos

![Fig.58](image1.png) The poster about clean and beautiful village in Zhoutian farming village
![Fig.59](image2.png) Zhoutian farming village was one of the demonstration village for clean and beautiful village in Shaoguan

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**Action Plan:** 3-4 To treat the fishers as a special group to guarantee their pension and medical insurance.

1. Description & reflections on the implementation processes

a. Implementation situation:
A proposal on “Improving the Livelihood of Fishers in the Pearl River” which was written by HighARCS China team member was handed to the Guangdong Provincial Political Consultative Conference in early 2011. The major contents in this proposal included (1) to improve social security system for fishers and treat them as a special group, (2) to solve housing issue for them, (3) to have job training for fishers, (4) to improve the management system for fishers and (5) to arrange compensation during no-fishing season.

b. Communication strategy and tools
To make a proposal for the Provincial Political Consultative Conference (PPCC)

c. Discussion and assessment (1-5) 4
It is a good channel to call for the attention from government departments and leaders through the form of proposal to PPCC or to People’s Congress held each year. According to the requirement, government departments have to read and reply those proposals.

2. Description and reflections on impacts:
   a. Expected impact towards solving the problem provided by each action
Fishermen enjoy special preferential treatment as to pension and medical insurance. Fishermen can afford pension and medical insurance. All fishers are covered with minimum pension and medical insurance.

b. Why to use and how to get these indicators
To check the respond from the provincial PPCC and local government.

c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)
A suggestion about compensation for fishers has been accepted by provincial government. The compensation standard increases up to 1100 RMB Yuan per person during the no-fishing season. However, there is no special social security package designed for fishers so far as we proposed. For other suggestions such as housing, job training and management, provincial government and local government in Guangdong Province are more or less doing what we suggested. Situation in Shaoguan are presented in Action 1-9 (social security), Action 1-12 (housing and job training), Action 2-2 (no-fishing compensation) and Action 2-8 (management and organization).

d. Make suggestions for corrective action if needed
It is hard to make special policy for fishers at this stage. We hope that this marginal group will be treated better in the future.

e. Conclusion and assessment (1-5) 4
Most of the suggestions have been actually accepted except to design a special policy for fishers.

Reference
http://szb.sgrb.com/html/2012-03/22/content_4475.htm

Action Plan: 3-5 To improve the current eco-compensation program

1. Description & reflections on the implementation processes
a. Implementation situation:
We found that the hydropower station and sand mining activity caused a serious negative impact on fish community and the livelihood of fishers relied on fishing. Government collected compensation fee from these enterprises. However, no compensation reached the fishers. The compensation fee level was also too low to stop those practices which are harmful to environment and resources. On the one hand, we talked with Shaoguan government departments and enterprizes about the situation. One another hand, we aware that a better design of eco-compensation system is needed in China. It will be a long term goal beyond our project time frame. We worked hard in our research and teaching to push forward this idea. In the 18th Conference of Chinese Communist Party in 2012, the major political report stated that it is
necessary to strengthen the formation of management system for ecological civilization in China. It also stated that this system included the eco-compensation system. In a document announced by the Ministry of Environmental Protection in 2007, the types of eco-compensation which were put forward included compensation for aquatic environment in a watershed level. In 2010, ecological compensation systems in several watersheds in Guangdong began to set up and entered an experimental stage.

b. Communication strategy and tools
To review the present eco-compensation system with various departments of Shaoguan government, and proposed our suggestions.
To look for the progress in other parts of China and introduce them to the research area.

c. Discussion and assessment (1-5) 3
The setting up of a new eco-compensation system will go through a long way. Both top-down design and bottom up trial should be put into practice together. The action is far from finish.

2. Description and reflections on impacts:
a. Expected impact towards solving the problem provided by each action
It is expect to set up formal eco-compensation system in order to internalize the externalized benefit of those human actions which are good and sound for the environment.
To improve the eco-compensation system into a more formal way in the region.
b. Why to use and how to get these indicators
A set of compensation regulations which includes the collection of money and the distribution of those money, are proposed.
c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)
The compensation for no-fishing season could be considered as the first step of eco-compensation for fishers. It is 1100 RMB Yuan for each person during the no-fishing season. We hope that a better designed system will appear in the near future.
d. Make suggestions for corrective action if needed
Experience elsewhere should be learned by Shaoguan and Guangdong government before we set up our own system.
e. Conclusion and assessment (1-5) 3
The eco-compensation system design for aquatic system is on its way now. There is still a long way to go.

Reference
Luo Shiming etc, 2010, Report on Highland Aquatic Ecosystem Services and Biodiverstiy Values in Beijiang River, China. (China site report for WP3 of HighARCS)
广东试点生态补偿，新快报，2010 年 6 月 5 日第A13 版 http://www.ycwb.com/ePaper/xkb/html/2010-06/05/content_845552.htm

Action Plan: 3-6 To revise two critical laws related to aquatic resources

1. Description & reflections on the implementation processes
a. Implementation situation:
We find that there is a flaw in the environmental assessment law. On one hand it requires that any
project has to conduct an environment assessment before it is put into operation. On another hand, it states that any project which under construction without environment assessment, must be stopped and finished the assessment before it can be put into operation again. It caused a lot of projects put into operation before having their environment assessments. The laws related with wild life protection in China pay great attention to those endangered species. However, there is no statement related to the protection of economically important species. The amendment of these two law systems is important. In China, these two laws can only be revised in National People’s Congress. So, we are looking for chance to discuss with influential persons related to this field in many occasions. However, it is hard to revise them within the project period. It is why this action is put into the long term action list.

b. Communication strategy and tools
To contact more law people to discuss the weakness of the present laws. And to make an amendment proposal to the people's congress eventually.

c. Discussion and assessment (1-5) 2
It is important to change the laws which related to the regulation of the behavior of legal person. The action is still in its preliminary stage.

2. Description and reflections on impacts:
a. Expected impact towards solving the problem provided by each action
To coordinate better the economic development with environment conservation.
The enforcement of the implementation of environmental assessment will be strengthened.
The protection of aquatic species and their habitat will be improved.
b. Why to use and how to get these indicators
The laws related to this action have not been revised yet. However discussion about the conflict caused by the flaws existed has been happened in many formal and informal meetings among legal experts.
c. Change of Indicators resulting from the action and discussion of the efficacy of the action in the light of this result (impact of action)
No change has happened yet for the laws mentioned above. However, the implementation of environmental assessment beforehand has been tightened because of the public awareness of environmental quality and ecological safety in recent years.
d. Make suggestions for corrective action if needed
To continue the effort after the project.
e. Conclusion and assessment (1-5) 2
Effort has been put forward towards the revision of the related laws.

Reference
4. Summary of findings, next steps and recommendations

4.1 General common on the results

There are 26 actions proposed in China site (Table 16). They have all been carried out for implementation from 2011 to 2013 within HighARCS project. The result which summarized in Table 6.1 indicated that 7 actions were implemented very well (score 4-5) and reached all the goals designed (score 5), 15 actions were implemented quite well (score 4) and most of the anticipated results have been achieved (score 4), 3 actions were partly implemented (score 3) and could only meet part of the set goals (score 3), 1 action has not been carried out very well (score 2) and the goal has not achieved (score 2).

<table>
<thead>
<tr>
<th>Actions</th>
<th>Imple.</th>
<th>Result</th>
<th>Common</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development strategy in Shaoguan will follow the national ecological planning.</td>
<td>4.0</td>
<td>5.0</td>
<td>The strategy stated in the 12th five year planning is very good. It needs to be fully implemented in the next few years.</td>
</tr>
<tr>
<td>to protect and expand forest cover in Shaoguan</td>
<td>4.0</td>
<td>4.0</td>
<td>Great effort has been used to increase forest cover in Shaoguan. It should be continued in the future.</td>
</tr>
<tr>
<td>improvement of aquatic conservation zones</td>
<td>3.0</td>
<td>3.0</td>
<td>More formal management system should be set up and the conservation measures should be strictly implemented.</td>
</tr>
<tr>
<td>to control water pollution from industry sector</td>
<td>5.0</td>
<td>4.0</td>
<td>It is not that easy for the city with many old heavy industries. However pollution has become a public concerned topic. It will help to push forward the action.</td>
</tr>
<tr>
<td>to increase biogas and renewable energy resources in rural area</td>
<td>5.0</td>
<td>4.0</td>
<td>Collective owned biogas tank larger than 20 m³ will be the major type in the next stage. Solar water heating will have a great potential for development.</td>
</tr>
<tr>
<td>to release fish fry</td>
<td>5.0</td>
<td>5.0</td>
<td>More high value species should be considered in the future.</td>
</tr>
<tr>
<td>to stop cage culture for fish in reservoirs</td>
<td>5.0</td>
<td>5.0</td>
<td>It has been well controlled now.</td>
</tr>
<tr>
<td>to have better management of sand mining activity</td>
<td>4.0</td>
<td>4.0</td>
<td>It has been improved. However, sand mining should totally be prevented in conservation sections.</td>
</tr>
<tr>
<td>to continue government subsidy for fishers</td>
<td>3.0</td>
<td>4.0</td>
<td>It refers to elderly security and medical security system. There is a lot for improvement in the future.</td>
</tr>
<tr>
<td>to continue the subsidy policy for diesel price</td>
<td>5.0</td>
<td>5.0</td>
<td>It should continue.</td>
</tr>
<tr>
<td>to continue 9 year compulsory education program</td>
<td>5.0</td>
<td>5.0</td>
<td>It is well done and should continue.</td>
</tr>
<tr>
<td>to continue provide low rent house and job training for fishers</td>
<td>4.0</td>
<td>4.0</td>
<td>Only those fishers living within urban Shaoguan got low rent houses so far. It is hope that more fishers can have that chance in the future.</td>
</tr>
<tr>
<td>to increase financial resources for protection and conservation of aquatic resources</td>
<td>4.0</td>
<td>4.0</td>
<td>Financial resources both from government budget and the public donation should increase in the future.</td>
</tr>
<tr>
<td>to implement the no fishing season from 2011</td>
<td>5.0</td>
<td>5.0</td>
<td>It had a good beginning from 2011. It will be continue in the future.</td>
</tr>
</tbody>
</table>
After many years of rapid economic development in China, the conflict between economic development and resources conservation/environment protection has become a major concern both by the public and Chinese government. Financial situation of Guangdong Government is also good enough to take care of the necessary input for environmental protection and resources conservation. The sustainable development approach has become a common recognized direction for the future development in China. This is why the actions were generally implemented well in China site. However the relatively tight financial situation in Shaoguan which located in a poor mountainous region and the bureaucracy existed in government departments were the two major obstacles which prevented the fully implementation of all action plans and to reach all goals designed.

For the first category of the actions which were already taken by government before HighARCS,
they were generally carried out continuously in 2011-2013 and got good results. Only the improvement of aquatic conservation zones was not done very well due to the difficulties in (1) increasing financial support and human resources support at this stage, and (2) the communication among government departments. For the second category of the actions which were designed by HighARCS were also implemented very well and reached the goals. The only exception was Action 2-4 which aimed at the reduction of water pollution in rural area. The amount of chemical fertilizer and pesticide used was still increasing in the past few years. It is also the situation in Guangdong Province and China as well. The transition from high dosage of chemical use to low chemical use pattern in agriculture is not very easy; especially the food demand pressure from 1.3 billion populations in China is very high. Actually this action should be considered as a long term action and listed in category three. For the third category of the 6 actions which were considered as long term actions, 4 of them had a good start and 2 of them have not been carried out very well yet. The improvement of eco-compensation system (Action 3-5) not only relates to the economic situation in Shaoguan, but also the whole eco-compensation system design in China. It needs money and time. The revision of “Environment Assessment Law” and “Wild Life Protection Law” (Action 3-6) have to go through a long process including lobbying, bargaining and coordination among different stakeholders and government departments in national level. We can only call for the attention to the flaws exited in these two laws.

4.2 The measures worthwhile to continue in next stage and use in other regions

The experience gained from the implementation of these actions will benefit the future aquatic resources conservation and sustainable use in Shaoguan. Most of these actions designed in HighARCS should continue in the future not only in the upper reach of Beijiang River, but also in the whole Pearl River watershed. The measures taken can be summarized as follow.

1. To protect and conserve aquatic resources by (1) direct actions such as setting aquatic species conservation zones, no-fishing season, and fish fry releasing, (2) improve aquatic environment by reducing pollution from both point sources pollution from urban region and non-point sources pollution from rural area, and better vegetation coverage with diversified local species in the whole watershed area, (3) better control of industrial activities in the river systems including dam construction, sand mining activity, and large scale cage fish culture (net box method), and (4) better control of fishing activity such as the elimination of using electricity method or explosion method to kill fish, the requirement of fishing license for legal fishing activity.

2. To improve the livelihood of fishers by (1) government support for the improvement of housing and other infrastructures such as road, communication and electricity and tap water supply system; (2) government supported free compulsory education program for children, (3) government welfare program for the poor, sickness and elderly extended to fishers in a more convenient way, (4) government subsidy for the increasing price of diesel and other necessary material for fishing,(5) strengthening the organization of fishing community and let their voice be heard by government and the society in general.

3. To improve management and related policy and law by (1) more education for the officers and the public about the real situation, (2) setting up coordination mechanisms among different departments of government to due with complex situation faced and conflicts among stakeholders, (3) long term regional planning and economic development strategy designed, (4)
eco-compensation system design and necessary financial support for the implementation of actions, (5) the review of existing laws/regulations and the changes of those which are contradiction to the principles of sustainable development.

4.3 The role of project researchers in the action plan

The role of the project researchers in action plan depended on many factors which included the composition of disciplines, the experience and the communication ability of team. It also depended on the relationship between researchers and stakeholders, and on the nature of each action.

1. The role of team members played in implementation

Researchers played a key role for the initiation and compilation of action plans. During the development of action plan, the communication between team members and stakeholders were critical. We listened carefully from different people for their complaint, hopes, difficulties, potential, ability and experience. We also have to consider the scope and the need of the general goal of the project. It is why we finally divided actions into three categories, e.g. actions underway already, short term new actions and long term new actions.

Researchers encouraged and pushed those good practices to be carried out continuously. It is especially true for the actions in the first category which were already tried or planned to do before. Through discussion, symposium, slide show and exchange among stakeholders, we gave a strong positive message to the stakeholders in charge of those actions. Most of these actions were actually implemented as we hoped.

Researchers designed most of the actions in the second and third category such as Action 2-3 to reduce water pollution from iron ore mining, Action 2-7 to notice the fishers about the water gate operation by hydropower stations on time, Action 3-1 to re-establish food chain and stabilized habitat for aquatic resources.

Researchers not only facilitated the implementation, but also took charge of implementation of some actions. In order to implement action 2-3, we went to the iron ore washing site in Kengkou Fishing Village to take water samples, test the chemical property of those samples, report the result to local government and the Bureau of Environmental Protection, and proposed our suggestion of measures which should be taken. In Action 2-6 to have more public educational activities, we made slides, hosted stakeholder meetings and symposium, met with reporters from newspaper, broadcast station and television, and designed poster and ruler for flagship species. In Action 2-1 to increase financial resources for protection and conservation of aquatic resources and Action 3-4 o treat the fishers as a special group to guarantee their pension and medical insurance, we wrote proposals for Guangdong Provincial Political Consultative Conference.

However, the boundary and limits of our role was clear. We could not replace the key role of government in policy design, social management and plan execution. We also could not replace the role of enterprises, farms and farmers to follow the principle of green production.

2. The approaches used in assessment

HighARCS team members played a key role in the assessment of action plan. Different methods have been adopted. We motivated stakeholders and discussed with them about the indicators of each action and finalized a set of indicators for the assessment of those actions. We got first hand information through site visit. We went to typical forests, farming villages, sewage treatment plants, fishing villages, hydropower stations, and iron ore washing sites to get the true results of those actions. We conducted some measurement, got samples, took pictures, and talked with
stakeholders at the sites. We collected first hand data from the three fishing villages in order to know the change of livelihood situation. We collected large number of government statistic data to chase the change of important indicators in the society. We also collected data from Shaoguan Fishing Monitory Team for the fishing records from the 12 fixed sampling boats and conducted data analysis. To have interview with different stakeholders was an important method to know weather and how much they were satisfied with the results of those actions.

3. Experience gained during implementation and assessment.
In order to have an ideal result, good planning, well organization and hard work are the key elements. However, the following two points are considered important for this project which links with many scientific disciplines and many stakeholders.

(1) The organization of the research team
The well designed and selection of team members in the research is critical. We have 18 faculty members and about 15 students participated in the research. In order to cover the fields of the project, they come from different disciplines which include ecology, geology, agronomy, fishery, plant science, entomology, economy, and law. The core members of the team are good scientists with rich experience in field work and in management position. There are 6 professors and 6 associate professors in the team. They are willing to cooperate, communicate and share with others. They also would like to take the responsibility. Young scientists and students not only took a lot of detail work, but also leaned a lot through the cooperation.

(2) The relationship between team members and stakeholders
The attitude of researcher is crucial. We carefully avoid the situation that the stakeholders felt a top-down pressure. We considered an equal position with all stakeholders when we had our contacts. We have one advantage that many officers in Shaoguan Municipal Government are alumni of South China Agricultural University. They fully cooperated with us and gave us a lot of helps. In China, university professors also enjoy high reputation in the society in general. So, people would usually like to share with us about their understanding and feeling. Only one exception is the relationship with sand mining companies. Although we contacted them in meetings, we could feel that they avoided individual direct contact with us. We realized later that some of those sand mining companies bribed government officers in order to give their permit and mining licenses. One Vice Director of Shaoguan Water Management Bureau was put on jail because of corruption in 2012.

Acknowledgment
We would like to thank many stakeholders in Shaoguan to help us for implementation and assessment of the action plan. They included officers from many bureaus and departments of Shaoguan Municipal Government, fishers and their families from Kengkou, Lishi and Zhoutian fishing villages, company leaders from many factories, and farmers in Zhoutian Village. We also like to thank the graduate and under graduate students from South China Agricultural University, who helped us a lot in getting first hand information from fishing village and fields... The HighARCS experts gave us a lot of advise and help, otherwise it is impossible to have a report like this. We would like to thank Dr. Søren Lund from Roskilde University, and Denmark and Dr. Kevin Smith from IUCN, UK that they gave us good suggestion for the revision of this report.
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45. http://roll.sohu.com/2012/02/20/n335294992.shtml
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1. **Sources: August 27, 2011, China News**


   **Title**: Experts of aquatic resources from EU conducted an investigation in Beijiang River and were satisfied with the fishery releasing activity
中新网韶关 8 月 27 日电(记者 李凌)由国际自然保护联盟和国际渔业信息与研究小组以及来自英国、丹麦、菲律宾、印度、越南五个国家共 22 名专家学者组成的欧盟国际水域资源合作项目考察团，27 日对广东北江流域韶关段进行考察。

当日下午，考察团 22 名成员在华南农业大学骆世明教授、蔡昆争教授等中国学者的带领下，到韶关市休渔放生平台参观北江水生物展览馆。广东省渔政总队韶关支队李成忠队长向考察团成员详细介绍了北江流域韶关段的各个鱼类保护区，以及保护区内控制污染、控制捕捞和严禁采砂等措施。

下午 16 时 30 分，考察团 22 名成员兴致勃勃地与当地民众现场放生了近 4000 尾鱼。

来自英国 Essex 大学的 Stuart 教授称赞北江流域韶关段的水生资源保护区比较多、而且水质清澈，特别是休渔放生平台理念先进、条件完善，这对于我们国家对保护和增值水生资源提供了有益的借鉴和参考。

据华南农业大学蔡昆争教授介绍，欧盟国际水域资源合作项目考察团主要是研究印度、越南和中国等国家典型水域资源的保护与可持续利用问题。而北江流域的韶关段，是此项目中国的主要研究区域。

蔡昆争表示，此次欧盟国际合作项目考察团对中国水域的主要研究对象是珠江，而北江流域是珠江的上游，所以考察团特地安排了两天时间，将先后对韶关段的渔村、鱼类保护区、水电站以及渔民的生活现状进行考察，目的是了解北江水域资源利用和保护的实际情况以及当地政府的行动和经验。

2. Sources: November 4, 2009 China First Food News
www.foods1.com/content/8651... 2013-1-17

Title: Experts from EU Project “Highland Aquatic Resources Protection ans Sustainable Developement” investigated Beijiang River in Shaoguan Guangdong
3. Sources: August 28, 2011, Guangdong News

Title: EU experts of aquatic resources conducted an investigation in Beijiang River Watershed

4. Sources: August 28, 2011 Shaoguan Daily

Title: Investigation on Aquatic Resources Protection and Utilization

考察水资源利用保护
韶关日报记者 曹智辉 摄影报道

图为考察团成员参与了当天举行的放生活动。
本报讯 昨日下午，由英国 Essex 大学、国际自然保护联盟、丹麦 Roskilde 大学、国际渔业信息与研究小组的 Maan 等 22 位国外有关人士组成的欧盟国际合作项目考察团，在华南农业大学教授的陪同下来韶，考察北江水域资源的保护与可持续利用，并到市休渔平台参观和参加放生活动。

据了解，欧盟国际合作项目“河流上游水域资源的保护与可持续利用”，主要研究印度、越南和中国几个发展中国家典型水域的保护与可持续利用问题。我市浈江、武江河段作为北江的上游，水域资源的利用和保护工作成为考察团重点考察了解区域。

5. Sources: August 30, 2011, DanXia UNESCO Natural Heritage Site
http://www.danxiashan.org.cn/new/article.asp?id=2991

Title: Experts of EU International Project highly appreciated the UN Natural Heritage Site – Sanxia Landscape

欧盟国际合作项目专家盛赞丹霞山水

近日，来自“河流上流水域资源的保护与可持续利用”欧盟国际合作项目的会议考察组专家莅临世界自然遗产丹霞山考察，考察团成员包括来自英国、丹麦、菲律宾、印度、越南等 27 名国内外专家。考察团一行先后参观游览了阳元山和长老峰游览区，鬼斧神工般的阳元
考察团在感受丹霞山峰丛林的绚丽奇特的同时，也称赞景区的自然生态保护得很好，对此次旅程给予了高度的评价。大家纷纷表示要将中国这处丹霞地貌命名地推荐给同事、朋友和学生们，让他们到丹霞山观光度假、考察学习。

通讯员：徐雪、梁国敏

6. Sources: October 11, 2009 Guangdong Fishery Monitory Team News
http://www.gdyzhj.gov.cn/

Title: Investigation team of the EU project “Highland Aquatic Resources Protection and Sustainable Development” visited Shaoguan

本月 19 日，由英国 Stirling 大学 Sanamtha 教授、菲律宾鱼类资源信息研究所的 Maan 博士、华南农业大学农学院蔡昆争副教授及研究生李祥意组成的“北江流域水生生物资源的保护与利用”考察组来韶进行考察研究。

在李成忠支队长的陪同下，考察组一行对北江流域鱼类资源的保护、增殖与利用的情况进行了详细的了解，并深入渔村对渔民的生产生活情况进行调研，与渔民召开座谈会，细致询问了捕捞生产、渔获量、居住、子女教育等情况，并了解了拦河坝、水电站及采砂对渔民生产生活的影响。

在韶关休渔放生平台和北江水生生物资源展览馆参观后，两位外国专家高度赞扬了韶关水生生物资源保护的做法，认为这是非常好的环境保护范例，并勉励韶关支队要继续保持下去。考察组一行还表示，会更加密切关注韶关渔民的情况，争取社会各界支持，努力寻求各种积极措施来改善渔民的生产生活问题。

（Sanamtha 教授、Maan 博士、蔡昆争副教授查看鱼网）
Title: EU investigation team visited Beijiang fishery releasing activity

7. Sources: September 1, 2011 Guangdong Fishery Monitory Team News
http://www.gdyzhj.gov.cn/yz/enforcing_law/content-2.jsp?id=18036
8. Sources: August 29, 2011 Guangdong Fishery Monitoring Team News
http://www.gdyzhj.gov.cn/yz/enforcing_law/content-2.jsp?id=17989

Title: EU aquatic resources experts visited Beijiang and they praised the protection work for fishery resources
9. Sources: Oct. 12, 2010 Guangdong Fishery Monitory Team News
http://www.gdyzhj.gov.cn/yz/enforcing_law/content-2.jsp?id=9456

Title: Shaoguan Fishery Monitory Team helped the investigation team of EU project on Beijiang aquatic resources protection and sustainable development to enter fishing villages for detail investigation.

10. Resources: November 19, 2009 Guangdong Fishery Monitory Team News
http://www.gdyzhj.gov.cn/yz/enforcing_law/content-2.jsp?id=9228

Title: Investigation team of EU project visited Shaoguan for further investigation and research
Attachment 2. Selected News in South China Agricultural University about HighARCS

1. Published in June 15, 2009

Title: Faculty members of South China Agricultural University joined the training activity of IUCN conducted in India

我校教师参加印度举行的国际自然保护联盟物种培训会议

2009 年 6 月 5 日至 10 日我校参加欧盟国际合作项目“河流上游水生生物资源保护与可持续发展”的 6 位老师（农学院的蔡昆争，林学院的庄雪影，资源环境学院的童晓立，动物科学学院的赵会宏，崔科，付京花）参加了在印度加尔各答举行的水生生物物种评价的培训会议。参加会议的其他人员分别来自国际自然保护联盟 IUCN（5 人）、英国 UEssex 大学（2 人）、丹麦 Roskilde 大学（2 人）、印度（10 人）、越南（2 人）等。来自国际自然保护联盟（IUCN）的专家介绍了有关培训内容。主要培训了如何运用 IUCN 的标准方法（Red list）进行物种的评价，如何用 GIS 软件制作物种分布图，以及如何将评价的物种列入 IUCN 物种信息数据库。我校教师也利用自己带去的资料进行了物种评价，与英国 UEssex 大学、国家自然保护联盟、丹麦、印度及越南等有关人员进行了讨论，增进友谊。本次会议学习和掌握了按照 IUCN 的标准方法进行水生生物物种评价的方法及步骤，了解了下一步项目的工作安排情况，也为后面在中国举办类似会议积累了经验。会议期间参观了加尔各答的一个湿地污水处理系统，他们尽量利用自然处理，大大减少成本。
（蔡昆争，2009.6.15）

欧盟国际合作项目简介:

欧盟资助的国际合作项目“河流上游水生生物资源保护与可持续发展”由 University of Essex 的 Stuart Bunting 博士主持。项目组包括来自英国的 University of Essex、University of Stirling、丹麦的 Roskelde University、瑞士的国际自然保护联盟、菲律宾的鱼类资源信息与研究中心、越南水产研究所等、印度 3 个单位及华南农业大学共 10 个单位参与。该项目从 2009 年 1 月开始，到 2012 年 12 月结束。整个项目将分别对中国的珠江流域（Pearl）、越南的红河流域（Red river）、印度的恒河流域（Ganges）进行水生生物物种的调查与评价，流域生物多样性和生态系统服务功能的评价、人类活动（工业、农业、生产活动等）对流域水生生物资源和水生态系统影响等进行研究，最后分别从管理、立法、经济、公众参与等多种途径对流域水生生物资源及生态系统的保护及可持续利用提出具体的措施。中方由我校农业部生态农业重点实验室主任骆世明教授负责，参加人员分别来自农学院、资源环境学院、林学院、动物科学学院、人文与法学学院和经济贸易学院多个学科。

2. Published in October 23, 2009

Title: The Training Activity of EU international cooperation project in SCAU campus

欧盟国际合作项目培训会议在我校举行

撰写时间: 2009-10-23  作者:  来源: 农学院
10 月 16 日至 18 日，由我校农业部生态农业重点开放实验室骆世明教授主持的欧盟国际合作项目“珠江上游水生生物资源保护与可持续发展”的课题培训会议在我校举行，来自英国、丹麦、菲律宾的四位专家完成越南的培训后，特地到广州开展中国部分的培训。来自农学院、资源环境学院、林学院、动物科学学院、人文与法学学院和经济贸易学院多个跨学科的教师和研究生共 30 多人参加培训会议。会议期间，我校党委书记李大胜会见了课题组部分专家。

2009-2012 年的这个欧盟项目将对珠江流域上游的水生生物物种的多样性和生态系统服务功能进行评价、了解人类活动的影响，并从管理、立法、经济、公众参与等多种途径对流域水生生物资源及生态系统的保护及可持续利用提出具体的措施。

本次培训会议的主题是“参与式、性别、年龄、生计分析与水生资源的保护与利用”。来自英国 Essex 大学的 Sarah Pilgrim 博士介绍了课题的设计思路和以及各个阶段的目标要求，丹麦 Roskilde 大学的 Soren Lund 博士介绍了参与式的概念、理论以及在有关研究课题实践中的应用，英国 Stirling 大学的 Samantha Punch 博士从社会和经济的角度介绍了不同性别、年龄、生计等在经济生活的作用及分析方法，特别强调妇女和儿童在资源利用与保护中的作用，菲律宾渔业资源信息研究所的 Maan Bimbao 博士对如何进行课题的管理、宣传等方面做了介绍。

培训会议为进一步研究珠江上游（北江流域）水生生物资源如何影响渔民的生计以及妇女、儿童在其中的作用和影响提供了指导。培训会议所采用的大量参与式教学方法不但对课题研究有较好的指导作用，而且对日常教师的教学方法提供很好的借鉴作用。根据项目安排，2010 年 3 月欧洲的专家还将来校对生态系统的服务功能评价的方法方面进行培训。

（文/蔡昆争  图/林伟鹏）

3. Published in September 1, 2011
Title: Steering Committee Meeting of EU international cooperation project
“Highland Aquatic Resources Protection and Sustainable Development” held in SCAU
欧盟国际合作项目“河流上游水生生物资源保护与可持续发展”协调会在我校召开

撰写时间: 2011-09-01  作者:  来源:

8月25日至28日，由我校农业部热带农业环境区域重点实验室主任骆世明教授参与的欧盟大型国际合作项目“河流上游水生生物资源保护与可持续发展”（HighARCS）的项目协调会议在我校召开。来自英国Essex大学和Stirling大学及国际自然保护联盟、丹麦Roskilde大学、菲律宾国际渔业资源与信息研究中心、印度环境研究与湿地管理研究所、越南第一水产研究所等5个国家22位国外专家及我校农学院、资源环境学院、林学院、动物科学学院、人文与法学学院和经济贸易学院跨学科的教师和研究生共40多人参加了会议。廖明副校长、农学院王建武院长出席了协调会的开幕式。
该欧盟国际合作项目的研究目的是了解亚洲发展中国家水域资源的利用现状和可持续利用问题，了解渔民的生活状况和面临的挑战，通过参与式的方法提出一套有利于资源保护和可持续利用的方法和政策，积极推动有关行动方案，跟踪执行效果。此项目已先后在英国、印度、越南召开过项目协调会议。
韶关放生活动

8月25-26日，来自中国、越南、印度的研究小组分别从水域生物多样性保护及生态系统服务功能的评价、渔民生计改善、相关法律及政策等方面汇报了各自研究水域生态系统的近期进展，来自英国、丹麦、菲律宾的专家分别从项目各个阶段的目标要求、阶段性报告的撰写、项目网页的维护更新、课题的管理、宣传等方面作了介绍。中国项目组在执行国家中进展最快、最好，提出下一段面临的挑战和应当采取的措施比较准确，给与会专家留下了深刻印象。

8月27-28日，项目组还到韶关北江段实地考察了当地的渔村、水电站，参观了韶关市政府为渔民上岸定居建造的安置房，了解渔民上岸定居和就业情况，参观鱼苗放生平台并参与放生工作。与水利局、水产局、环保局、渔业支队、农业局有关负责人开展座谈，了解有关河流资源利用、水质保护、鱼类资源利用与保护、渔民生活等问题。对中国当地政府为保护生物多样性、改善渔民生计方面做出的多方面努力表示赞赏。会议的召开为未来两年研究印度、越南和中国典型河流上游水生生物资源在生物多样性及生态服务、渔民生计及有关法律政策方面的行动计划等方面奠定了基础。（文图/农学院）

（责任编辑：方玮）
Section 3 : Site report from Nainital, Uttarakhand, India
IMPLEMENTATION OF THE ACTION PLANS OF
UTTARAKAHAND
NANITAL-BHIMTAL-NAUKUCHIATAL LAKE

DR. NITAI KUNDU
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I. Introduction

Highland Aquatic Resources Conservation and Sustainable Development or HighARCS aims to develop an understanding of the importance of aquatic resources in highland areas of Asia. It is focused on the highland aquatic resources and their functionality, management, exploitation, and their conservation at five sites in Asia, that is, Guangdong, China; Uttarakhand and West Bengal, India; and Northern and Central Vietnam. This study is focused on the Nainital lake system in Nainital District of Uttarakhand, India (Figure 1).

Figure 1. Location of the HighARCS project site in Nainital, Uttarakhand, India.

In phase 1, this study undertook a situation analysis to identify the site and management issue, then in phase 2 pursued the integrated approach (toolkit) to collate data on biodiversity, livelihood and institutions, policy & conflict. This document is the Integrated Action Plan (IAP) which aims to identify the needs and deficiencies of the different conservation, livelihood and policy issues in these communities and then to develop an integrated action plan focusing on these aspects.
Situated in the Kumaon foothills of the outer Himalayas and blessed with scenic natural splendor & varied natural resources, **Nainital** is ideally ‘a glittering jewel in the Himalayan necklace’. Nainital, the 'Lake District of India', possesses more than hundred of lakes amid them some are the exquisite beautiful lakes in India and attracts hundreds of domestic and foreign tourists every year. Although few among them are already dried up (we came to know this information by discussing with the local people). Few lakes attract tourists more than others due to their scenic beauty, easy accessibility and resource availability to becoming a tourist place. Nainital, Bhimtal, Naukuchiatatal lakes are the three most important water bodies in Nainital in terms of environment importance, tourist attraction as well as income and livelihood generation of the local people. These lakes have its importance in the socio-economic and cultural life of the people in the region and have varied uses from tourism, potable water, irrigation, and to fisheries in some cases. The livelihood of the most of the people, specially marginalized people living in the villages adjacent to these lakes are mostly dependent on these lakes. In the past, this area had plentiful aquatic resources and these aquatic resources and associated ecosystem services used to provide great benefits to people living there but there is little information on the present situation. But no detailed and comprehensive study has been conducted to understand the present status of biodiversity in the lake system and the dependence of the local people on these resources for their livelihood activities. This is the main reason why a study was undertaken at the start of the HighARCS project which focuses on the aquatic resources and the livelihood of the people in these areas (see Work package 3 and Work package 4, for further details).

In HighARCS project, Action Planning is the nub. By means, Action Planning involves stakeholders in joint appraisal and decision-making with respect to highland aquatic resources planning and management. Three elements of action planning consist of conservation, livelihoods and policy issues, however instead of organizing action planning separately for conservation, livelihoods and policy concerns; it was decided to adopt an Integrated Action Planning approach because they (conservation, livelihoods and policy) are all inter-related concerns (problems and solution) and it’s impractical to hold separate planning activities (on conservation, livelihoods and policy) with the same group of stakeholders. This Integrated
Action Planning approach seeks to point out apparent conservation, livelihoods and policy requirements and paucities; appraise anticipated actions with respect to possible depressing effects on conservation and livelihoods or conflicts with policy and existing management provision appraise; recognize suitable indicators applicable to conservation, livelihoods and policy for scientific and partaking supervision and assessment of impacts of Integrated Action Plans (IAPs); choose final action plans with regard to stakeholders’ priority, viability and worth and wise-use of wetlands.

The approach adopted for this study is based on facilitating the interactive participation of communities and stakeholders who utilize these resources and associated ecosystem services. The different stakeholders such as the boat drivers, fishers, tourists, small shop and restaurant owners are dependent on these lakes’ ecosystem and associated services and apart from this, there are various non-use values attached to the lakes. In our study, we have not included stakeholders related to spiritual interest and the reason behind this is that though Uttarakhand is commonly known as ‘Dev Bhoomi’ because of its religious significance but tourists generally visit our field sites i.e. Nainital, Bhimtal and Naukuchiatel to enjoy its natural scenic beauty. Though it is also true that there they do visit the places of religious interests but it is not generally the main reason behind their trip to HighARCS sites. The livelihood activities in this region with respect to aquatic resource use and tourism industry, can be characterized into three types: directly dependent on aquatic resources (such as boating, fishing, agriculture etc), indirectly dependent on aquatic resources (such as hotels, resorts, restaurant owners etc), and not dependent on the lakes but are dependent on the tourism economy (such as travel agents, local site seeing services, tourist guides, photographers, car repairing, rickshaw pulling etc). These groups of people are dependent on the lakes (directly or indirectly) and the tourism industry to earn their living and make the most use of aquatic resources i.e. they are the ones who mostly influence the lakes (positively/negatively) and are affected by any changes in the lake. For example, tourists have both positive and negative impacts on biodiversity, supply of ecosystem services, as well as on the livelihoods of local communities. Positive effects associated with tourism development include: creation of job opportunities for unskilled, semiskilled and skilled workers; improvement in infrastructure, local arts and crafts, regional
development and standard of living; encouragement of ecological awareness and conservation pollution control measures. Negative impacts attributed to tourism include pollution (throwaway mentality, congestion, hygiene problem, waste water from hotels or restaurants seeping into the lake water etc), destruction of forests for energy, eradication of fauna due to poaching and degradation of grazing lands due to camping activities.

II. Presentation of the main actions and impacts targeted

Any Action Plan which aims to conserve and manage biodiversity along with fulfilling and improving local community interests and livelihoods must combine biodiversity and ecosystem service values, livelihoods and institutions, policy and conflict issues and thereby take an integrated approach. For meeting this requirement a detailed study of the relevant reports, i.e. Biodiversity and ecosystem service values of Nainital, Uttarakhand; Livelihood Report, Uttarakhand Site, India; Institutions, Policy and Conflict, Uttarakhand Site, India; was done and this helped us to understand the issues of aquatic resources conservation and the conflicts for sustainable development more deeply.

In the HighARCS project, the freshwater biodiversity and ecosystem services at the HighARCS site, which may aid in evaluation of the ecological attributes of the wetlands, that is the lakes, were recognized and valued, i.e., studied closely. Since these wetlands comprise a vital source of livelihood for the people, a study has been carried out on the basis of the apparent necessity to preserve these wetlands. This however has to be done in a way which will balance the livelihood of the people as well as the lakes’ biodiversity. The different Governmental Institutions which are at work and the policies formulated by them for the conservation of the lakes have been evaluated. This includes both policies on biodiversity conservation and livelihood enhancement. On the basis of these three reports the Integrated Action Plan report has to be done which includes notable aspects of needs and deficiencies, conflicts of biodiversity conservation, livelihood development within an integrated policy framework.

The need for an integrated assessment and planning approach was highlighted in Figure 2 which shows the amalgamation of conservation, livelihoods and policy-based approaches.
These three strands have been combined because the livelihoods of people are dependent on biodiversity and both biodiversity and livelihoods must be protected by a policy approach. Hence with this integrated view an Integrated Action Plan has to be formulated where the three interdependent issues of needs and deficiencies, conflicts or negative impacts and indicators have been combined together (Figure 2).
project, conducted field visits, collected data, gathered information about these wetland related livelihoods and biological resources from secondary sources. Listed out direct and indirect stakeholders through the analysis of focus group interview and wetland sites, selected sample villages, i.e. Nainital, Chanoti and Pandeygaon on the basis of the place of residence of the families engaged in different types of activities associated with these wetlands. Arranged meetings and workshop with the stakeholders to discuss situation and management issues and adopted the stakeholder Delphi method to structure the joint identification and assessment of problems and management issues affecting the full range of stakeholders associated with the lakes in the study site.

In the selected locations chosen as field sites, the informal focus group interviews were conducted in the villages situated near to the lakes. On the basis of these informal focus group interviews, a detailed discussion with the stakeholders was carried out. For more in depth study, a detailed household survey was carried out in a minimum of thirty households in each village. These included fishers, boat drivers, rickshaw pullers, school going girls and boys and all those men, women and young boys and girls whose livelihoods are in some way related to and dependent on the lakes in this region. Informal interviews were also carried out in villages nearby to each of these sites such as Siloti, Sanguri, Karkotak, Shongaon, Pangot and Pali. Further analyses were made on the issues mentioned by the stakeholders during the interviews. Draft Integrated Action Plans were then formulated on the basis of these issues, focused on mitigation and or improvement. The issues, mitigation and improvement plans will be verified through a process of joint assessment and decision-making with stakeholders. And on the basis of these verification discussions, the final Integrated Action Plan will be formulated and agreed. The process is summarized in Figure 3.

In our Integrated Action Plan we have concentrated on realistic actions and identified their goals, timescale, main agencies in charge of implementation and/or finance, their capacity and commitment and/or incentives they have for undertaking the action, indicators for success, and difficulties which may be faced during implementation.
Fig 3: Formulation Process of final Integrated Action Plan

The field site areas being the lakes and the immediate surroundings, the stakeholders are chosen in accordance to the site, being directly or indirectly associated with the lakes. Here association means any kind of interaction with the chosen lakes. IAP report here covers a diverse range of stakeholders which can broadly be classified into

1) National Lake Region Special Area Development Authority (NLRSADA) and G.B. Pant Nagar University of Agriculture and Technology via NLRSADA.
2) Department of Fisheries, Uttarakhand.
3) Directorate of Cold Water Fisheries Research, Bhimtal.
4) Nainital Nagar Palika Parishad (NNPP).
5) Nagar Panchayat Bhimtal and Chanoti Pariyavaran Vikas Samity.
6) Tarai Irrigation Division, Nainital.
7) Vikas Khand Bhimtal (BDO), Nainital and Zilla Gramya Vikas Adhikaran.
8) Interested local schools, colleges, NGOs and local people.
9) Department of Agriculture, Govt. of Uttarakhand.
10) Department of Horticulture.
11) Boat drivers.
12) Fishers.
13) Tourists.
14) HighARCS team.

The rationale behind the involvement these above mentioned stakeholders in the proposed action plans is given in each action plan accordingly.

**Management Proposals**

The main focus of the proposed actions is to improve the management and conservation of aquatic resources in the lakes as well as benefit the local people, which in other words, can also be termed as “Wise-Use of Wetlands”. With reference to Ramsar Convention, “Wise Use of Wetlands” is the maintenance of ecological character, sustainable utilization for the benefit of mankind in a way compatible with the maintenance of the natural properties of the ecosystem. That is, the ‘Wise Use of Wetlands’ mainly comprises of three components:

1) Maintenance of biological, chemical and physical components of wetlands.
2) Maintenance of ecological balance between the components of wetlands.
3) Protect the livelihood of the local people who are directly or indirectly dependent on wetlands.

Fishing, integrated farming, agriculture, forestry, aquaculture, transportation and nature tourism may be consisted with wise use within certain limits, but can damage wetlands and become unwise uses if they exceed the carrying capacity of the concerned wetland systems.
The recommended actions from our team to solve the Management Issue(s) and the general aims of the project at our field site are as follows:

1) Desiltation of Bhimtal lake
2) Prevention of garbage disposal in and around the lakes
3) Fish release programmes
4) Proper marketing of Handicrafts
5) Proper marketing of Agricultural products
6) Crop Protection from wild animals

III. Description & reflection on the implementation process(es)

1) Desiltation of Bhimtal lake

**Objectives**

- Activities to be carried out
1) Organize stakeholder meetings to encourage the concerned departments to implement better catchment management to help reduce silt loads – appropriate engineering intervention to trap silt and sustainable means of maintaining and renovating this.

2) The HighARCS team can recommend the concerned department to take up some cost effective measures to resist further siltation of the lake, such as,

- Build cross bunds at upper catchment areas
- Construct more silt traps
- Cleaning of existing silt traps at regular interval
- No construction below High Flood Level(HFL)

3) The HighARCS team can suggests the concerned department to take necessary steps to analyze silt’s chemical composition (if possible) and formulate silt disposal plan accordingly
- Silt can be used to make a pavement across the lower side of the lake (where people can walk and enjoy the beauty of the lake) → beautification

- If soil enriches soil nutrients and absence of heavy metal contamination or hydrocarbons then involve farmers of adjacent areas to use this silt

4) Tarai Irrigation Division, Nainital itself has some lake desiltation programmes. HighARCS team can recommend the concerned department to take into consideration the above mentioned issues while preparing their future lake desiltation programme plans.

4) Seeking local government assistance to implement this action.

   o  *Reasons for prioritization*

1) Bhimtal lake is the source of water for irrigation and drinking water in case of villagers of Chanoti and Pandeygaon.

2) As agricultural practices are common in Bhimtal, so water for irrigation is very essential there. Thus if high siltation result in reduction of lake’s depth, then it may lead to scarcity of water needed for irrigation in case of farmers of Chanoti and Pandeygaon.

   o  *Potential issues*

1) High siltation resulting in reduction of lake’s depth.

2) Uncontrolled surface runoff from the upper catchment.

3) Clogging of water channels (drains) in the surrounding hills because of encroachment, leading to poor drainage.

4) Construction activities at upper catchment areas.

5) Some effluents from drains, leakage and open defecation.
2) Prevention of garbage disposal in and around the lakes

Objectives

Activities to be carried out

1) Organize stakeholder meetings with local authorities to discuss the possible options to prevent garbage disposal in and around the lakes.

2) A strict regular monitoring around the lake to look out and prevent the disposal of garbage in the lakes of Bhimtal and Naukuchiatal. Local people can be employed for the look after of the lakes and can be paid on daily/monthly basis. This system is already present in Nainital. Around 6 to 7 people can be hired for regular monitoring around Nainital lake, around 8 to 9 people required for Bhimtal lake and 6 to 7 people for Naukuchiatal lake.[Length of shoreline: Nainital-3630m; Bhimtal- 4023m; Naukuchiatal- 3560m. We have assumed that, for monitoring 1 Km, approximately 2 persons are required.]

3) Building awareness of cultural heritage of lakes and need for environmental protection amongst tourists and local people may also help. This could include giving training to guides and boatmen to warn tourists against disposing of garbage in the lakes. This could take more the form of a meeting, and the team could also learn from the guides/boatmen’s own ecological knowledge. The aim would be to gain a commitment from them to inform tourists about environmental issues and encourage ‘ecological’ behavior.

4) Put emphasis on the matter of collection of plastics in definite vats and time to time cleaning of vats in the front concerned department in the stakeholder meeting.

5) Visual tools such as posters could be presented next to ticket counters for tourists with an aim to reduce their throw away mentality and imposition of fine if anyone tries to pollute the lake and adjacent areas.

6) If possible ban use of plastics around other lakes’ side like Nainital.

7) Seeking local government assistance to implement this action.
3) Fish release programmes

Objectives

- Activities to be carried out

1) There can be fish release programmes in the lakes which may engage local people as laborers. This fish release programmes will be conducted on the basis current stock management practices which was developed by the concerned department focusing on threatened or decline fish species of the area to maintain the fish biodiversity of the lakes. The fish release will be done on the basis of current practice and experience of local fisherman and stakeholders. Fish release programmes should be such that would enhance surveillance and also new introductions of invasive or non-native species programs should be prevented to eradicate or reduce non-native species populations.

2) The fish release programmes in the lakes can also involve school and college students because in that way they would be aware about conservation concern fish species of their area and that would help in spreading awareness which is required for future conservation of the lakes.

3) Organize stakeholder meetings with local authorities to discuss the progress of existing fish programmes and the other alternative processes through which these fish release programmes could be conducted.

4) This could be done by tourists whereby they will pay to release the fish, as was observed in Shaoguan, China. If the tourists are willing to release the fish they have to buy them.

5) Directorate of Cold Water Fisheries Research, Bhimtal in association with Department of Fisheries, Uttarakhand Department of Fisheries, Uttarakhand can play a role in deciding which fish to release according to present ecological interests. Another fact is that risks from disease and parasite introductions must be considered and managed even when fish species selection is
good. These organizations can be approached to initiate proper research work to identify present threatened or decline fish species of the area so that fish biodiversity of the lakes can be maintained.

4) Proper marketing of Handicrafts

Objectives

- Activities to be carried out

1) Organize stakeholder meetings to encourage production and marketing of handicrafts which are generally made by women and girls.

2) To set up a centre near the lakes where the handicrafts items can be sold.

3) facilitate the formation of Self Help Group (SHG), whereby they apply for a license for a stall to sell all the handicrafts, and the profit could be shared- a marketing cooperative.

4) Capacity building of the women in this activity.

5) Integration of the Govt. programme in respect of development of small and cottage industry.

6) Seeking local government assistance to implement this action.

7) Seeking local NGOs assistance to implement this action.

5) Proper marketing of Agricultural products

Objectives

- Activities to be carried out

1) Agriculture is not commercially practiced in our field sites so organize stakeholder meetings to encourage the farmers to adapt vegetable cultivation on commercial basis.
2) In Nainital there is no agricultural land as it is totally an urban area. However, in Bhimtal and Naukuchiatal people have some amount of agricultural land. These agricultural lands are mainly for producing vegetables, fruits and other crops by the families for self consumption. So there is little or no marketing of the agricultural goods. Main crops produced in this region are wheat, maize and rice. Thus, if agriculture could be enhanced by producing more output using organic fertilizer or pesticides then the surplus beyond the consumption could be marketed. Moreover, vegetables mainly come from Haldwani and the local markets are expensive. So if vegetables are produced locally and marketed then that problem could be solved.

3) Encourage farmers to use organic fertilizers at household level.

4) Promotion of suitable organic vegetables cultivation.

5) Involvement of women in homestead vegetable cultivation.

6) Needs diversification of livelihood.

7) Seeking local government assistance to implement this action.

6) **Crop Protection from wild animals**

   - **Activities to be carried out**

1) Organize stakeholder meetings to discuss various possible options of crop protection.

2) The fact of often damage of crops by the wild animals (particularly pigs) should be put forward in the stakeholder meeting and local people(farmers) must be encouraged to form groups for monitoring the agricultural fields so that fields could be protected from wild animals (particularly pigs).

3) Increase awareness among farmers and local people about the use of organic fertilizers, insecticides and pesticides and other products.
4) Promotion of composting at household level.

5) Training and extension in Integrated Pest Management.

6) Seeking local government assistance to implement this action.

IV. Reflection of Implementation Process and its impacts.

- The actual desilting work has not yet started. The Govt. authorities are prepared the desilting plan to start the work and submit the project for finance. Since the work involves a huge capital due to lack of finance the work is yet to start. There is probability to increase the cost due to delay of time.
- In Nainital area, boatman are take the initiatives to prevent pollution of lake. In doing so, they built the awareness among the tourists to minimize their throw away mentality. The boatman asked the tourists not to take any food while they are in the boat. According to the boatman “Enjoy while roaming by boat and enjoy the lake and as well the nature, rest of the time take food and enjoy the food”- this is a common slogan among the boatman. In Bhimtal and Naukuchiatatal area also boatman takes the initiatives to clean the lake side and maintain the beauty of the lake as well as the nature around. They put some posters in and around the ticket counters stating that it is punishable offence to throw the plastics and any other impurities around the lake. The boatman formed and small volunteer group to clean the lake water.
- Fish release programme is a continuous programme of the Fisheries Department. They organize the release programme involving local school children, tourists, local people and make them aware about the biodiversity of the lake. The programme is very successful in Bhimtal lake.
- In regard to proper marketing of handicrafts and agricultural products, Govt. take the initiatives to renovate the existing marketing place at Haldwani. The work has started but lack of adequate fund the work is not at the required level.
- Local people form a group to watch the crops while the crop in the field and when they are harvested and heap in the field site. The villagers form a group of 6 to 7 people and make a roaster to do the work. They keep watching around the clock. During the day time woman and children alternately watch the field because the male members are going to their usual work to earn money.
Section 4 : Site report from Buxa, West Bengal, India
Report on Lessons learnt regarding adoption, implementation and monitoring the results of Integrated Action Plans Formulated at Buxa, India

*HighARCS New Deliverable 8.1 (integration of former D6.2, D7,3, D8.2)*

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1.0 Introduction

The Buxa project site, under the Buxa Tiger Reserve, in the foothills of Bhutan Himalaya in Jalpaiguri District West Bengal, offered a number of interesting case studies to understand the overall HighARCS research agenda. It is, today, a protected area and is a region of rich forest and aquatic biodiversity, with many seasonal and perennial rivers flowing down from the hills. It is home to marginalised communities, many of whom are from minority ethnic groups, together representing a cross section of the eastern Himalayan population. These communities have used aquatic resources for multiple purposes over the generations, and their presence within the National Park adds a new angle to explore. It is also a region of growing tourism but is also vulnerable to natural disasters such as flooding, landslides and soil erosion. The project site, for the research purpose, has been divided into three clusters, namely Adma, Buxa Fort and Jayanti. In all the three clusters there is a seasonal variation in the availability of livelihoods opportunity. In terms of access to and control over livelihoods resources, there does not seem to be much difference, especially in the Adma and Buxa clusters, where cultural beliefs and practices are favourable to women.

The High ARCS project assessment and research focused on biodiversity and ecosystem services, institutions and livelihoods during the first phase of implementation. The second phase centred on research covering selected areas within the overall framework of the project followed by stakeholders evaluation of the ecosystems and their views. Based on results of the preceding investigations an Integrated Action Plan (IAP) was developed in consultation with local stakeholders, including men, women, girls and boys and this will be implemented and monitored during the third phase. The IAP includes activities (what), actors (who) and strategy (how) to be implemented within a given time frame.

Research findings suggest that Buxa has a rich biodiversity of both plants and animals (please refer to WP3 report); . According to the IUCN Red List assessments undertaken by this project in collaboration with another project the Buxa wider catchment is one of the most freshwater species rich sub-catchments of the whole Ganges and Brahmaputra basin, containing 142 species of fish 81 molluscs and 82 odonate species (Allen et al. 2010). Most of these species are classed a Least Concern but three species (all fishes) are classed as threatened (assessed as Critically Endangered, Endangered, or Vulnerable); *Clarias magur* – known as the wagur (Endangered); *Botia rostrata* – known as the Dohser (Vulnerable); and *Cyprion semiplotum* – known as the Assamese kingfish (Vulnerable).

Based on the field and market surveys 46 species of freshwater fish and 25 wetland plants were identified to be present within the High ARCS Buxa site. A key finding is that even though no fish species recorded are considered globally threatened, six are classed as Near Threatened (this is the category assigned to species that are very close to meeting the criteria for a threatened category). According to the Red Listing assessments, six species are impacted by over-exploitation (*Tor tor, Chitala chitala, Ailia coila, Ompok bimaculatus, Wallago attu, Bagarius bagarius*), one by pollution (*Chitala chitala*) and one by dams (*Tor tor*). However, based on discussions with villagers and fishermen it was identified that almost all the fishes in the Buxa area are declining in number and that nearly every species are utilised as food. Moreover, size and
weight of the fishes is reportedly decreasing year by year due to different reasons including soil erosion. This was revealed through survey as well as oral history by the stakeholders. Therefore, although the nutritional value as well as economic value of fish in the project area are very high, the declining fish stocks has lessened the people’s interest in fishing, and thus livelihood support from fishing has become weak. A total of 25 aquatic plant species were identified from the three cluster sites, none of which are of global conservation concern and nearly half of them being non-native species. Based on the observations taken during field work, and discussions with stakeholders the key threats to aquatic biodiversity, resources and ecosystem services were identified and have been mapped (see Ray and Mishra 2011 for a discussion of all threats and maps). The key threats are water pollution from domestic and agricultural sources, soil erosion due to deforestation and sand and boulder mining from river beds (s). Based on the ecosystem service identification, valuation and mapping work undertaken, the services ‘fishes for commercial use’ and ‘disease regulation’ were valued the highest by the communities at the site. Figure 6 shows that these two services had the greatest proportion of ‘high value’ preferences given to them by the respondents. ‘Tourism’ and sand and ‘stone mining’, were the least valued with the greatest proportion of ‘low value’ preferences. Water for human consumption was not highlighted as a highly valued service through the valuation work, however based on the results of focus group discussions common priorities were shared across many of the different stakeholder groups, including the poor water quality for drinking and declining fishes. Research findings and our general understanding suggest that Buxa region has a predominantly forest-based and agricultural economy. There used to be rich aquatic resources which people used to exploit for their livelihood. The Bengalis population in Jayanti are fish lovers. Fish, however, is also preferred by all the communities in the three clusters. In Buxa Fort cluster which is home, primarily, to Nepali and Dhukpa communities, labouring remains the primary livelihood activity, and the Department of Forest is the primary employer. ‘Construction labour’ and ‘other labour’ are the most significant income sources, the latter including jobs such as maintaining roads and trails. Much of this work is available through NREGA, which ensures individuals get 100 days work a year, or a compensation pay-for the period when a job is not offered after application for registration. Actually NREGA is an employment assurance scheme of the Government to ensure that the unemployed population has access to job opportunities locally. There is also a considerable amount of out-migration, not abroad, but to urban centres such as Siliguri, Kolkata and Delhi. Jobs include working as machine operatives in factories or work in hotels (general notes from HH interviews, Buxa, Oct 2010). Some of the Dhukpa community who are familiar with the language and culture regularly migrate to Bhutan for work. In Lepchakha, for example, it was suggested that up to 90% of the local men work as labourers in Bhutan. This opportunity however is reportedly only available to the Dhukpa community who know the language and can merge into the local population without official documents. Given their lack of citizenship papers however, they can only secure menial employment (interview in Lepchakha village, Oct 2010). In addition to labouring, households raise livestock in the forest, which is mostly for household consumption. Agriculture is limited, given the steep terrain, damage from wild animals, and restrictions imposed from the Department of Forestry. Nevertheless, there is some maize production in most villages, and some production of cash crops such as garlic, ginger and turmeric which are sold to merchants in Santalalbari at the foot of the hills on the weekly market days. The weekly market does not ensure remunerative price for their product.

Jayanti cluster is currently home to predominantly Nepali, Adivasi Bengali and Bihari migrants who settled to work in the now abandoned mines. The livelihoods, however, are somewhat similar to the Buxa Fort
cluster. Labouring is the primary source of income, along with migration to urban centres. Agriculture is limited to a few fields of maize on the far side of the river, and these are often damaged by elephants. Being a plain, Jaynati has livestock raising as one of the important livelihoods sources. It is only in Adma cluster, which is populated entirely by the Dhukpa community, where livelihoods follow a more traditional pattern. Although shifting cultivation is less common, local people operate fixed fields of maize and millet, and there is even some rice in the lower valleys. Their livelihood is semi-nomadic. Most households have large herds of cattle which they tend in the lower valleys at the foot of the plains during the monsoon when the upper forests are abundant with leaches, then moving up to the level of the villages in the autumn, and then returning to villages in winter to tend the harvests of millet. In the early spring they move to pastures on the high ridges on the Bhutan border (HH interview, Adma, Nov 2010). They produce cheese, butter, ghee and milk, and sell these in Bhutan, or locally at the surrounding hills. Although some people work as labourers, no out-migration pattern exists in the other two clusters, and much work is simply carried out locally for other villagers. This community however, displays a greater level of self-sufficiency than the other villages in the Buxa region. In all the three clusters there is a seasonal variation in the availability of livelihoods opportunity. In terms of access to and control over livelihoods resources, there does not seem to be much difference, especially in the Adma and Buxa clusters, where cultural beliefs and practices are favourable to women.

The most important institutional factor to be considered is the fact that Buxa is located within a Tiger Reserve. As the area falls under the Reserve Forest Act, governance of the area is influenced by the Department of Forestry on subjects related to forest and natural resources management. This makes things complex. On the one hand where there is the possibility of resources optimization, on the other there is always an avoidable conflict between the Department of Forestry and other local agencies including Department of Panchayat. No local planning initiatives can take place unless it is ratified by the Department of Forestry. The institutional and policy framework, as it exists in Buxa, often comes in to conflict with the local actions people might take for the conservation of biodiversity and livelihoods. For example people cannot take such actions without going through a complex system of obtaining permission from the Department of Forestry and other related line departments. This is the context for testing the feasibility of local actions related to aquatic resources management taking the community as the anchor. Research findings (Buxa, D5.1, D5.2) suggest that although there is the possibility of convergence and synergy among different actors, including communities, this is not achieved because of a number of constraints including lack of awareness about various policy perspectives, conflicting legal regimes and policies and lack of trust among the agencies and individuals. Consequently it was proposed that Integrated Action Planning would hold this as a critical consideration while evolving testable and feasible Integrated Action Plans during the current phase of the project.

The selection and planning processes leading to the proposed Integrated Actions Plans in Buxa have been reported in D7.1: Report on Implementation and Monitoring Strategy agreed of IAPs, Buxa India (December 2012). In Buxa, needs were identified across five thematic area covering 23 activities/actions and this assessment evolved from different stakeholders for proper implementation and monitoring to achieve the overall goals of the High ARCS project. Some of the activities have already begun in 2010-2011 but almost all activities are now taking place at three cluster of Buxa from January 2012. The IAPs including Policy actions plans (PAPs) as well as conservation and livelihoods to be undertaken to address the challenges mainly consist of gender and age as well as stakeholder specific capacity building for biodiversity conservation (Action 1: self-help groups; local authorities (cf. action 4, below)). This is being matched with similar activities in view of building awareness and provide information about biodiversity conservation and about the legal acts and rules of protection and management (Action 2), and activities facilitating the
setting up of community-run farmers’ clubs and innovation forums, where local farming communities engage innovative activities related to their livelihoods and the management of local aquatic resources (Action 3). The project will similarly also work with the Panchayat to “reorient and sharpen their governance efficiency” (IAP, Buxa)(Action 4). Finally, a more livelihoods oriented policy initiative into set up a livestock and insurance programme (Action 5). The present report is intended to contribute in documenting and understanding how these proposals are being discussed, negotiated and adapted in the on-going participatory monitoring & implementation process, and accounting for the results obtained so far.

2.0 Main actions retained for implementation from 2012 and impacts targeted

In Buxa, the needs-based implementation and monitoring strategies evolved from a series of consultations and sharing with the stakeholders during the period from Aug 2011 to January 2012. As mentioned above, 23 activities have been proposed under five (5) broad action plans. The activities can further be classified into three categories such as i) ongoing actions which were proposed by the local authorities and communities ii) short-term actions which are suitable for implementation within timeframe of the HighARCS project and iii) long-term actions which should be implemented in the long-run.

Compatibility analysis of the different activities was done considering conservation and sustainable development aspects. There were 12 actions out of 23 which appear well aligned with both conservation and economic development objectives. There are five (5) actions which are conducive to conservation but have no direct effect on development. It is to be noted that there are some activities which may not have a direct effect on economic development but in the long-run there could be some effects. For example, planting trees has no direct effect on development but if we consider the longer period then we will find financial benefits.

Priority setting or ranking of activities has been done on the basis of indicators including how specific, measureable, achievable, realistic and time bound (SMART) the plan is. All 23 activities were ranked from 1 to 15. There were 10 activities which fall within the top priority category I covering ranks one to five. Activities under category I include capacity building of SHGs and farmer club, development and dissemination of Information Education and Communication (IEC), awareness building on biodiversity for local governance, micro-planning for fine tuning of action plans originating from HighARCS, application of manure to plantations and fish culture linkage building. In category II, a further 9 activities were identified, including biodiversity registration, tree plantation, building of small fish ponds and counseling on non-native and invasive species. In category III ranked between 11 to 15, there were 4 activities including painting competition among children, training for cattle owners and insurance.

The feasibility assessment was done using STEPS (social, technical, environmental, political and sustainable) criteria. The good thing is that no constraints or threats in the social and sustainable sectors were identified. There were a few conditions or challenges concerning 5 social and 4 technical factors but these were not deemed major. Actions under social and technical need support for implementation but this can be mobilized locally. Out of 23 actions proposed 18 are considered environmentally friendly, though there is a threat of water pollution in the summer season due to animal husbandry. This activity cannot be stopped outright, however, as it is the main source of income for all community. The project should take special care so that this activity can be continued whilst maintaining pure drinking water. Most aspects of Indian society are politicalized but interestingly 21 of actions were deemed free of political influence in the
Buxa area. Considering factors necessary for sustainable interventions, the result showed that there were no constraints or challenges perceived in implementing the actions and 20 of activities were deemed viable. Additional support is needed for 3 activities and this can be mobilized in collaboration with different stakeholders including government departments.

2.1. Overview of Planned Actions in Buxa

All activities are divided into five actions after consultation with the different level stakeholders to achieve the objectives of the HighARCS project in Buxa. The implementation of the action and activities started from middle of 2011 but real implementation started in July 2012. Most of the activities are designed for short activities. There are some activities such as capacity building for SHGs towards high land aquatic resources, plantation of trees and promotion of insurance for animals are on-going government activities and some activities including application of manure for plants and fishes, counseling people not to use non-native and invasive species etc. are fall under long term activities.

The following table 1 shows the activities in terms of above three categories.

Table 1: Overview of the implementation time frame of the selected actions and activities

<table>
<thead>
<tr>
<th>ACTIONS &amp; Activities</th>
<th>On going</th>
<th>Short terms</th>
<th>Long terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Capacity building of existing Self Help Groups (SHGs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Prepare a biodiversity register to assess local ecology and harness indigenous ecological knowledge</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>B. Provide training to help local people plant certain tree/plant species which can allow regeneration of biodiversity</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Provide advocacy to government to plant trees to reduce soil erosion and sedimentation</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. To offer training in the identification and use, and production of medicinal plants plants (native, non-invasive species).</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. Develop a small fish pond of native, non-invasive species</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. To check, reduce and regulate discharge of household pollutants and agricultural chemicals from the fields into the river &amp; monitor levels of sediment in rivers</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Awareness building and information dissemination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Dissemination activities at the ground level will be prepared to increase awareness about government biodiversity regulations</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Student seniors and art competition raising awareness on biodiversity</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Stakeholder seminars/discussion on biodiversity regulations and laws (x2)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Setting up community owned Farmers Clubs/ Innovation Forums</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Mobilization of farmers into 'clubs’</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Training and other capacity building inputs (incl. effectively use manure, drip irrigation, environmentally friendly fertilisers and pesticides)</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
C. Facilitating linkage with banks and other institutions
D. Linking the farmers with the experts and professionals and professional groups
E. Counselling them not to use non-native and invasive species
F. Creating awareness about the existing provisions of conservation using the earlier action plans
G. Disseminating the learning to other communities and the government agencies

4. Reorientation of Local Governance / Panchayats
A. awareness about the objectives (focus on biodiversity) and expected outcome of HighARCS research
B. training for micro-planning and helping Panchayats fine tune their agenda to support the planned activities and higher level project objectives of HighARCS under their regular programs
C. to help them take the learning of the HighARCS to higher levels of their governance system
D. catalyze interfacing with different agencies and departments

In Buxa action one is to build the capacity of existing Self Help Groups (SHGs). The SHGs are supposed to deal with social and empowerment issues and are expected to expand their areas of activity to cover all other relevant subjects which affect people’s lives. The SHGs to take up gender, men and women, boys and girls and environmental issues within their locality seriously and systematically. Building on this potential it is planned to involve SHGs in the High ARCS project. Buxa has a substantial number of SHGs in the three clusters with some variation in their number. It is planned to involve SHGs in proactively promoting and conserving biodiversity. Specifically SHGs are to be oriented and their capacity built to achieve this objective by checking, reducing and regulating discharge of household pollutants and chemicals from the fields into the river. They are to be involved in reviewing their own biodiversity stock and embed the implication of a degraded ecology in their life. Adequate capacity would be built among the members by exposing them to appropriate training modules or by fine tuning the existing capacity building inputs already available for SHGs.

The second action is awareness building and information dissemination among the community and local stakeholders. The objective of this activity is to raise the awareness of local officials and the community to have better (clearer) understanding of the acts and their provisions to be able to relate them to each other. A number of dissemination activities at the ground level will be prepared to increase awareness about government biodiversity regulations. The focus audiences will be Department of Forestry staff at the ground level, Panchayat members, SHGs and Farmers Clubs. Preparation of materials will be undertaken as a joint exercise by the different stakeholders. A cultural troupe has already started training the school children on different aspects of biodiversity. The activity shall be extended and spread to all three clusters. Preparation of posters through the school children has started and will be continued. Some more information brochures will be prepared and distributed together with local level consultation and reflection meetings.
Setting up the community owned farmers club / innovation forum is the third action of Buxa. Livelihoods and biodiversity issues cannot be addressed adequately by state interventions alone; they have to be carried out by self-evolving and self-regulating community-based interest groups/institutions( Ref: Emerged from interview -Delphi report, HighARCS D5.2, 2012). Farmers clubs help the members strengthen and improve their agricultural activities and through this help augment their livelihoods endowments. In case of HighARCS they may help reduce pressure on the aquatic environment by offering additional endowment. The additional opportunity may also help the communities to replace their income loss because of the declining fish stock in the area.

The fourth action is to reorientation of local governance (Panchayats) which is very strong institutions in India. The local level governance has a strong interface with the Department of Forestry and others related to agriculture, fish culture, horticulture, livestock, etc. The Indian planning system follows a bottom-up approach which would mean that priority for different programmes and activities would evolve from the bottom, Gram Sabha (Village Assembly) and shall form part of the larger planning process. The functionaries of the Panchayati Raj Institutions (PRIs), however, lack awareness and capacity to evolve bottom-up processes and programmes, articulate and analyse various priorities and monitor functioning of different programs objectively. Implementation of various action plans would depend largely on the efficacy of the Panchayats. The FGDs and different levels of consultations bring to the fore the need to orientate and strengthen the Panchayat system.

The promotion of livestock and insurance program is fifth action to support the livelihood. Insurance has been suggested to be an effective tool to deal with the vulnerability of livestock and problems the local communities face in the event of illness and death of livestock. The main objective of the livestock is to promote additional livelihoods to the local communities and enable opportunity for enriched soil fertility. The above planned actions have direct and indirect linkage with High ARCS project. The indicators of the actions will be considered in terms of qualitative and quantitative measurement.

2.2 Biodiversity conservation and ecosystem services aspects

As a consequence of the holistic, integrated approach to action planning adopted by High ARCS, linkages to the performance on specific indicators of biodiversity conservation or on ecosystem services may not always be so easy to assess for each of the five main action areas. The below table shows the direct linkage between action/activities and objectively verifiable indicators (OVIs). The table also shows the reflection of the impacts of IAPs to ecosystem services including fishes for food –both commercial purpose and consumption use; Other animals for food (non-fish – e.g. molluscs, shrimps etc); flood regulation; sand and stone mining; water use for animal and human consumption; plants for medicinal use etc.

In order to monitor the IAP impacts to the related ecosystem services, some of the indicators identified for the activities (see Table 4: Overview of impacts) can be used. The ‘fish species monitoring (for food and commercial use)’ will also provide an indicator for the ecosystem service of fish provision, the data on the number of flood events will also serve as an indicator for flood regulation, and the ‘water availability and water quality’ monitoring being undertaken by the SHG’s will also be an indicator for water provision

**Action 1 focuses on capacity building of existing Self-Help Groups (SHGs).** From the table below, it can be seen that activities undertaken in the SHGs are directly and indirectly linked to conservation of the natural
aquatic resources. The fish pond of course can be used for raising fish, which of course must be categorized as a livelihood purpose. But it has implications for ecosystem services and biodiversity. It does not help bring back fishes which have disappeared over the latest years. But we think that these fish ponds will be replicated at many places of the project area and many of them will be used to capture the disappearing fishes. But a danger might be that non-native or invasive species could be introduced this way. Most of the activities are related to ecosystem services such as -the capacity building training to SHGs leaders to monitor the discharge of households pollutants, level of sediments of the rivers and agricultural chemicals aiming water availability and improved water quality; number of houses with better access to water storage systems etc. To offering training in the identification and use, and production of medicinal plants plants (native, non-invasive species) aims to use of medicinal plants among the local community members and other stakeholders. Provide advocacy to government for Planting trees to reduce soil erosion and sedimentation aiming at flood regulation . Another activity on developing small fish pond of native and non-invasive species targeting to fishes for food (both commercial and substance use).

**Action 2** includes seminars on biodiversity laws and regulations aims to reduce illegal harvesting of fish and stop illegal (polluting) harvesting methods.

**Action 3** contributes to biodiversity conservation and provision of ecosystem services by training and other capacity building inputs (incl. effectively use manure, drip irrigation, environmentally friendly fertilizers and pesticides). The idea is that such trainings will motivate the farmers in doing multi cropping as well as ensure the quality water and increases the number fishes.

**Action 4** includes activities on organizing training for micro-planning for Panchayats / local governance aiming to achieve flood regulation, reduce the sand and boulder mining etc. Through this reorientation and capacity building of local governance it is expected that local government staff will consider including high ARCS issues in their planning process.

**Action 5** includes the activities on organizing the livestock health camps, training to the cattle owners and training in composting and organic manure preparation.

**Table 2 : Actions to Ecosystem Services matrix**

<table>
<thead>
<tr>
<th>ACTIONS &amp; Activities</th>
<th>Ecosystem Services</th>
<th>X=(Action directly relates to ecosystem service)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Fishes for food (commercial &amp; subsistence)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flood regulation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plants for medicinal use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water provision</td>
</tr>
</tbody>
</table>

**1. Capacity building of existing Self Help Groups (SHGs)**

A. Prepare a biodiversity register to assess local ecology and harness indigenous ecological knowledge

B. Provide training to help local people plant certain tree/plant species which can allow regeneration of
biodiversity

| C. Provide advocacy to government to plant trees to reduce soil erosion and sedimentation | X | X |
| D. To offer training in the identification and use, and production of medicinal plants (native, non-invasive species). | X |
| E. Develop a small fish pond of native, non-invasive species | X |
| F. To check, reduce and regulate discharge of household pollutants and agricultural chemicals from the fields into the river & monitor levels of sediment in rivers | X | X | X |

2. Awareness building and information dissemination

| A. Dissemination activities at the ground level will be prepared to increase awareness about government biodiversity regulations | X | X |
| B. Student seinars and art competition raising awareness on biodiversity |
| C. Stakeholder seminars/discussion on biodiversity regulations and laws (x2) | X | X |

3. Setting up community owned Farmers Clubs/ Innovation Forums

| A. Mobilization of farmers into 'clubs' |
| B. Training and other capacity building inputs (incl. effectively use manure, drip irrigation, environmentally friendly fertilisers and pesticides) | X | X |
| C. Facilitating linkage with banks and other institutions |
| D. Linking the farmers with the experts and professionals and professional groups |
| E. Counselling them not to use non-native and invasive species | X |
| F. Creating awareness about the existing provisions of conservation using the earlier action plans | X | X |
| G. Disseminating the learning to other communities and the government agencies | X |

4. Reorientation of Local Governance / Panchayats

| A. awareness about the objectives (focus on biodiversity) and expected outcome of HighARCS research | X | X | X |
| B. training for micro-planning and helping Panchayats fine tune their agenda to support the planned activities and higher level project objectives of HighARCS under their regular programs | X | X | X |
| C. to help them take the learning of the HighARCS to higher levels of their governance system | X | X | X |
| D. catalyze interfacing with different agencies and departments | X | X | X |
2.3 Policies, institutions and conflicts

Another concern of the High ARCS project has been to strengthen local stakeholder capacities, mediate conflicts, and to facilitate the creation of consensus and commitment for action. In Buxa, decisions on local planning are undertaken by the Panchayati Raj Institutions. In addition, as it was mentioned in the introduction, Buxa is situated within a Forest Reserve (Buxa Tiger Reserve). This implies that governance regarding resource use and management is also influenced by the Department of Forestry, which often leads to conflicts. Therefore most of the actions developed are to support and develop capacity of the Panchyat, local communities and Department of Forestry and to promote better engagement between them.

3.0 Implementation Process: strategy, methodologies and organisation

The CDHI is a locally based NGO with a focus on empowerment and capacity building of local poor communities. It has an existing participatory practice for working with the local communities, into which the High ARCS activities have been merged. The High ARCS action plans have come as opportunities for diversification of the knowledge, skills, and competencies already being disseminated and developed by CDHI. The High ARCS action planning implementation strategy has evolved from our understanding that several of the action plans would require resources and technical support from the relevant stakeholders who have the formal mandate and resources to attend to similar activities. Consequently efforts to promote collaboration in this regard is assumed to create a win-win situation. Owing to its strategic positioning and past experiences CDHI is well placed to facilitate the process of implementation. CDHI has been closely involved with the community and has collaborated with both local agencies and stakeholders. CDHI has developed local youth workers / volunteers who would be involved in the mobilization of the community and local level institution. The High ARCS action plans have been an opportunity to pursue this human resource development at the community level. In addition, the CDHI has enlisted support from the local partners and agencies in the areas/spheres of expertise where it has limitations itself. It has been technically supported by local agencies, such as forest department, North Bengal university. The management team of CDHI includes a coordinator and researchers who maintain close links with the local level and state level policy makers. The High ARCS team members in the Buxa site have discussed in detail with line department / government officials in order to facilitate the activities under IAP and CDHI has also ensured the proper implementation of the activities by different stakeholders. Before organizing any program CDHI is always consulting with community and relevant stakeholders. The field level report on certain activities documented by the filed level staff and volunteer. Then CDHI management is preparing the report for follow up of action as well as report is being shared with respective line department and some time shared with WP leaders. The monitoring of the implementation of the proposed action plans and decisions on the need to change implementation strategies during the process of implementation have been undertaken through the following major methods and activities, as suggested by the different stakeholders including the community during the planning phase (D7.1):

- Consultation and sharing with stakeholders on issues, strategies, monitoring, outputs and trends and their involvement in rearticulating further follow-up actions;
• Focus group discussion with different level participants including children, women and professional groups;
• Participatory rural appraisal (PRA), rapid rural appraisal (RRA), stakeholder Delphi etc tools while implementing activities. Social audit techniques organized with mixed groups including officials, community members, etc on different issues.
• A series of workshop and consultation with policymakers and community so that activities can be included in the government policy;

District level policy workshops and consultation by CDHI to inform the policy makers and the general people.

The following table 3 shows that most of the activities are planned to complete in July 2012 to June 2013. The project is giving more emphasis on creating awareness about the existing provisions of conservation, application of manure in plantation and fishery, facilitating linkages of different agencies with local governance / panchayat, self help groups, biodiversity registration, development of small pond for fish culture and mobilization of farmers.

Table 3: Gantt Chart on Actions & Activities

<table>
<thead>
<tr>
<th>Actions and activities</th>
<th>Time Period (July 2012 to December 2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Encourage local people-led by the SHG members</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18</td>
</tr>
<tr>
<td>2. Through the SHG, offer training to help local people plant certain species</td>
<td></td>
</tr>
<tr>
<td>3. Develop a small fish pond</td>
<td></td>
</tr>
<tr>
<td>4. Dissemination among stakeholders</td>
<td></td>
</tr>
<tr>
<td>5. Development of posters and pamphlets</td>
<td></td>
</tr>
<tr>
<td>6. Discussion and seminars at the local levels</td>
<td></td>
</tr>
<tr>
<td>7. Painting competition among children</td>
<td></td>
</tr>
</tbody>
</table>
8. Mobilization of farmers

9. Training and other capacity building inputs

10. Facilitating linkage with banks and other institutions

11. Counselling them not to use non-native and invasive species

12. Creating awareness about the existing provisions of conservation.

13. Disseminating the learning to...

14. Awareness building on bio-diversity for the panchayats

15. Training on micro-planning for fine tuning HighARCS project.

16. Facilitating linkages of different agencies with panchayats

17. Training to the cattle owners

18. Training in composting and organic manure preparation

19. Application of manure in plantation and fishery

20. Insurance plan launched

21. Implementation of insurance plan

22. Encourage local people
All the activities shown in above table 3 are organized according to the plan and timely. There is one activity on Counselling them not to use non-native and invasive species which has been organized by the High ARCS project team at 3 clusters but team is not convinced with its impact and that is why it is planned to conduct the counselling program on above issue in collaboration respective government departments. According to local demands and community needs the project team in collaboration with other local stakeholders has been organizing some other activities such right and entitlement; eco tourism development; natural and human resource development; enterprise development of forest produces; awareness on water borne diseases etc.

4.0 Results produced

The Action Plans reported in D7.1 included a Logical Framework Table with goals, activities, indicators, means of verification and expected results (outputs). In the following section, the activities actually implemented within each main Action will be reported, and the preliminary results as of August 2013 presented and discussed.

The proposed activities in IAPs are organizing with specific implementing and monitoring strategies designed in 2011-12. CDHI in collaboration with respective departments and local institutions has been organizing 54 numbers program of 21 activities out of 23 at all three clusters. The major activities which have been done so far are shown in Table 4. All the indicators of results have been verified through field survey, FGD, interview with key persons, project documentation and government data.

4.1. Impacts

The overall basic impacts till date are – i)regenerating aquatic resources and promoted their wise-use, ii) optimize access to and control over the resources, iii) Marginalized communities including local institutions-SHGs, farmers club, Village development committee etc. are strengthened and consolidated their livelihood endowments and iv) Fostering relationship between service providers and community / project participants.

The following table 4 shows the activities to achieve the objectives with measurable indicators as well as institutional support to create some impact on ecosystem services and sustainable livelihoods.

Table 4: Overview of impacts
<table>
<thead>
<tr>
<th>Objectives</th>
<th>Activities</th>
<th>Indicators</th>
<th>Impact so far</th>
<th>Collaborative Institutions / Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build capacity of existing self-help groups for biodiversity conservation activities regulations.</td>
<td>Encourage, support and capacity build the SHGs to monitor levels of sediment in rivers</td>
<td>Number of meetings organized, Training events and Members</td>
<td>SHGs are re-activated towards High ARCS. For an example SHGs are involved in planting the trees of 7000. They are creating awareness for stopping to catching small fishes.</td>
<td>Local governance, project team (PT) and SHGs.</td>
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<tr>
<td>Awareness building and information dissemination.</td>
<td>Dissemination among stakeholders</td>
<td>Number and population/</td>
<td>5000 poster on bio diversity protection and 3000 leaflets distributed.</td>
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<tr>
<td>Discussion and seminars at the local levels</td>
<td>Fishes and other animals (non-fish – e.g. molluscs, shrimps etc ) for food Water for both human and animal consumption.</td>
<td>54 program on different issues organized.</td>
<td>PT, local governance and line deptt.</td>
<td></td>
</tr>
<tr>
<td>Painting competition among children</td>
<td>Number</td>
<td>4 program with children organized.</td>
<td>PT, Education department and Children.</td>
<td></td>
</tr>
<tr>
<td>Catalyzing farmers’ clubs innovation forums</td>
<td>Mobilization of farmers Number of farmers Attendance at the meetings</td>
<td>More than 350 farmers attended in 8 meetings.</td>
<td>PT and Agriculture depatt.</td>
<td></td>
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<tr>
<td>Training and other capacity building inputs</td>
<td>Training events Farmers trained</td>
<td>Training on paddy SRI is organized and 45 farmers trained.</td>
<td>-do-</td>
<td></td>
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<tr>
<td>Facilitating linkage with banks and other institutions</td>
<td>Visit of by the bankers,Visit and collaboration of departments , Bank facilities.</td>
<td>Fostering relationship with line deptt. and banking institution.</td>
<td>PT</td>
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<tr>
<td>Activity</td>
<td>Outcome</td>
<td>Implementing Agency</td>
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<tr>
<td>Counseling them not to use non-native and invasive species</td>
<td>Two counseling event has been organized and 80 farmers benefitted.</td>
<td>PT and Forest deptt.</td>
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<tr>
<td>Creating awareness about the existing provisions of conservation using the earlier action plans</td>
<td>One program has been organized and 60 participants attended</td>
<td>Forest deptt.</td>
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<td>Disseminating the learning to other communities and the government agencies</td>
<td>Workshop is organized for dissemination of the learning.</td>
<td>PT.</td>
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<tr>
<td>To re-orientation of local governance.</td>
<td>Two program organized for member of governance.</td>
<td>PT</td>
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<tr>
<td>Training on micro-planning for fine tuning high arcs project components into their mainstream programs</td>
<td>3 program is organized.</td>
<td>PT and Forest deptt.</td>
<td></td>
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<tr>
<td>Facilitating linkages of different agencies with panchayats</td>
<td>Good collaboration is created on different issues.</td>
<td>PT</td>
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5.0 Observation on Implementation

5.1 Issues during the implementation process

On the whole, the implementation process of the Action Plans went quite smoothly. Table 4 shows how the actual implementation happened, which type of specific activities we did, what reactions/results they produced, what obstacles/challenges we met, how we addressed them.

Table 4: Overview of implementation process: activities, results, methods, problems faced and solutions found.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Action</th>
<th>No</th>
<th>None</th>
<th>None</th>
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<tbody>
<tr>
<td>into their mainstream programs</td>
<td>Local stakeholders and community are better informed about the different Acts</td>
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<tr>
<td>Creating awareness about the existing provisions of conservation.</td>
<td>Power point presentation</td>
<td>No</td>
<td>None</td>
<td>None</td>
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<tr>
<td>Training on the government schemes related to livelihoods.</td>
<td>Community members are getting benefits of all the government schemes</td>
<td>No</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Field survey</td>
<td>Identified the possibilities of the fish farming and sharing with the community members</td>
<td>No</td>
<td>None</td>
<td>None</td>
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<tr>
<td>Training on the use of Water for different purpose.</td>
<td>Optimum use of water.</td>
<td>No</td>
<td>None</td>
<td>None</td>
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<td>Capacity building for members of local governance.</td>
<td>Included the High ARCS issues in government planning.</td>
<td>No</td>
<td>None</td>
<td>None</td>
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<tr>
<td>Mobilization of farmers and formation</td>
<td>Farmers club formed and doing multi</td>
<td>Yes</td>
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</table>

We faced difficulties in collecting the

We approached to the
<table>
<thead>
<tr>
<th>Event Description</th>
<th>Details</th>
<th>Actions</th>
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<tr>
<td>of farmers club</td>
<td>cropping practices and involved in environment protection.</td>
<td>PRA</td>
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<tr>
<td>SOS workshop on High ARCS Deliverable reports</td>
<td>Shared and reflected back of High ARCS findings.</td>
<td>Group discussion and power point presentation.</td>
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<tr>
<td>Awareness creation about the importance of Plantation</td>
<td>Protecting the environment and biodiversity</td>
<td>Discussion, consultation and lecture</td>
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<td>SOS Workshop on Environment protection</td>
<td>To protect the biodiversity</td>
<td>Handholding training</td>
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<td>Follow-up visit of IAPs</td>
<td>To make sure whether stakeholders following the action plan</td>
<td>Group discussion</td>
</tr>
<tr>
<td>Capacity building program for SHGs towards</td>
<td>Involved in environment protection activities and</td>
<td>Field visit and discussion</td>
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<td>High ARCS.</td>
<td>planting trees.</td>
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<td>Training on ponds and fishing</td>
<td>Made the community to earn a minimum livelihood. New ponds developed and old pond renovated. Illegal fishing is declining.</td>
<td>Group discussion and field visit.</td>
</tr>
<tr>
<td>Training on livestock and Linkage with the animal husbandry department</td>
<td>Ensured good health of the cattle’s which will help to ensure minimum livelihood of the community members</td>
<td>Group discussion and visualisation</td>
</tr>
<tr>
<td>SOS workshop for advocacy and policy integration.</td>
<td>Shared and reflection of High ARCS research findings and some of the activities done by other stakeholders.</td>
<td>Power point presentation</td>
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<tr>
<td>Linkage with the Forest</td>
<td>Built better relationship</td>
<td>Group discussion</td>
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<td>Department</td>
<td>with community living in forest fringe village and forest officials.</td>
<td>,follow-up</td>
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<td>Training conducted on awareness on biodiversity protection.</td>
<td>Listed out the work distribution of the community in different groups</td>
<td>Group discussion</td>
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<td>Awareness on Ecosystem service</td>
<td>To aware common people on biodiversity and ecosystem services</td>
<td>Discussion, consultation Lectures</td>
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<tr>
<td>Capacity building for members of local governance.</td>
<td>Included the High ARCS issues in government planning.</td>
<td>Discussion, consultation Lectures</td>
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<td>SHGs involvement in identifying the aquatic resources</td>
<td>Listed out the aquatic resources available in the area</td>
<td>Group discussion</td>
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<td>Meeting farmers club and fisher men</td>
<td>Educated them for multi cropping and educated them to revive the fishes.</td>
<td>Discussion, consultation Lectures, presentation</td>
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<td>Training on manure</td>
<td>52 youths have skill for manure</td>
<td>Discussion, Exposure and</td>
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SHGs: Self Help Groups
The availability of scarce or absent plants and water for animal consumption is now improving by involving local stakeholders and line departments. For an example forest departments and SHGs are involved in planting the trees (information available in project documents and forest department) Now they are implementing public schemes including soil conservation, 100 days work, plantation etc. The amount of water available during the dry period is slowly increasing by cleaning and renovating the drainage system as well as repairing of pipe line for drinking water. The pollution of drinking water is slowly improving due to mass scale awareness among the local households. Data and information is available in documents of local governance (Annual report of Rajabhatkhawa Gram Panchayat, 2012 and CDHI’ CBIDP quarterly report, April 2013).

The problem in Buxa is that fishes for human consumption (subsistence and commercial) is reduced as well as the variety of fish harvested has reduced. Now awareness is created by joint venture of Fishery department and CDHI (technical support provided by fishery department)resulting in development of new ponds and renovation of existing ponds as well as number of fishing person is increased (please see the CDHI’s Annual report 2012-13).

Local level institutions including women SHGs, farmers club are more empowered towards livelihood rights and eco system services. Now more than 70 % households are doing animal
husbandry / livestock business for sustainable livelihoods. Multi cropping practices including paddy SRI-Systematic root intensification is adopted in the project area which is initiated by CDHI and Agriculture department. Now local community including FRC- Forest right committee, EDC- Eco development committee etc and forest department are protecting medicinal plants (Please see the CDHI Annual report 2012-13 on CBIDP-community based institution development program ).

- To control the flood, rivers are now wide with high river beds (people often have to dig river beds for water harvesting during dry periods at different project villages including Adma, Chunabhati, Onchloom, Lalbangla) are protected in constructing the dyke by using boulders and iron mesh at Adma river and Jaynati river bed. People were suffering from many different water borne diseases, which was also resulting in more expense in treatments. Local health department data shows that now less diseases due to awareness undertaken by local governance, NGOs and Health department.

- New policy has been taken by forest department regarding Tourism which was an issue resulting in more tourist which has resulted some income but also more pollution. Now department is very much restricted to follow the forest rules and regulation. The specific person with license holder can work as tourist guide and the department is organizing the training program for tourist guide as well as local villagers including male, female, youth and children.

- It is well established and visualized that the implementing and monitoring strategies developed in IAP-Integrated action plan in 2011-12 were effective and timely resulting in better implementation of government schemes carried out by forest department and local governance. The institutions and stakeholders are involved in this process very well resulting in good partnership is built between community / project participants and service providers as well as conflict is reduced. Building up ponds in bigger size is violating the forest rules resulting in slow progress of fishes for food ( both commercial and substances use ). It is also observed that illegal fishing techniques have declined due to awareness raising activities but fishery department should take major action to stop the illegal fishing in project area and catchment area as an emergency. The department also to plan how they can stop non-native species being used in fish ponds.

### 5.3 Description and reflections on impacts

The overall impacts of the High ARCS project so far are including enhancing ecosystem services and biodiversity values, diversified and sustainable livelihood and well-being enhanced and enhanced policy formulation and integration.

Before High ARCS, it was found that water consumption for both animal and human was a burning issue due to reduced flow and drying up of rivers. Some storage systems have been developed to store water from the source of river water to the villages through pipe line during the project interventions. Now the considering reality, line department and local governance are taking up actions to provide quality water to all households. The leaked pipes are repaired as well as number of storage tank is increased. Households have now rain collection systems for consumption of animal. Before High ARCS project intervention, the quality of water for drinking purpose was an issue contains several physical and chemical impurities, and bacterial contamination due to human and animal waste as well as use of pesticides in agriculture field. The
concentration of the pollutants in the water were increasing in the dry season as the water flow of the main river and tributaries becomes very low. Health department, Government of West Bengal and High ARCS project team is creating awareness among the community members as well as mobilizing farmers resulting in decreasing pollution as people are now doing animal husbandry in more scientific way as well as farmers are not using chemical fertilizers in agriculture fields.

The large areas both within the Buxa site and outside ‘benefit’ from the provisioning ecosystem service of fishes for food generated within the Buxa site. These areas benefit people as the fish are caught and sold in the markets away from Buxa site, often being sold at high prices due to their good taste and high nutritional value (as expressed by the people during FGD). The local fishermen benefit as they often make a good profit. However as already discussed harvesting of fish is declining in the site and to provide a sustainable supply of fishes for subsistence use and commercial use, many issues need to be addressed. Critically an improvement in water quality and an increase in flow in the dry periods must be achieved. To considering the present scenario government department is taking up some actions including soil conservation, dike repairing, plantation, 100 days work under MGNREGS- Mahatma Gandhi national Rural Employment Guarantee Scheme to provide work to poor family (MGNREGS has good role in renovate ponds, water management, plantation etc), developing the new ponds, renovation of existing ponds etc which are very encouraging for the villagers. The supply chain from the harvester to market has improved at Santhalabari as there was poor market infrastructure before High ARCS project but need more such market infrastructure.

The loss of flood regulation has been caused by deforestation, increased runoff and soil erosion (leading to sedimentation) which has reduced the systems natural ability to regulate flood waters during the monsoons. There were no management strategies in place or in development (from the government) to try and strengthen the flood regulating services provided naturally by aquatic systems and their catchments. During the project actions the villagers and local governance are using their own manpower and are constructing temporary dikes made of bamboo, iron mesh and wood. They have also constructed boats which they use during flooding. Now government department is constructing the dikes, small bridge as well as doing some soil conservation work. The local level institutions like SHGs, Forest right committee etc are enough empowered to include flood issue in government planning process for implementation.

Before High ARCS project community were depending on forest department for their livelihood and there was no social mobilization regarding aquatic resources and biodiversity. Now the local level institutions are more active in doing such social activity as well as farmers giving more attention to the agriculture farming and practicing multi cropping practices. Due to High ARCS actions they are also not catching the small fishes and communicating with Fishery department for community level fish culture.

The convergence among the different level stakeholders / institutions including different line department is created on aquatic resources and ecosystem services during the High ARCS project resulting in some of the activities are organizing in collaboration with project team and line departments. This convergence and synergy will also help to adopt the good results of High ARCS to other places.

5.4 Self assessment

Making a “self-assessment” ranking of how well we succeeded to reach the impacts compared to activities, objectives and expectations on a marks from 1 (no impact or worse) to 5 (fully reached or surpassed) has
been done. The ranking joint exercise is done with the local partners institutions and local level policy makers.

The following table 5 shows that there is significant outcome to re-orient the members of local governance toward High ARCS project and then awareness building and promotion of IEC. There is also good progress on capacity building of SHGs who are emerging as a strong institution. There is need to promote the live stock and insurance in creating active involvement of Animal husbandry and livestock department.

The ranking for achieving the objectives is done on the basis of initial impact of the activities and perception of local level stakeholders. The FGDs have been conducted for priority ranking of each activities. One the basis of marks (1 to 5) of each activities, total marks sum up of each action and highest marks considered as rank 1 or top ranking and rank 5 considered as lowest ranking of action.

**Table 5:** Activities, objectives and ranking

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Activities</th>
<th>Marks</th>
<th>Ranking for achieving objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build capacity of existing self-help groups for biodiversity conservation activities regulations.</td>
<td>Encourage, support and capacity build the SHGs</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Encourage, support and capacity build farmers clubs</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Encourage local people in each village to prepare a biodiversity register</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Planting trees</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Build small fish pond</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Awareness building and information dissemination.</td>
<td>Dissemination among stakeholders</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Discussion and seminars at the local levels</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Painting competition among children</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

( Average score of each activity is 3.40 )

Existing SHGs or local institutions need capacity and skill to explore the aquatic resources and protection of environment and ecosystem services. These are institutions who can continue the high ARCS activities beyond project support.

( Average score of each activity is 4.00 )

The villagers and local level institutions at forest fringe villages of the project area are lacking of knowledge related to bio diversity and ecosystem services. Dissemination of IEC materials can play vital role to enhance their knowledge and articulation.
### 6.0 Summary of findings and recommendations.

The mobilization of farmers and farmers club are important to conserve the wildlife and other species as well as ensuring quality water in doing organic farming.

The activities to achieve objectives considered as to priority as members of Panchayat are local level implementing agency of all activities as well as they can continued the high ARCS activities even after completion of project support.

Lowest ranking as the activities are not so much directly related to High ARCS project.
In Buxa, it has been visualized / shown that policy programs and legal provisions aiming the protection of the environment and the improvement of local livelihoods exist and complex organizational set-ups are in place through which they are being implemented. Within this institutional and policy framework, competing interests and concerns for access to and use or protection of the local aquatic resources are being played out. The report has shown that significant institutional supports are available to implement the IAPs though few challenges exist for further protection or improvement, such as need of smooth coordination amongst the line departments, the provision of adequate knowledge base for local stakeholders and institutions, lack of transport and market linkages etc. The conflict among the user groups within project area is minimized, but in some cases conflicts amongst user groups and local institutions have been observed and various measures such as counseling, advocacy etc. are being suggested to address these conflicts through combined efforts of CBO- community based organization and user groups and facilitation of negotiations amongst stakeholders. Also suggested to organize more need based training and awareness campaigning.

There are positive changes and impacts related to institutional and policy aspects such as commitment from appropriate institutions biodiversity protection and sustainable agriculture is adequately assured; existing conservation and livelihoods policy frameworks are deployed; participation of common people and awareness is increasing; forest department is now fully aware about decline in aquatic resources; trust between line department including forest management and community is encouraging and local level institutions are strengthening and empowering on aquatic services and their rights.

7.0 Analysis of the implementation of actions

Two programs –launching of insurance plan and implementation of insurance plan for livestock yet to be organized in collaboration with line department but community are not so much interested to insure the animals as the mortality rate of livestock is negligible. To considering the fact CDHI and community has decided to omit these two activities from the proposed IAPs.

The project activities are done in time and the remaining program will be completed before October 2013 to achieve the ultimate goal of the High ARCS. The stakeholders and institutions are very supportive and collaborative and now there is no major challenges project team is facing except natural calamities. The project research team and other stakeholders have appreciated the methodologies and strategies adopted as resulting is encouraging and motivating. There are recommendations and suggestions evolved from stakeholders including community are as follow

- Promotion of demonstration plot on ecosystem services and sustainable livelihood to be included in the planning process.
- State level workshop with policy makers to be organized for policy integration.
- Research findings to be discussed with community and stakeholders for creating the ownership.

The project team is very much optimistic and willing to adopt the good learning at other area of North Bengal and other state like Terai region of Bihar and Assam.

8.0 List of references
i) Ray D & Mishra R. High Land aquatic Ecosystem services and Biodiversity, Buxa, Sep 2011.(D 3.1 / WP 3)

ii) Mishra R, Ray D & Sudgen F. Livelihoods in Highland areas, Buxa, West Bengal, May 2011( D4.1/ WP 4)

iii) Mishra R & Ray D Institutions, Policy and Conflict, Buxa, West Bengal, Sep 2011( D 5.1 /WP 5)

iv) Flood Protection and Ecosystem services in the Chehalis river basin, May 2010, Prepared by Earth economics.


vi) Report on Implementation and Monitoring Strategy agreed for IAPs, Buxa, India, 2012 ( D 7.1 / WP 7)

Section 5 : Site report from Quang Tri, Vietnam
Title: Report concerning lessons learnt regarding adoption and implementation of actions (process) and actions achieving goals (impacts) with country reported results of Implementation and Monitoring activities included as annexes

Vietnam site-reporting for D8.1

Preliminary version, August 20, 2013

Authors: Nguyen Thi Dieu Phuong, Do Van Thinh, Nguyen Thi Hanh Tien, Soren Lund, Kevin Smith, and Stuart W Bunting

Research Institute for Aquaculture No.1, Vietnam

Date: August 2013
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Disclaimer: Preparation of this working paper was supported by the European Community FP7 HighARCS (Highland Aquatic Resources Conservation and Sustainable Development) project [Contract No: 213015]. This publication reflects the authors' views, and the European Community is not liable for any use that may be made of the information contained herein.

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Introduction

The Highland Aquatic Resources Conservation and Sustainable Development (HighARCS) project aims to enhance livelihoods, conserve aquatic biodiversity and encourage sustainable development at five sites including Guangdong, China, Uttarakhand and West Bengal, India, Northern and Central Vietnam. The project analyses the status of highland aquatic resources, examines ecosystem services, livelihoods of poor people and biodiversity conservation issues of highland aquatic resources in order to produce integrated action plans addressing livelihood, conservation and policy issues in collaboration with various local stakeholders. In order to.

Two study sites in Vietnam were selected based on the following criteria: study sites must occupy areas demonstrating typical characteristics of highland environments that are not situated on the alluvial plains and they representative of Northern (Son La Province) and Central (Quang Tri Province) Viet Nam. These areas are situated within the upper reaches of a watershed and provide a home for many poor people. Through a long process of in-depth studies, ecosystem system assessments and stakeholder meetings a number of appropriate action plans were identified at each of the two selected sites. However, due to budget, staff and time limits, the decision was made in consultation with the HighARCS project leader and the project work packages leaders to carry out action plans at the site in Quang Tri Province only.

The three communities in the Quang Tri study site are situated along the watershed and are dependent for their livelihoods on aquatic resources, ecosystem services and biodiversity in the watershed. Based on further discussions including the use of a stakeholder Delphi consultation technique (HighARCS D5.2, 2012, revised 2013) and stakeholder workshops, five major integrated actions were selected and planned for implementation in Quang Tri, including strategies for their implementation and monitoring (reported in HighARCS (new) D7.1, December 2012).

The new D8.1 is an integrated report of the process and results of the implementation of all the action plans which originally were devided up in wp 6, 7, 8, not just the policy action plans. This deliverable is one of the key outputs of the HighARCS project. It accounts for the implementation of the jointly elaborated action plans at the Quang Tri study site. Did we achieve the impacts expected? And what lessons did we learn about action planning for wise use of aquatic resources across the HighARCS site in Vietnam?

This report is describing and reflecting on:

(a) process: the step-wise implementation of the activities planned (or necessary) to achieve the action plans, and
(b) outcomes: the impacts achieved through these actions.

The Vietnam site reporting is basically follows the framework proposed in the agreed I&M strategies submitted in July/August 2012 and reported in the new D7.1 from December 2012.

**Overview of Planned Actions at the Dakrong Site**

Based on all WPs outputs, problems faced, solutions and action plans were identified as following Table:

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>SOLUTIONS</th>
<th>ACTION PLANS</th>
</tr>
</thead>
</table>
| Low awareness of local people in aquatic resources conservation | Awareness raising    | - Enhance local people’s knowledge about fish stock and aquatic environment issues  
| Destructive and unsustainable fishing methods       | Development of policy and legal framework | - Detail and suitable regulation in aquatic conservation  
|                                                   | Enforcement           | - Clear punishment regulation for destructive fishing  
|                                                   | Training capacity     | Train local staff in aquatic resources conservation  
|                                                   | Local management in aquatic resources | - Decentralization in aquatic resources management  
|                                                   | Awareness raising     | - Enhance local people’s knowledge about fish stock and aquatic environment issues  
| Hard climatic conditions (lack of water, complicated topography, climate change) |                         |  
|                                                   |                          |  
| Water pollution (agriculture, industry waste, hydropower dam) | Development of policy and legal framework | - Develop policy in environment protection and wastewater treatment policies.  
|                                                   | Enforcement            | - Enforce environment protection regulation  
|                                                   | Training capacity      | - Enforce environment protection regulation  
|                                                   | Awareness raising      | - More strict in giving permission for exploiting  
| Exploiting gold, sand, stone                      | Enforcement           | Stricter punishment for environmental pollution activities  
|                                                   | Policy                 | More strict in giving permission for exploiting  
| Weak enforcement                                  | Enforcement           | - Stricter punishment  
|                                                   | Training               | - Decentralization in aquatic resources management  
| Lack of access to information                    | Local management       | - Build village regulation  
|                                                   |                        | Build village regulation  
| Livelihood difficulties                           | Improve livelihood and living condition | - Drinking water support: Construct water tank to promote more easily suitable drinking water  
|                                                   |                       | - Expand use of mini-hydropower  
|                                                   |                       | - Promote medicinal plants protection  
|                                                   |                       | - Training in production of handicrafts for tourism  

### Table 1. Type of problems, proposal solutions and action plans
### Table. Integrated Action Plan: activities, indicators, implementers and monitoring

<table>
<thead>
<tr>
<th>Specific objectives</th>
<th>Activity</th>
<th>Indicators</th>
<th>Main responsible agency</th>
<th>Monitoring &amp; Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raise awareness of local people on the conservation of biodiversity and aquatic resources</td>
<td>Communication tools: campaign in biodiversity conservation; HighARCS calendar; poster presents at public place</td>
<td>1 contest for school children (poster/oral/presentation/written) 1 poster at commune station Conferences, festival, field trip</td>
<td>RIA1, Darkrong commune</td>
<td>A same set of questionnaire will carried out at the beginning and after 6 or 12 months; assessment how much awareness improved by age, gender and different stakeholder groups Participatory assessment</td>
</tr>
<tr>
<td></td>
<td>Training in law environment protection; regulation and fisheries law for staff and local people</td>
<td>1-3 training for commune</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atlas of fish species in Dakrong river</td>
<td>Atlas of fish species and for flagship species</td>
<td>RIA1, FIN and IUCN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Publication</td>
<td>Articles/news of HighARCS will be posted on Quang Tri website, TV, radio program</td>
<td>RIA1, FIN</td>
<td></td>
</tr>
<tr>
<td>Local management for better conservation aquatic resources</td>
<td>Decentralization in aquatic management and environment protection</td>
<td>- Setup management group - Quantities of fish collected</td>
<td>- Commune People Committee &amp; village</td>
<td>Group of management people Performance of its assessed after 6 or 12 months</td>
</tr>
<tr>
<td>---</td>
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<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Setup village convention in aquatic conservation and environment protection</td>
<td>3 conventions for 3 communities</td>
<td>RIA1, villages, commune, district people committee</td>
<td>3 conventions for 3 communes - Participatory assessment its affect</td>
</tr>
<tr>
<td>Improve livelihoods and living conditions</td>
<td>Expand using mini hydropower</td>
<td>mini hydropower</td>
<td>villages, commune, district people committee</td>
<td>No. of mini hydropower is increased Quality assessed by participatory</td>
</tr>
<tr>
<td></td>
<td>Construct water tank and water filter</td>
<td>water tank</td>
<td></td>
<td>No. of water tank is increased Quality assessed by participatory</td>
</tr>
<tr>
<td></td>
<td>Training and setup cooperative of brooms, handicraft, textile produce for tourism production</td>
<td>Training cooperative established</td>
<td>district people committee</td>
<td>Number of training Number of participants Cooperative Quality assessed by participatory</td>
</tr>
<tr>
<td>Development of policy and legal framework</td>
<td>Limited in gold and mineral mining and limited new hydropower factory</td>
<td>Policy</td>
<td>Province District</td>
<td>Changing in policy/master plan (limited project for new hydropower; factory permission; budget for conservation biodiversity aquatic resources; building staff capacity</td>
</tr>
<tr>
<td></td>
<td>Detail guideline in environment protection and wastewater treatment policy</td>
<td>Detail regulation</td>
<td>Province, district</td>
<td>Detail regulations</td>
</tr>
<tr>
<td>Enforcement</td>
<td>Clear punishment and regulation for illegal fishing tools; gold and mineral mining</td>
<td>Detail regulation</td>
<td>Province, district</td>
<td>Detail regulations</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td>More strict punishment in illegal fishing tools</td>
<td>punishment; More staff monitoring</td>
<td>village commune district</td>
<td>Number of species conserve Illegal fishing tool reduced</td>
</tr>
<tr>
<td></td>
<td>More strict punishment gold and mineral mining and deforestation</td>
<td>More staff monitoring</td>
<td>village commune district</td>
<td>Water quality in Dakrong river is improved Habitat maintain Forestry cover</td>
</tr>
<tr>
<td></td>
<td>Factory is strict undertake environment protection regulation</td>
<td>undertake protection environment agreement</td>
<td>factory; district</td>
<td>Number of factories signing and following environment protection agreement</td>
</tr>
</tbody>
</table>

Above Tables was introduced and discussion in Stakeholder meetings in Quang Tri. Stakeholders not only involved in raise awareness, understand specific objective of purpose of project but also understand their (institution and personal) responsibility involved in protection/conservation aquatic resources for sustainable. Stakeholder also given comments for HighARCS staff and discussion about activities. Minutes of Stakeholder meeting will present in Annex.

**Links to Ecosystem services.**

The IAP objectives and activities have been developed to either improve or conserve the highly valued ecosystem services identified by stakeholders through the assessment phase of the project. Table 2 shows the links between the activities and the ecosystem services they are related to. The most valued ecosystem services at the site were the fish and shrimp harvesting, small scale hydro-power provision for villages, water provision and flood control (please see the Work Package 3 – D3.1 report for more information). The activities of the IAP are mostly targeting fishes and shrimp provision and water provision through Raise awareness of local people on the conservation aquatic resources and biodiversity, sustainable local management, improve livelihoods and living condition, adequate more suitable policy & legal framework, improve enforcement by many activities such as children contest, training law of environment protection, training degree, circulations, regulations; fish sampling for research biodiversity of fish species in Dakrong, communication.... These activities are aiming to target improve protect fish and shrimp provision.

Water provision (for human consumption) is being targeted through sugession to villages, commune, district to carry out IAP by construction tank or water fillter, develop guideline.
protection water resources, protection forestry, limited gold mining as well as improve enforcement. These activities aiming to target, improve protect water provision.

Flood control is being targeted by improve protect forestry and prevent gold mining. Activities are aiming to target ecosystem services as shown in Table 2.

Table 2. Action Plan and ecosystem services targeted

<table>
<thead>
<tr>
<th>ACTIONS &amp; Activities</th>
<th>Key Ecosystem Services</th>
<th>Hydropower (small scale provision for villages)</th>
<th>Water provision</th>
<th>Flood control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Raise awareness of local people on the conservation of biodiversity and aquatic resources</strong></td>
<td>X = Action directly relates to ecosystem service</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Campaign to raise awareness of biodiversity conservation and values</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Training in law environment protection; regulation and fisheries law for staff and local people</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Fish sampling and production of an Atlas of fish species in Dakrong river</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Communication and media publications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2. Establishment of sustainable Local management structures for better conservation and wise use of aquatic resources</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Decentralization in aquatic management and environment protection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Setup village convention in aquatic conservation and environment protection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3. Improve livelihoods and living conditions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Expand using mini hydropower</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>b) Construct water tank and water filter</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>4. Development of more adequate policy and legal frame work addressing pressures on aquatic resources</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Development of new regulations aimed at limiting gold and mineral mining and new hydropower development</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>b) New guidelines on existing regulations and policies on the protection of forestry and water resources</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>c) New Provincial and District regulations on illegal fishing and mining (highlighting criminal offences and punishment)</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><strong>5. Enforcement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Improving enforcement of illegal fishing practices and tools</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>b) Improving monitoring and enforcement of illegal gold and mineral mining and deforestation</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>c) Improve the enforcement of industrial pollution</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
**Objective 1: Raise awareness of local people on the conservation of biodiversity and aquatic resources**

There are 3 activities:

**Activities 1: Communication tools**

The contest Understanding on Biodiversity and aquatic resources conservation in Dakrong children were organised on 27 Dec 2012 from 18:00 PM-21:00 PM at Secondary school of Dakrong

- **Participant**: All Children of of 3 schools: primary school of Dakrong 1, primary school of Dakrong 2 and secondary school of Dakrong commune

- **Team setup for competition**: Each school establish a team. For section answer questions has five members, the art section (theatricalize) unlimited the number of team member.

- **Clothes apparel for** Team member: Boys wear green trouser, white shirt, tie scarf, girls wear traditional dress of Pako;

**Regulation of contest: Consists of 04 parts**

**Part 1 (Called Introduction part)**: Each team have to present an Introduction including informations of school, team member, class as well as why the team attending the contest.

Duration for part 1: From 3 to 5 minutes;

Maximum score given for this part is 20 points.

**Part 2. (Called Passing the barricade part): Answer the knowledge questions on Biodiversity and aquatic resources conservation**

- Each team answered quickly ten questions with content of knowledge related to the understanding and protection aquatic resources at Dakrong district.

- Time for section 2: About 10-15 minutes. Each team will appoint a members representative for the team to answer questions.

- Questionnaire for each team were random,

- Each of correct answer the team get 5 points, wrong answers 0 poin. If team had no answer for the question then can skip and went to the next questions.

- The maximum score for this section: 50 points

**Part 3. (Called Increase speed): Art performance contest**
Each team represented:

- Genre: Folk songs, singing and dancing of the Van Kieu people, ...

- Subject: Talk about Uncle Ho, homeland, country, teachers, friends, school...

- The art performance is prepared carefully, relate to content of contest Understanding Biodiversity and Aquatic resources conservation

- Duration of presentation for each team: From 5 to 7 minutes

- The maximum score for part 3: 25 points.

**Part 4. The finished part (Called finishing)**

Each team built a small skits which has content expressed understanding about aquatic resources at local, situation exploiting fish and reduce aquatic resources after that give the recommendations and comments of individuals to contribute to the protection of aquatic resources on the river at Dakrong district.

- Time present section 4: from 7 - 10 minutes.

- The maximum score for part 4 is 30 points.

All detail in video link (will sent to Maan to post to HighARCS website) and pictures:

**Jury:** Phuong and Tien (HighARCS project), Hung (Dakrong district leader), Cham (Leader of Department of Culture and Information), Thanh (Leader of Secondary school), Ninh (Leader of Department of Exploitation and protection of Fisheries in Quang Tri province), Huong (Staff of Department of Agriculture and Rural Development of dakrong district)

**Mark and ranking:** Based on the total points through four parts of contents calculated for each team. Contest will rank the first prize, second, third and some sub-prize.
The contest were creating a useful playground where pupils of each team from the different school can share, learn and exchange experiences with other teams. This contest help them understand better about the diversity of aquatic species in the Dakrong river, the value and importance of river, streams and aquatic resources for local life. Base on these activities make people to change behavior in the process of mining, fishing, contributing to the conservation and protection of aquatic resources in the Dakrong river.

The contest has attracted the interest and attention of the leaders at Dadrong district and departments at district level and local people.

- Representative district’s leaders attent: Mr. Pham Van Hung - Vice Chairman Dakrong.

- Representative of Department of Education and Training Dakrong:

- Representatives of local exploitation and protection of aquatic resources attent: Nguyen Huu Ninh - Deputy Head of Exploitation and Protection of Aquatic Resources.
- A representative of the Research Institute for Aquaculture No 1: Ms. Nguyen Thi Dieu Phuong - Deputy Head of applied Biology department and 2 researchers of RIA1.

- Representative of Dakrong Cultural department: Mr. Tran Van Chay and some staff.

- Representative of the school: the teachers from three schools the Dakrong Primary School number 1 and 2, The Dakrong Secondary school.

- All the students from three schools and the People at Commune Dakrong.

Contest Results: After more than 2 hours contest. The competition ended with a deep impression.

Sub-Prizes:

- The most impressive display greeting: The Dakrong Secondary School

- The best performance: Dances "Khan Quang Thap Sang Binh Minh" - Repertoire of The Dakrong Primary School No. 2

- The best Theater: "Together protect aquatic resources" – of The Dakrong Primary School No. 1

Group Award:

- The first Prize: The Dakrong Secondary School

- Second Prize: The Dakrong Primary School No. 1

- Third Prize: The Dakrong Primary School No. 2

The competition attracted nearly 1000 pupils and local people at Dakrong commune. The schools require pupils practiced thoughtful, beautiful costumes. The content is high quality which brings for people a lot of information and knowledge on protection of aquatic resources in the rivers and streams at Dakrong district. Through the contest helped raise awareness for understanding the diversity of aquatic species in the Dakrong river. The value and importance of rivers and aquatic resources for and livelihood of local people. From activities will change behavior of local people in the process of mining, fishing to contribute in the conservation and protection of aquatic resources in the rivers, contributing to the reduce poverty at Dakrong district.

The banner:

- Title: Contest Biodiversity and protect aquatic resources
- event: Contest for pupil at 2 primary schools and a secondary school in Dakrong commune
- date: 27 Dec 2012,
- place: Secondary School of Dakrong, Dakrong commune

- The purpose the banner was created: Formal and Raise attention to all pupils, teachers and local people including their parent, family members, etc. regarding value of fish biodiversity and necessary protection Dakrong river and fish resources.

- Audience: Audience are pupils, teachers and local people including their parent, family members, friends, neibourgh... who are living near school.

- Display: 3 schools and local public place such as communities office

- Summarize the content of banner: notice of the content of contest Biodiversity and protect aquatic resources including date, HighARCs symbol, organiser of contest (RIA1 cooperation with Department of Culture and Information of Dakrong district)

Figure. The banner of contest "Understanding biodiversity and protection of aquatic resources"

**Activities 2: Training in law environment protection; regulation and fisheries law for staff and local people**

- Training to raise awareness on aquatic resources conservation and environment protection in Dakrong
- date: From 25-26 Dec 2012
- Place: People committee of Dakrong commune; People committee of Dakrong district.
- presentors: (1’) Mr Nguyen Huu Ninh: Deputy Head Department of Exploitation and Protection of Fisheries Resources, Quang Tri province and (2) Mrs Nguyen Thi Dieu Phuong- HighARCS project

- The audience:

  + Training at communes: about 40-50 participants including local farmers/fishing people at different village, commune staff representative in women union, youth union, elderly union, leaders of villages in commune.

  + Training at district: about 40-50 participants including stakeholders related with aquatic resources conservation such as distric staff and village staff representative in agriculture department, environment and resources protection, women union, youth union, elderly union, leaders of communes in district.

- Presentations have been used for 2 training to raise awareness on aquatic resources conservation and training environment protection in local area general, Title of PowerPoint Presentations as following:

  + Decree No. 31/2010/ND-CP from government regulation on administrative sanctions in fisheries areas.

  + Circular No. 01/2011/TT-BNNPTNT date 05 Jan, 2011 from Mimister of Agriculture and Rural Development on amended and additional list rare aquatic species with endangered required protection recovery and development.


  + Directive No. 01/1998/CT-TTg date 02 Jan, 1998 from Prime Minister on prohibited use explosive, poisons, electrical impulses in exploit fisheries.

  + The role of environment on human life

- Summarize or describe the contents of ppt: Presentations content extract and summary update decree, circular, directive, regulation, papers, information update and figures relating to fisheries conservation and environment protection.

- Purpose of the presentation: Raise awareness and raise concern of local stakeholders regarding to aquatic resources conservation at stream, river in villages Dakrong communes, Dakrong district, Quang Tri province.

Indicator of training at Dakrong district
Before the training

After the training

Figure. Change awareness of participants: percentage of participants answer correct before and after training at Dakrong district

Discussion: Representatives of HighARSC project presented the results of research about the diverse fish species at study site and the factors threat to the decline of species diversity. Mr. Nguyen Huu Ninh representative for protecting and management aquatic resources in Quang Tri province presented the fishing regulations, the list of species which need protection, mesh size, fishing seasons and other regulations for the protection of aquatic resources.

Through discussions Mr. Ninh shared the learn lessons in the activities management for local staff to learn and apply into the local situation. The discussion was helped officials of the departments in the district level as well as leader of communes in Dakrong district understand and has a comprehensive view on the local aquatic resources. It also makes participants understand the regulations in the management of aquatic resources. Results of the changes express via questionnaire before and after the training.

Qua hình 1 ta nhận thấy nhận thức của người tham gia có sự thay đổi rõ rệt thể hiện: Trước khi tham gia tập huấn có 8.33% số người không trả lời đúng 50% số câu hỏi thì sau khi tập huấn xong còn số này đã giảm xuống một nửa chỉ còn 4.17%. Trái lại Số người trả lời đúng từ 50 – 80% lúc đầu chiếm tỷ lệ cao nhất là 54,17% thì sau tập huấn số người trả lời đúng trên 80% câu hỏi lại chiếm tỷ lệ cao nhất đạt 58%. Qua đây cũng cho thấy rằng người tham gia rất hứng thú với các kiến thức được đưa ra trong quá trình tập huấn đồng thời cũng thấy được hiệu quả của công tác tuyên truyền và tập huấn cho người dân trong việc bảo tồn và phát triển nguồn lợi thủy sản địa phương.

The training to raise awareness about the protection of aquatic resources for local people.

Local people who are directly involved and influence on the preservation of aquatic resources. So raising of awareness of the people about conservation aquatic resources is essential. On
26.12.2013 the HighARCS project has arranged the training for the fishmen and representatives of departments at Dakrong commune.

Participants: Fishmen, representatives of the Dakrong Primary school number 1 and 2, The Dakrong secondary school, representatives of villages and these departments at commune level.

Through the training, representative from Research Institute for aquaculture No1 and management and exploiting fish department in Quang Tri province has communicated to the participants regulations and methods to protect aquatic resources at study site.

![Before the training](image1)

![After the training](image2)

**Figure. Change awareness of participants: percentage of participants answer correct before and after training at Dakrong commune**

Là cán bộ thôn xã và những người dân tham gia đánh bắt, trình độ hiểu biết về bảo tồn nguồn nguồn lợi thủy sản còn hạn chế. Trước buổi tập huấn số người trả lời đúng dưới 50% bọ câu hỏi chiếm 21% và số người trả lời đúng từ 50 – 80% bọ câu hỏi chiếm cao nhất 50, đúng thứ 2 là 29 số người trả lời đúng trên 80% bọ câu hỏi. Tuy nhiên sau khi được tập huấn nhận thức và hiểu biết của người tham gia đã có sự chuyển biến tích cực thể hiện bằng việc số người trả lời đúng trên 80% bọ câu hỏi tăng lên đáng kể đạt tỷ lệ cao nhất 54%. Thông qua buổi tập huấn cũng là nơi trao đổi chia sẻ các biện pháp biện pháp bảo tồn NLTS, biện pháp canh tác nâng cao đời sống cho người dân địa phương cũng người dân địa phương tìm ra các phương án thoát khỏi các khó khăn trong công dong. Là nơi để cho cán bộ chính quyền cũng như địa bàn có hiểu rõ hơn nữa tầm tự nguyên vong của người dân để từ đó có cách nghiên cứu tìm gia các giải pháp giúp đỡ hỗ trong công cuộc xóa đời giảm nghèo nâng cao sinh kế.

Comments of participants and local officer said when the project implemented at study site, people's perceptions from children to adults about protect aquatic resources has changed, local
people understood the role of aquatic resources to each family life and if they do not quickly embarked on conservation, the aquatic resources will decline in the near future. Through training participants would like the project and the authorities continue to work to help local people find other sources of livelihoods to reduce dependence on aquatic resources and better preservation of aquatic resources.

About the RIA1 and managers promised to try to best to resolve conflicts related to the conservation of biodiversity, especially of aquatic resources and to find out the other source of livelihood to improve the livelihood of local people. Planning for the future RIA1 will continue to coordinate with the Agriculture Department at Province level in implementing the conservation and culture the economy fish species such as eel, the survey the breeding characteristics of Mat fish ... Besides Ria1 will also cooperate the culture and information department disseminate wider to local people about protection aquatic resources through competition ....

Activities 3: Atlas of fish species in Dakrong river
Purpose: To provide update list of fish species in Dakrong river and related information to Researcher, teacher, Student.

Atlas of fish species in Dakrong river have been preparing. It including 2 sections:

- Fish species have been known in Dakrong river
- Potential new fish species in Dakrong river

Table. List of fish species have been known in Dakrong river

<table>
<thead>
<tr>
<th>No.</th>
<th>Vietnamese name</th>
<th>Scientific name</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Bọ cá Thát lát</td>
<td>Osteoglossiformes</td>
</tr>
<tr>
<td>I</td>
<td>Họ cá Thát lát</td>
<td>Notopteridae</td>
</tr>
<tr>
<td>1</td>
<td>Cá thát lát</td>
<td><em>Notopterus notopterus</em> (Pallas, 1763)</td>
</tr>
<tr>
<td>B</td>
<td>Bọ cá Chình</td>
<td>Anguilliformes</td>
</tr>
<tr>
<td>II</td>
<td>Họ cá Chình</td>
<td>Anguillidae</td>
</tr>
<tr>
<td>2</td>
<td>Cá Chình hoa</td>
<td><em>Anguilla marmorata</em> Quoy &amp;Gaimard, 1824</td>
</tr>
<tr>
<td>C</td>
<td>Bọ cá Chép</td>
<td>Cypriniformes</td>
</tr>
<tr>
<td>III</td>
<td>Họ cá Chép</td>
<td>Cyprinidae</td>
</tr>
<tr>
<td>a</td>
<td>Phân họ cá Lòng tong</td>
<td>Danioninae</td>
</tr>
<tr>
<td>1</td>
<td>Cá Cháo thường</td>
<td>Opsariichthys bidens (Gunther, 1873)</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td>2</td>
<td>Cá Đầm đất suối thường</td>
<td>Nicholsicypris normalis (Nichols &amp; Pope, 1927)</td>
</tr>
<tr>
<td>3</td>
<td>Cá Mắt sọc</td>
<td>Rasbora steimeri (Nichols &amp; Pope, 1927)</td>
</tr>
<tr>
<td>b</td>
<td>Phân họ cá Trắm</td>
<td>Leuciscinae</td>
</tr>
<tr>
<td>4</td>
<td>Cá Trắm cỏ</td>
<td>Ctenopharyngodon idella (Cuv.&amp;Val., 1844)</td>
</tr>
<tr>
<td>c</td>
<td>Phân họ cá Mương</td>
<td>Cultrinae</td>
</tr>
<tr>
<td>5</td>
<td>Cá Mương thường</td>
<td>Hemiculter leucisculus (Basilewsky, 1858)</td>
</tr>
<tr>
<td>6</td>
<td>Cá Đầu hổ</td>
<td>Toxabramis houdemeri Pellegrin, 1932</td>
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<tr>
<td>7</td>
<td>Cá Đầu sông mong</td>
<td>Pseudohemiculter dispar (Peters, 1880)</td>
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<tr>
<td>8</td>
<td>Cá đầu sông ngày</td>
<td>Pseudohemiculter hainanensis (Nichols&amp;Pope, 1927)</td>
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<tr>
<td>d</td>
<td>Phân họ cá Mè</td>
<td>Hypothalmichthyinae</td>
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<td>9</td>
<td>Cá Mè trông vẹt nam</td>
<td>Hypothalmichthys harmandi Sauvage, 1889</td>
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<tr>
<td>e</td>
<td>Phân họ cá Thè be</td>
<td>Acheilognathinae</td>
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<tr>
<td>10</td>
<td>Cá Thè be thường</td>
<td>A. tonkinensis (Vaillant, 1892)</td>
</tr>
<tr>
<td>11</td>
<td>Cá Buôm chậm</td>
<td>R. ocellatus (Kner, 1867)</td>
</tr>
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<td>g</td>
<td>Phân họ Cá Đực</td>
<td>Gobioninae</td>
</tr>
<tr>
<td>12</td>
<td>Hồ cá Đực ó</td>
<td>Hemibarbus umbrefer (Lin, 1931)</td>
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<tr>
<td>13</td>
<td>Cá Đực danh chấm</td>
<td>Microphysogobio kachekensis (Oshima, 1926)</td>
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<td>14</td>
<td>Cá Đúc danh chấm mỏm ngắn</td>
<td>M. yunnanensis (Yao&amp;Yang, 1977)</td>
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<tr>
<td>15</td>
<td>Cá Đúc trông ngà</td>
<td>Squalidus argentatus (Sauvage&amp;Dabry, 1874)</td>
</tr>
<tr>
<td>H</td>
<td>Phân họ cá Bồ</td>
<td>Barbinae</td>
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<tr>
<td>16</td>
<td>Hồ cá Bồ</td>
<td>Spinibarbus denticulatus (Oshima, 1926)</td>
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<tr>
<td>17</td>
<td>Cá Chày đất</td>
<td>Spinibarbus hollandi Oshima, 1919</td>
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<tr>
<td>18</td>
<td>Cá Chày</td>
<td>Paraspinibarbus macracanthus (Pell. &amp;Chev., 1936)</td>
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<tr>
<td>19</td>
<td>Cá Động</td>
<td>Capoeta senifaciolatus Gunther, 1868</td>
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<tr>
<td>20</td>
<td>Cá Động đốt</td>
<td>P. carinatus (Wu&amp;Lin, 1977)</td>
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<tr>
<td>21</td>
<td>Cá Đấm</td>
<td>Neoliissochilus stracheyi (Day, 1871)</td>
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<tr>
<td>22</td>
<td>Cá Đấm</td>
<td>Neoliissochilus stracheyi (Day, 1871)</td>
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<tr>
<td>23</td>
<td>Cá Sinh gai</td>
<td>Onychostoma laticeps (Gunther, 1896)</td>
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<td>24</td>
<td>Cá Sinh</td>
<td>O. gerlachi (Peters, 1881)</td>
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<tr>
<td>25</td>
<td>Cá Sinh cao</td>
<td>O. vietnamensis Banarescu, 1972</td>
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<tr>
<td>1</td>
<td>Phân họ cá Trôi</td>
<td>Labeoninae</td>
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<td>27</td>
<td>Cá Trôi</td>
<td><em>Cirrhus molitarell</em> (Vallenciennes, 1844)</td>
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<td>Cá Dưới đất</td>
<td><em>Osteochilus salsburyi</em> Nichols &amp; Pope, 1927</td>
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<td>K</td>
<td>Phân Họ cá Chép</td>
<td>Cyprininae</td>
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<td>29</td>
<td>Cá Diệc</td>
<td><em>Carassius auratus</em> (Linnaeus, 1758)</td>
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<td>30</td>
<td>Cá Nhúng</td>
<td><em>Carassiodon cantonensis</em> (Heinck, 1892)</td>
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<tr>
<td>31</td>
<td>Cá Chép nhập</td>
<td><em>Cyprinus caprio</em> Linnaeus, 1758</td>
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<td>32</td>
<td>Cá Chép việt</td>
<td><em>C. rubofuscus</em> (Lacèpède, 1803)</td>
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<td>33</td>
<td>Cá Dây</td>
<td><em>C. melanes</em> (Yên, 1978)</td>
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<td>IV</td>
<td>Họ Cá Chạch</td>
<td>Cobitidae</td>
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<td>Cá Chạch lão</td>
<td><em>C. laosensis</em> (Sauvage, 1878)</td>
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<td>35</td>
<td>Cá Chạch bún</td>
<td><em>Misgurnus anguillicauda</em> (Cantor, 1842)</td>
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<td>Cá Chạch bắc bồ</td>
<td><em>M. tonkinensis</em> Rendahl, 1944</td>
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<td>V</td>
<td>Họ cá Chạch vây bàng</td>
<td>Balitoridae</td>
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<td><em>Schistura chapaensis</em> (Rendahl, 1944)</td>
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<td>Cá Chạch suối sọc</td>
<td><em>S. fastciolatus</em> (Nichols &amp; Pope, 1927)</td>
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<td>Cá Chạch suôi nâu</td>
<td><em>S. incerea</em> (Nichols, 1931)</td>
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<td>Phân họ Cá Chạch bám</td>
<td>Gasterosteidae</td>
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<td>Cá Chạch vây bàng miền trung</td>
<td><em>Annamaia normani</em> (Hora, 1931)</td>
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<td>Cá Đếp thường</td>
<td><em>Sewellia lineolata</em> (Valencienne, 1846)</td>
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<td>D</td>
<td>Bọ Cá Nheo</td>
<td>Siluriformes</td>
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<tr>
<td>VI</td>
<td>Họ cá Láng</td>
<td>Bagridae</td>
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<td>42</td>
<td>Cá Mít</td>
<td><em>Leiocassis virgatus</em> (Oshima, 1926)</td>
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<tr>
<td>43</td>
<td>Cá lang quang bình</td>
<td><em>Hemibargus centralus</em> Yên, 1978</td>
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<tr>
<td>VII</td>
<td>Họ cá Nheo</td>
<td>Siluridae</td>
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<tr>
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<td>Cá Nheo</td>
<td><em>Silurus asotus</em> Linnaeus, 1758</td>
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<td>45</td>
<td>Cá Thèo</td>
<td><em>Pterocryptis cochinchinensis</em> (Valenciennes, 1840)</td>
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<td>Họ Cá Chiến</td>
<td>Sirosidae</td>
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<td>46</td>
<td>Cá Chiến sông hồng</td>
<td><em>Glyptothorax honghensis</em> Li, 1984</td>
</tr>
<tr>
<td>No.</td>
<td>Vietnamese name</td>
<td>Scientific name</td>
</tr>
<tr>
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</tr>
<tr>
<td>47</td>
<td>Cá Trè đen</td>
<td><em>Clarias fucus</em> (Linnaeus, 1758)</td>
</tr>
<tr>
<td>E</td>
<td>Bộ cá Nhái</td>
<td>Beloniformes</td>
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<tr>
<td>X</td>
<td>Họ cá Kim</td>
<td>Hemiramphidae</td>
</tr>
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<td>48</td>
<td>Cá Kim bạc</td>
<td><em>Hyporhamphus limbatus</em> (Valenciennes, 1847)</td>
</tr>
<tr>
<td>G</td>
<td>Bộ Mang liễn</td>
<td>Synbranchiformes</td>
</tr>
<tr>
<td>XI</td>
<td>Họ Luron</td>
<td>Synbranchidae</td>
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<tr>
<td>49</td>
<td>Luron</td>
<td><em>Monopterus albus</em> (Zuiew, 1793)</td>
</tr>
<tr>
<td>XII</td>
<td>Họ cá Chạch sông</td>
<td>Mastacembelidae</td>
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<tr>
<td>50</td>
<td>Cá Chạch sông</td>
<td><em>Mastacembelus armatus</em> (Lacèpède, 1800)</td>
</tr>
<tr>
<td>H</td>
<td>Bộ Cá Vược</td>
<td>Perciformes</td>
</tr>
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<td>XIII</td>
<td>Họ cá Rò Phi</td>
<td>Cichlidae</td>
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<td>51</td>
<td>Cá Rò phi vân</td>
<td><em>Oreochromis niloticus</em> (Linnaeus, 1758)</td>
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<td>XVI</td>
<td>Họ Cá Bống trảng</td>
<td>Gobiidae</td>
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<tr>
<td>52</td>
<td>Cá Bống dâ</td>
<td><em>Rhinogobius giurinus</em> (Rutter, 1897)</td>
</tr>
<tr>
<td>53</td>
<td>Cá Bống dâ khe</td>
<td><em>R. bruneus</em> (Tem. &amp;Sch., 1845)</td>
</tr>
<tr>
<td>54</td>
<td>Cá Bống châm</td>
<td><em>R. ocellatus</em> (Fowler, 1937)</td>
</tr>
<tr>
<td>55</td>
<td>Cá Bống cát</td>
<td><em>Glossogobius giuris</em> (Hamilton, 1822)</td>
</tr>
<tr>
<td>XVII</td>
<td>Họ cá Rò đồng</td>
<td>Anabantidae</td>
</tr>
<tr>
<td>56</td>
<td>Cá Rò đồng</td>
<td><em>Anabas testudineus</em> (Bloch, 1792)</td>
</tr>
<tr>
<td>XVIII</td>
<td>Họ cá Sắc</td>
<td>Belontidae</td>
</tr>
<tr>
<td>57</td>
<td>Cá Rò cò</td>
<td><em>Macropodus opercularis</em> (Linnaeus, 1758)</td>
</tr>
<tr>
<td>58</td>
<td>Cá rò cò vây dò</td>
<td></td>
</tr>
</tbody>
</table>

Table. List Potential new fish species in Dakrong river
| 1  | Cá Cháo lá             | O.sp1                  |
| 2  | Cá Cháo lung cong      | O. dorsoarcus nov.sp   |
| 3  | Cá Cháo vây hâu môn dài | O.langjanalis nov.sp   |
| 4  | Cá Cháo miệng ngân     | O. brenristomatus nov.sp |
| 5  | Cá Đạm đất suối        | N. dosohorizontalis Hào & Hoa, 1969 |
| 6  | Cá Giao som             | Yaosahnicus            |
| 7  | Cá Xầm                 | Danio sp               |
| b  | Phân họ cá Muống      | Cultrinae              |
| 8  | Cá Ngão quảng trị      | Ancherythroculter quangtriensis nov. sp |
| c  | Phân họ cá Bông        | Barbinae               |
| 9  | Cá Bông vây đen        | Spinibarbus sp1        |
| 10 | Cá Bông vây bung đen   | Spinibarbus nguyenhuuduci. nsp |
| 11 | Cá Bu lu                | Spinibarbus hoenoti .nsp |
| d  | Phân họ cá Trôi        | Labeoninae             |
| 12 | Cá Tựa diệc             | Osteochilus            |
| 13 | Cá Bầu                 | Garra sp1              |
| 14 | Cá Bầu                 | G. sp2                 |
| 15 | Cá Sừt mủi             | G. sp3                 |
| 16 | Cá Đồ                   | G. sp4                 |
| 17 | Cá Đồ hai mủi          | G. sp5                 |
| II | Họ cá Chạch vây bằng    | Balitoridae            |
| a  | Phân họ cá Chạch suối  | Nemacheilinae          |
| 18 | Cá Chạch cát            | Traccaticthys quangtriensis. nsp |
| b  | Phân họ Cá Chạch bắm   | Gymnomyzoninae         |
| 19 | Cá Đếp cao              | S. sp1                 |
| III | Họ cá Chạch sông        | Mastacembelidae        |
| 20 | Cá Chạch leo cây        | M. sp1                 |
| 21 | Cá Chạch lâu           | M. sp2                 |
| IV | Họ cá Quải              | Channidae              |
| 22 | Cá Trâu suối quảng trị  | Channa quangiensis nov.sp |
Postcard: 

Postcard produced based on recommendation fish species in Redlist and it have in Dakrong river.

Poscard viewed and commented by FIN and we are considering:

- How many postcard should be printed?
- Where have the postcard should distributed? to whom?
- Should we use it in different events and purpose: for local tourism at Dakrong commune, Dakrong district, Quang Tri province; Initial sugession by Dr. Maan that can produce to HighARCS stakeholder or HighARCS team,
- The postcard basically including scientific name with reference from FishBase or IUCN and local name. Maan suggested may addition information on the fish in the postcard.
- Currently the draft prepared. We are considering should we printed hard copy of postcards?

Flagship species

- Flagship of 4 fish species were prepared (annex): We sent to Maan (FIN) for comment for a long time but have not recieved feedback.

- We are considering:

  + Should be printed? How many?
  + Where have the flagship species distributed? to whom?......
Activities 4: Publications

By Dec 2012, Phuong prepared 2 Articles/news of HighARCS and sent to Department of Culture and Information for them edit and post on Quang Tri website or TV, radio program by local language.

Monitoring & evaluation: A same set of questionnaire will carried out at the beginning and after 6 or 12 months; assessment how much awareness improved by age, gender and different stakeholder groups; Participatory assessment

At the national level, the RIA1 team presented outputs of HighARCS at The 4th national workshop of science fisheries for young reseacher under the sections of Environment and Social- Economic which were 1 oral presentation and 2 poster:

Oral presentation: Initial research results on fish composition in dakrong river, Quang Tri province 2 posters: (1) The threat and conflic in highland aquatic conservation in the Northern and central of Vietnam and (2) Livelihoods of Resetlment communities in areas of Da river at Phu Yen district, Son la province.

Those publication presented in workshop proceeding:


And all full papers were organised into workshop proceeding.

RIA1 will send paper to related local institution and pick up main information to submit to news of Dakrong District and commune.
**Objective 2: Local management for better conservation aquatic resources**

**Activity 5: Decentralization in aquatic management and environment protection**
- **Main responsible agency:** Commune People Committee & village
- **Monitoring & Evaluation:** Group of management people
  - Performance of its assessed after 6 or 12 months
- **Indicators:**
  - Setup management group
  - Quantities of fish collected

**Activity 6: Setup village convention in aquatic conservation and environment protection**
- **Main responsible agency:** RIA1, villages, commune, district people committee
- **Indicators:**
  - 3 conventions for 3 communities
- **Monitoring & Evaluation:**
  - 3 conventions for 3 communes
  - Participatory assessment its affect

**Objective 3: Improve livelihoods and living conditions**

**Activity 7: Expand using mini hydropower**
- **Main responsible agency:** villages, commune, district people committee
- **Indicators:**
  - mini hydropower
- **Monitoring & Evaluation:**
  - No. of mini hydropower is increased
  - Quality assessed by participatory

**Activity 8: Construct water tank and water filter**
- **Indicators:**
  - water tank
- **Main responsible agency:** villages, commune, district people committee
- **Monitoring & Evaluation:**
  - No. of water tank is increased
  - Quality assessed by participatory
Activity 9: Training and setup cooperative of brooms, handicraft, textile produce for tourism production

Indicator: Training and cooperative established

Main responsible agency: district people committee
Monitoring & Evaluation: Number of training
Number of participants
Cooperative
Quality assessed by participatory

Objective 4: Development of policy and legal framework

Activity 10: Limited in gold and mineral mining and limited new hydropower factory

Indicator: Policy
Main responsible agency: Province; District
Monitoring & Evaluation: Changing in policy/master plan (limited project for new hydropower; factory permission; budget for conservation biodiversity aquatic resources; building staff capacity

Activity 11: Detail guideline in environment protection and wastewater treatment policy

Indicators: Detail regulation
Main responsible agency: Province, district
Monitoring & Evaluation: Detail regulations

Activity 12: Clear punishment and regulation for illegal fishing tools; gold and mineral mining

Indicators: Detail regulation
Main responsible agency: Province, district
Monitoring & Evaluation: Detail regulations
**Objective 5: Enforcement**

**Activity 13: More strict punishment in illegal fishing tools**

**Indicators:** punishment, More staff monitoring

**Main responsible agency:** village, commune, district

**Monitoring & Evaluation:** Number of species conserve; Illegal fishing tool reduced

**Activity 14: More strict punishment gold and mineral mining and deforestation**

**Indicators:** More staff monitoring

**Main responsible agency:** village, commune, district

**Monitoring & Evaluation:** Water quality in Dakrong river is improved
Habitat maintain
Forestry cover

**Activity 15: Factory is strict undertake environment protection regulation**

**Indicators:** undertake protection environment agreement

**Main responsible agency:** factory; district

**Monitoring & Evaluation:** Number of factories signing and following environment protection agreement

**Recommendations:** Continue propagate wider about biodiversity, aquatic resource and water protection at Dakrong River, through organized a children's drawing competition contest and the contest of fishermen and women
APPENDIX:
ATLAT PREPARED

FLAGSHIP OF 4 FISH SPECIES

*Anguilla marmorata* Guéy & Gaimard, 1824

| Scientific name: Anguilla marmorata Guéy & Gaimard, 1824 |
| Vietnamese name: Cá mốc | Local name: Còc mốc |
| Max length: 1 m |
| Climate range: Tropical species |

**Length at maturity, Note outside:**

**Environment Feasible:** |

**Distribution:** In Vietnam, *Anguilla marmorata* is distributed in upstream of Dong Nai River, the largest river system connected to sea. They breed in coastal provinces like Ca Mau, Bac Lieu, Kien Giang, and Vinh Long, and the sea near Ho Chi Minh City. In the Mekong Delta, this species is caught in the river and coastal areas.

**Conservation status:** The species is considered vulnerable in Vietnam and is protected by law. It is also listed in the CITES Appendix III.

**Human interaction:** This species is an important target for commercial fishing and local communities.

**Biology:** Adults swim at 30–70 cm length, 0.3–0.4 kg weight. Scales are thin and more than 10 cm long. It is an omnivorous fish, feeding on small fish, shrimp, and invertebrates. It normally breeds during the rainy season. Egg laying is common in the sea, but it is also observed in fresh waters. After hatching, the fry migrates to the sea to hatch and feed.

**References:** *Spence et al. (2012)*
**Oreochromis lazera** (Gilbert, 1806)

**Scientific name**: Oreochromis lazera
**Common name**: 
**Local name**: 

**Length maturity**: 18 months, more than 4 years

**Environment**: Freshwater fish

**Distribution**: In Vietnam, Oreochromis lazera is distributed in the middle and upper reaches of the Red River Delta, the Mekong Delta, the Tonle Sap Lake, and some rivers in the southern Mekong Delta.

**Conservation status and notes**: B culis is listed as a Red Data Book species. Oreochromis lazera is being evaluated for its conservation status.

**Threats**: Habitat fragmentation, climate change, and overfishing.

**Biology**: Oreochromis lazera is a bottom-dwelling fish that lives in clear, slow-moving waters. It feeds on small invertebrates and aquatic plants. It has a schooling behavior and is often found in groups. It is a predatory fish and preys on other small fish. The breeding season is from December to March, and the eggs are about 1.2 mm in size. The young fish are born in May and June. During the breeding season, males build nests in shallow water and lay eggs in them. The females then cover the eggs with a mucus-like substance, which protects them until they hatch.

**Reference**: Aquaculture & Fish Health
**Cyprinus melanostigma (Mai, 1978)**

<table>
<thead>
<tr>
<th>Scientific name:</th>
<th>Cyprinus melanostigma (Mai, 1978)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vietnamese name:</td>
<td>Cyprinus melanostigma</td>
</tr>
<tr>
<td>Habitat:</td>
<td>Tropical species</td>
</tr>
<tr>
<td>Max size:</td>
<td>5 kg</td>
</tr>
<tr>
<td>Length similarity:</td>
<td>One year old fish with more than 15 cm length of body custom tending</td>
</tr>
<tr>
<td>Value:</td>
<td>Commonly used for food in freshwaters and some regions.</td>
</tr>
<tr>
<td>Conservation status:</td>
<td>Not currently threatened.</td>
</tr>
<tr>
<td>Distribution:</td>
<td>Distributed in the Danang River basin, northern central Vietnam.</td>
</tr>
</tbody>
</table>

**Short description:**

- Body is flat and not as thick as common carp, belly is slightly white. Back is slightly prominent and has a dorsal fin. Head is slightly long, not quite as long as the body. There are two pairs of anal fins, one of which is slightly larger than the other.
- Body is covered with small scales. Lateral line complete, slightly sagging on the abdomen. No mode is visible from the side, but it is visible from below. Head is covered with many clearly visible dots. Body color is white with slight greenish tint on the back. There is a yellow edge on the anal fin posteriorly more intense, the anus behind the vent is visible in large, dark areas.

**Ecology:**

- Breeding: The fish is medium sized, usually reaching a length of 15 to 25 cm at 1 year old and weighing about 100g. Breeding occurs from May to June and the young are about 10 cm and 200g at age 3. The fish can grow to a length of up to 70 cm and reach 500g.
- Food habits: Cyprinus melanostigma is omnivorous, feeding on a variety of aquatic plants and animals.
- Breeding: Cyprinus melanostigma begins breeding at one year old. The species has a dense number of eggs and high fertility. The female can produce up to 10,000 to 15,000 eggs. Breeding season is in February to May, and the fry hatches in late June to early July.
POSCARD PREPARED

TRAINING BUILDING CAPACITY AND RAISE AWARENESS

Table 1. Participants in the training and changes awareness about protecting of aquatic resources at district level

<table>
<thead>
<tr>
<th>No</th>
<th>Name of participants</th>
<th>Before the training</th>
<th>After the training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>numbers of correct answer within total 15 questionnaires</td>
<td>% correct answer</td>
</tr>
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<td>Chau Khanh Loc</td>
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<td>73.33</td>
</tr>
<tr>
<td>2</td>
<td>Ho Thanh</td>
<td>4</td>
<td>26.67</td>
</tr>
<tr>
<td>3</td>
<td>Nguyen Tien Duc</td>
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</tr>
<tr>
<td>4</td>
<td>Ho Sy Tam</td>
<td>8</td>
<td>53.33</td>
</tr>
<tr>
<td>5</td>
<td>Nguyen Thi Ha</td>
<td>11</td>
<td>73.33</td>
</tr>
<tr>
<td>6</td>
<td>Ho Van Linh</td>
<td>11</td>
<td>73.33</td>
</tr>
<tr>
<td>7</td>
<td>Ho Xuan Hoang</td>
<td>9</td>
<td>60.00</td>
</tr>
<tr>
<td>8</td>
<td>Ho E Not</td>
<td>9</td>
<td>60.00</td>
</tr>
<tr>
<td>9</td>
<td>Nguyen Binh Luan</td>
<td>11</td>
<td>73.33</td>
</tr>
<tr>
<td>10</td>
<td>Hoang Dinh Toan</td>
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</tr>
<tr>
<td>11</td>
<td>Le Van Hai</td>
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<td>46.67</td>
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<td>12</td>
<td>Nguyen Quang</td>
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<td>15</td>
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<tr>
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<td>Pham Thi Hien</td>
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<tr>
<td>18</td>
<td>Tran Thien Truong</td>
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<td>73.33</td>
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<tr>
<td>20</td>
<td>Ho Xuan Ninh</td>
<td>11</td>
<td>73.33</td>
</tr>
<tr>
<td>21</td>
<td>Nguyen Thi Ny</td>
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<td>93.33</td>
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Table 2. Participants in the training and changes awareness about protecting of aquatic resources at commune level

<table>
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<th>Name</th>
<th>Correct answer before training</th>
<th>% Correct answer</th>
<th>Correct answer after training</th>
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<td>3</td>
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<td>60.00</td>
<td>13</td>
<td>86.67</td>
<td>15</td>
</tr>
</tbody>
</table>
Other issues

To improve the efficiency of the propagation of aquatic resource protection at the study site as well as sharing the experiences for other researchs. Besides organizing training at all levels. The project was designed flyers, posters, postcards and rare fish species which need to protect and do atlats the species composition of fish in the DAkrong river. The project also regularly participated in workshops to share research results to scientists and policy makers, published publications in the journa. In the next period the project will continue to publish article about the results of the project.

Through the training, these regulations of mining and protect aquatic resources have been communicated to management and local people to contribute to raising awareness of the people in the conservation of natural resources, specially aquatic resources in the study site. Local people's awareness and participants have significant changes which expressed by the evaluation results before and after training.

The competition on diversity and aquatic resource protection has attracted the participation of all schools at study site. It interest pupils and local people. This is a prerequisite for the maintenance aquatic resource later.

**CONTRIBUTION INTO EXHIBITION IN SCIENCE & TECHNOLOGY ASEAN-EU AT INTERNATIONAL TECHMART VIETNAM 2012**

From 20 to 23 September 2012, Ministry of Science and Technology have organised International Techmart Vietnam 2012 at Centre for International Exhibition Hanoi.

At the International Techmart Vietnam 2012, the Research Institute for aquaculture No.1 (RIA1) which representative presented by the Highland Aquatic Resources Conservation and Sustainable Development (HighARCS project) - is an international co-operation project in the Framework of FP7 of EU contributed some results from research which were diversity of fish species, some new fish species discovered at study site in Dakrong river – Quang Tri of HighARCS project, contributed poster, brochures and newsletter of RIA1 to the room exhibition of science and technology ASEAN-EU YoSTI 2012 of National Science and Technology Information.
During the exhibition, staff of HighARCS project had opportunities in introducing to the visitors of exhibition about RIA1, researches achievement from RIA1, free delivered RIA1 newsletters and shared research outputs of HighARCS project. Reserved samples diversity of fish species and some new fish species discovered were attractive public people and contributing to the raise awareness about aquatic resources conservation.

The involvement of RIA1 into exhibition were highly appreciated by leaders of National Agency for S&T Information of Vietnam (NASATI) and building cooperation with RIA1 for the international events in the future.

International Techmart Vietnam 2012 realy significant and it is environment to connect scientist and contributing to promote research, develop science & technology, innovation, connecting to communities research and development with private sectors, promoting marketing outputs of research as well as exchange cooperation research, extension science technology with neighbour countries as well as global.

Dr Le Xuan Dinh -Vice Director of NASATI and staff of RIA1 in the exhibition Science and Technology ASEAN-EU YoSTI 2012

Diversity fish species and some new fish species discovered from HighARCS project were attractive young generation.

PRESENTED HIGHARCS OUTPUTS AT NATIONAL WORKSHOP ON FISHERIES

RIA1 team presented oral presentation and posters at workshop on fisheries scicence at national level. Audience were interesting of outputs and its were presented in proceeding of workshop:

1. THE KNOWLEDGE QUESTIONS

"Understanding biodiversity and protection of aquatic resources" at Dakrong district

(Format Italics and bold are these answers)

I. THE KNOWLEDGE DIVERSITY (5 questions)
**Question 1.** According to the research results of the Research Institute for Aquaculture No1, up to 10/2012. How many fish species on river Dakrong?

a. 80

**b. 108**

c. More

**Question 2.** Give ten economic fish species in the Dakrong River at the currently?

*Answer: Common Carp, eel, grass carp, silver carp, Bong fish, Sharpbelly, Sinh gai fish, major carp, snakehead, Asian redtail catfish.*

**Question 3.** Some fish species in the river Dakrong which are recorded as new species and added to the list of Vietnam fish species by Research Institute for aquaculture No1, which is the fish’s name?

*Answer: Snakehead, Chao fish, Bulu fish.*

**Question 4.** What are the rare fish species on Dakrong River should be protected?

*Answer: Sinh gai fish, eel, Chay dat fish, Choc fish, Day fish, swarm eel and snakehead.*

**Question 5.** The following fish species which the species’ numbers are declining the most in recent years?

a. Tilapia, Common carp, goby

b. Chao fish, Bronze featherback fish, Lesser spiny eel

c. Eel, Chay dat fish and Sinh gai fish

**II. ROLE OF AQUATIC RESOURCES FOR LIVELIHOOD (5 questions)**

**Question 6.** Let tell the name of the main source income of households in Dakrong?

*Answer: Agriculture, livestock, fishing, employment (coffee picking, carrying wood, Xe om driver ....) collecting iron, making broom*

**Question 7.** How is the role of aquatic resources in rivers, streams with livelihood of Dakrong people?

A. Fed, the food supply for people
B. For learning and researching

C. A source of additional income for the family.

**D. Answers A and C**

**Question 8.** What is the benefit from the Dakrong river with local people?

*Answer: Provide water*

- Provide aquatic resources
- Irrigation for cultivation
- A place for fun, washing people
- Making electricity for households with small hydropower

**Question 9.** Which type of the households in Dakrong usually participate in fishing the most?

a. The rich households

b. The average household

c. **The poor household**

*Note: 18% of the wealthy households; 13% of the medium household; 33% of the poor households*

### III. CONDITION OF RIVERS AND STREAMS

**Question 10.** In the following groups which one do regularly participate in fishing on rivers and streams?

a. Man  
b. Women  
c. **Boys**  
d. Girls

**Question 11.** Let give the main kind of method for fishing the on rivers Dakrong now?

a. Net, the hook

b. Trap, electric

c. **Both answers and b**

**Question 12.** Let give causes of water pollution on rivers and streams in Dakrong?
a. Mineral mining, sand mining, collecting gold

b. Waste from the household.

c. Both two answers

**Question 13.** Let give the change of the river and streams in Dakrong current compared before?

a. More fish than before

b. Shallow and less fish than before

c. Dirty and polluted water than before

d. Answers b and c

**Question 14.** Let give causes reduction of aquatic resources on rivers Dakrong?

*Answer: - Gold Mining and minerals

- Construction of dams

- Fishing with destructive forms (by electric, roots cause asphyxiation fish, mine)

**Question 15.** Let me know how many are constructed hydropower on the river Dakrong? How dose it affect on the fish/shrimp in rivers?

*Answers: Rao Quan, Dakrong 1, Ta Long

The construction of the dam affects on the shrimp / fish in the water is: Prevent the migration of fish, loss of spawning grounds, affecting on biodiversity in species composition, change river's flow and change the habitat of fish and shrimp.

IV. DIFFICULTIES AND RISK

**Question 16.** In Dakrong today, what are people facing difficulties in cultivation and daily life?

a. Lack of land for agricultural cultivation

b. Lack of clean water for domestic use

c. Lack of power

d. All 3 answers
**Question 17.** What should be done to improve the livelihood of local people in the future?

**Answer: - To raise the awareness for local people**

- **Development of extra job to improving income for local people**
- **Training on cultivation and livestock**
- **Building electric systems and clean water**

**Question 18.** How will aquatic resources (fish/shrimp) in rivers and streams change in the future if we do not care about protecting right now?

- a. Aquatic resources remain
- b. **Aquatic resources will decline, have not aquatic resources for future.**
- c. Aquatic resources increase

**V. CONSERVATION MEASURES TO PROTECT AQUATIC RESOURCES**

**Question 19.** How should be protected aquatic resource?

- a. Control strictly activities which making pollution
- b. Strictly control mining and collecting gold
- c. Strict management, ban destructive fishing
- d. **All 3 answers**

**Question 20.** The mesh size 2a (mm) of Dredge for fishing is not smaller?

- a. **18**
- b. 20
- c. 28

**Question 21.** The mesh size 2a (mm) of Casting-net for fishing is not smaller?

- a. 30
- b. 20
- c. **15**
**Question 22.** What is instrument which according to regulation ministry of fishery $2a \geq 20 \text{ mm}$ of mesh size?

a. Post, drift-net

b. Dredge, Casting-net

c. Both answers are correct

**Question 23.** According to Circular No. 1 issued 04/28/2000 by the Ministry of Fisheries, the following banned species from exploitation?

a. Bronze featherback, Eels

b. Tilapia, goby

c. Silver carp, snakehead

d. All 3 answers are correct

**Question 24.** How much money you will be punished? If you exploring fish in the banned area or during time do not allow fishing, under 10kg

a. Between VND 1,000,000 and VND 3,000,000

b. Between VND 3,000,000 and VND 5,000,000

c. Between VND 500,000 and VND 1,000,000

**Question 25.** How much money you will be punished? If people exploite fish in the banned area or during time do not allow fishing, under 10kg but repeated second time or more;

a. Between VND 500,000 and VND 1,000,000

b. Between VND 1,000,000 and VND 3,000,000

c. Between VND 3,000,000 and VND 5,000,000

**Question 26:** The following types of caughting fish, which type was forbidden?

a. Hook

b. Net

c. Electricity
Question 27. With activities exploiting fish species which are recorded in forbiding list under 20 kg, How much money will punish by government?

a. Between VND 1,000,000 and VND 3,000,000

b. Between VND 5,000,000 and VND 10,000,000

c. Between VND 10,000,000 and VND 15,000,000

Question 28. With activities exploiting fish species which are recorded in forbiding list from 20 kg to less than 50 kg, How much money will punish by government?

a. Between VND 1,000,000 and VND 3,000,000

b. Between VND 5,000,000 and VND 10,000,000

c. Between VND 10,000,000 and VND 15,000,000

Question 29. Using, illegal storage of toxic chemicals, toxic plants to exploit fish. How dose government punish?

a. Between VND 5,000,000 and VND 7,000,000

b. Between VND 7,000,000 and VND 10,000,000

c. Between VND 10,000,000 and VND 15,000,000

Question 30. Who do have got the responsibility to protect aquatic resources?

a. Police at commune

b. Participants fishing

c. Students

d. All the people

HIGHARCS PRESENTED OUTPUTS AT TECHMART 2012

http://phapluatxahoi.vn/2012050209172906p1001c1017/ubnd-tinh-chi-dao-mot-dang-ubnd-huyen-hieu-mot-neo.htm; Thứ Tư, 02/05/2012

Department of Sở TN-MT Quảng Trị ký văn bản số 281/STNMT-KS về việc đúng khai thác, tận thu vàng sa khoáng gửi các Cty CP xây dựng số 6, TNHH Mai Hoàng, TNHH xây dựng số 9, TNHH Minh
Phúc và DNTN Đức Hiền, đê nghị chăm dứt hoạt động khai thác vàng sa khoáng trên sông Đakrông, huyện Đakrông trước ngày 31-3-2012. Tuy vậy, Cty TNHH Mai Hoàng (trụ sở Đakrông) vẫn ngang nhiên khai thác vàng sa khoáng trên sông này do các pháp luật khác đều cho phép khai thác vàng sa khoáng trên sông Đakrông ngay sau khi UBND tỉnh Quảng Trị ban hành chỉ thị số 04/2012/CT-UBND về việc tặng cương công tác kiểm tra, xử lý nhanh khai thác vàng sa khoáng trái phép trên địa bàn.

Ngoài việc giao cho Sở chủ tri, UBND tỉnh Quảng Trị cơn yêu cầu định kỳ hằng quý UBND huyện Đakrông phải có báo cáo chi tiết tình hình hoạt động khoáng sản, vàng trên địa bàn gửi Sở để Sở tổng hợp báo cáo UBND tỉnh theo dõi, xử lý tình trạng vi phạm.


Ngày 12/10, thông tin từ UBND xã Đakrông (Đakrông, Quảng Trị) cho biết, một lượng nước lớn từ thượng nguồn bất ngờ đổ về đã làm cho con đập chẩn của công trình thủy điện Đakrông III bị vỡ, cuốn trôi hàng chục tấn sán mòi thu hoạch, gây thiệt hại lớn cho người dân.

Nguyên nhân vô đáp ban đầu được xác định do ảnh hưởng của đợt mưa lớn kéo dài trong những ngày đầu tháng 10/2012. Lượng nước lớn đổ về đập đã cuốn trôi hàng chục tấn sán mòi thu hoạch của hơn 15 hộ dân ở 2 xã Tà Long và Đakrông, gây thiệt hại lớn cho bà con.
Annex 1: Framework for the site-reporting for D8.1
D8.1: Report concerning lessons learnt regarding adoption and implementation of actions (process) and actions achieving goals (impacts) with country reported results of Implementation and Monitoring activities included as annexes

Due Month 54 (June 2013)

Framework for the site-reporting for D8.1

March 4, 2013

Søren Lund, Roskilde University & other work package leaders
Introduction

It is now time to prepare the reporting for D8.1. This deliverable is going to be one of the key outputs of the HighARCS project. How did we in HighARCS and our local partners go about implementing the jointly elaborated action plans? Did we achieve the impacts expected? And what lessons did we learn about action planning for wise use of aquatic resources across the HighARCS sites?

In order to account for this, it is important that each team produces a 15-25 pages report describing and reflecting on (a) process: the step-wise implementation of the activities planned (or necessary) to achieve the action plans, and (b) outcomes: the impacts achieved through these actions.

The site-reporting should basically follow the framework proposed in the agreed I&M strategies submitted by each country-team in July/August 2012, explained in the following section.

We invite the country teams to submit draft versions by April 12, thus allowing time for a round of feedback from the work-package leaders within two weeks from the reception of the draft (please note that Kevin will out of the office between April 17 and May 1). Hopefully, final country-reports could be ready and sent to the responsible work package leader (Roskilde University) by May 1, 2013. This would allow the making of the main D8.1 report by the end of May 2013.

Below you will find a review of the elements and overall structure expected from the site reports.

Overall structure

1. **Front page:** Should include the title, the indication of the relevant deliverables number, the name of the site, the name of the institution, the name of the author(s), and date.
2. **Introduction (1-2 pages):** purpose of the report, brief summary of process leading to the selection of the selected action plans, brief summary of the I&M strategies (make reference to the I&M strategy reports from 2012), brief summary of the contents of this report, brief summary of the methodologies used for collecting the data used in this report.
3. **Presentation of the main actions retained for implementation from 2012 at your site and impacts targeted (2-3 pages):** Here you can copy-paste from your own I&M strategies reports. You can add some general observations summarizing the kinds of livelihoods and biodiversity conservation problems they attempt to address, who is generally the main responsible local institution, and the impacts on livelihoods, biodiversity and the state of the aquatic resources which are expected.
4. **Description & reflections on the implementation process(es) (6-9 pages):** Describe systematically your actions/objectives 1, 2, 3, etc. as a narrative of the activities undertaken (including how and by whom) structured chronologically into major steps. If the observations
(i.e. on-going monitoring activities) of emerging impacts (or lack of same) played any role in the implementation, you should include it in this narrative.

a. Descriptions should include the characteristics of the approaches and methods used in organizing and implementing the activities as smoothly and efficiently as possible. Please use the tables indicating your intended methodologies as reported in the I&M strategies report from your institution.

b. The communication strategy followed and communication tools elaborated and/or used are important to mention.

c. Please also include your reflections on “how it went”: was it easy or difficult to get activities started? What kind of problems or questions did your partners raise as you went along? Why? Were there any changes in the contexts of the project, which influenced the process? What role did your team play to make the process go smoothly forwards? What responses did your team provide to challenges or questions raised by the local partners during implementation? Did the implementation work better after that? Etc.In short: report on any observations, thoughts and reflections of your team or your local partners which can be useful for concluding on “the lessons learnt” on facilitating and monitoring the implementation of each of the actions selected. You may also include a “self-assessment” ranking of how well you succeeded to facilitate the planning process compared to your objectives and expectations on a scale from 1 (unsatisfactory) to 5 (excellent).

5. **Description and reflections on impacts (6-9-)**:

a. In this section you should highlight the main features, the problem addressed and the expected impact towards solving the problem provided by each action undertaking by HighARCS at your site (action/objective 1, 2, 3 etc.).

b. Then proceed to explaining your choice of indicators (livelihood, biodiversity or policy related), the monitoring methodologies applied, and the name of the participant/partner responsible for making the observations of the indicators and performing the actual monitoring role.

c. Report the observed data on the indicators and discuss the efficiency and adequacy of the action toward reaching the expected impacts.

d. Make suggestions for corrective action if needed.

e. Conclude by making a “self-assessment” ranking of how well you succeeded to reach the impacts compared to your objectives and expectations on a scale from 1 (no impact or worse) to 5 (fully reached or surpassed). You might consider making this exercise as a joint exercise with the local partners.

6. **Summary of findings, next steps, and recommendations for changed actions if relevant (2-5 pages)**: In this final section, you sum up across all the actions being implemented on your site:

a. How far in the planned process are you?

b. What are the main activities having already been done

c. What are the main activities remaining to be done? Is the project on time?
d. What impacts are being observed? Have the expected impacts been achieved? Why, why not?
e. Any challenges?
f. Any recommendations for changed/improved approaches, or methods?
g. What are the future prospects for Integrated Action Planning in the HighARCS sites, in highland areas of your country and elsewhere generally in your respective States or countries?