HighARCS Integrated Action Planning for the Dakrong District study site, Quang Tri Province, Vietnam

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1. Introduction

The Highland Aquatic Resources Conservation and Sustainable Development (HighARCS) project aims to analyse the status of highland aquatic resources at five sites including Guangdong, China, Uttarakhand and West Bengal, India, Northern and Central Vietnam. The project examines ecosystem services, livelihoods of poor people and biodiversity conservation issues of highland aquatic resources in order to produce action plans. An integrated action plan on livelihood, conservation and policy issues will be produced and implemented among various stakeholders in order to enhance livelihoods, conserve aquatic biodiversity and encourage sustainable development.

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 should be 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. 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. The willingness of communities and authorities to participate in the project was also taken in to consideration when selecting study sites. This report is for the Quang Tri study site which is considered representative for Central Viet Nam.

Situation analysis and management issue identification

Vietnam is a country with a diverse topography, including tropical lowlands, hills and densely forested highlands (Wikipedia Contributors, 2010). Two-thirds of the total natural area is covered by hills and mountains, with a general downward slope from west to east (Viet Nam Environment Protection Agency, 2005). The country is divided into eight regions including the Northwest, Northeast, Red River Delta, North Central Coast, South Central Coast, Central Highlands, Southeastern and Mekong River Delta (Wikipedia Contributors, 2010). The four highland regions are Northeast region, Northwest region, North Central and Central Highlands which are indicated in Figure 1 below.

Figure 1: Vietnamese regions (Wikipedia Contributors, 2010)

Viet Nam has a tropical monsoon climate and the annual average temperature is above 20^{o}C, average annual humidity is more than 80%, and rainfall averages 1500 mm per year (Vietnam Environment Protection Agency, 2005). The differences in climate between regions, especially in temperature and humidity range widely and strongly influence the biodiversity of each region.

HighARCS study site selection

Based on the desk study concerning values, livelihoods, conservation issues and wise-use options of highland aquatic resources in Central Viet Nam, Quang Tri Province, representative of Central Viet Nam was selected for further study within the framework of the HighARCS project.

Quang Tri Province has a total area of 4746 km^2 (Institute of Science and Technology and People's Committee of Quang Tri, 2007), is 600 km from Hanoi and is located between 16^{o}18' to 17^{o}10' north and 106^{o}32' to 107^{o}24' east in the Central region of Vietnam and there is one city, one town and eight districts in Quang Tri (Quang Tri Statistical yearbook 2010a). Lying to the north is Quang Binh Province, and to the south is Hue Province, Lao P.D.R. shares a 186.8 km long border to the west. The geography of Quang Tri is varied including mid-range mountains, hills and coastal areas (Informatics Centre of Quang Tri, 2012). Three ethnic groups predominate including the Vietnamese (Kinh), Bru-Van Kieu and Pa Co- Ta Oi. The main income sources for many local people in Quang Tri are agriculture and forest exploitation which combines both collecting and cutting things from formal forestry and natural forests. In addition local people exploit fish and aquatic plants and

animals from the river and reservoirs formed behind dams to supply food for family consumption. Fisheries production from rivers, streams and brackish water is about 668 metric tonnes of fish and 87.3 tonnes of shrimp annually (Department of Environment and Natural Resources of Quang Tri, 2006).

Dakrong District was established in 1996 (Government of Vietnam, Decree 83-CP, 1996). Dakrong has a total areas of 1,223.3 km^2, and contains 1 town and 13 communes (Quang Tri Statistical Yearbook, 2010a). This is the poorest district in Quang Tri and is on the list of the 61 poorest districts in Vietnam (Government of Vietnam, Resolution number 30a/2008/NQ-CP, 2008). Of households in Dakrong District 48% were classified in 2008 by the Government of Vietnam as poor owing to the mountainous terrain, hazard prone nature of the environment and remoteness, whilst 80% of these poor households were home to people classed as coming from ethnic groups. Dakrong Commune in under the jurisdiction of Dakrong District, Quang Tri Province and is located in the highlands and it is difficult to physically access the commune and it is hard to make a living. Many people residing in Dakrong live in close proximity to the Dakrong River. The Dakrong River originates from the Truong Son mountain range near the border of Vietnam with Laos. Upstream of Dakrong the river is known as the Thach Han River and thus whilst the Dakrong River catchment is shown in Figure 2. The commune is located in a valley between the high mountains of the Truong Son range, with the height of mountains ranging from 500 m to more than 2000 m above sea level. People in this commune use river water for domestic uses, fishing and for agriculture purposes.

Three villages of Cu Pua, Chan Do and Kalu within the Dakrong commune that rely upon the Quang Tri River and its tributary the Dakrong River were selected in the project site (Figure 3). This commune was officially recognized as a highland one by Decision No 21/UB-QD date 26 January 1993 (Committee for Ethnic Minorities, 1993). For more information on the background of the Dakrong, Quang Tri study site, including the social and natural setting of the commune please see the Work Package 1 report “Situation analysis report on highland aquatic resource and sustainable development in Northern and Central Vietnam” (Nguyen et al. 2010).

Box. Outputs from HighARCS WP3 report

The three selected villages (Kalu, Chan Do and Cupua) within the Dakrong Commune, are situated along a 20km stretch of the Quang Tri River halfway up the watershed just below the confluence of the Dakrong River with the Rao Quan River in the foot hills of the Truong Son mountain range (Figure 3). The Rao Quan River flows from Huong Hoa District whilst the Dakrong River originates in the Truong Son mountain range in the south of the Dakrong District. The majority of the land cover upstream to the south is forest partially protected by the Dakrong Nature Reserve, with patches of agriculture, but upstream to the north is predominantly agriculture and shrub with some

settlements. Large areas of developed land (urban and managed wetlands) are found downstream, and particularly along the coastal areas.

The Dakrong River is characterised by a high gradient and high speed flow that floods seasonally. At the site villages, river habitats are varied and the water level is strongly influenced by the weather conditions. In some sections, particularly around Cu Pua there are sections of fast flowing water that is channelled between large rocks, has a sloping gradient and a gravel and rock riverbed (Figure 5). In other sections, the channel is slow flowing with a wide channel and sandy deep pools. On the river banks, vegetation changes from plantation woodland and natural forest on the mountains upstream, to maize cultivations closer to the villages on the sandy banks down to the river itself. Here the river forms a number of braided channels; the south side has a series of rapids with fast flowing water, while the north bank is mostly shallow and slow with many stagnant pools. However, the river floods during the wet season or when the hydropower station in Rao Quan (Huong Hoa District) discharges water and the water becomes brown and sediment laden after flooding.

Figure 2. Location of the Quang Tri and Dakrong river catchments in central Vietnam (source , IUCN)

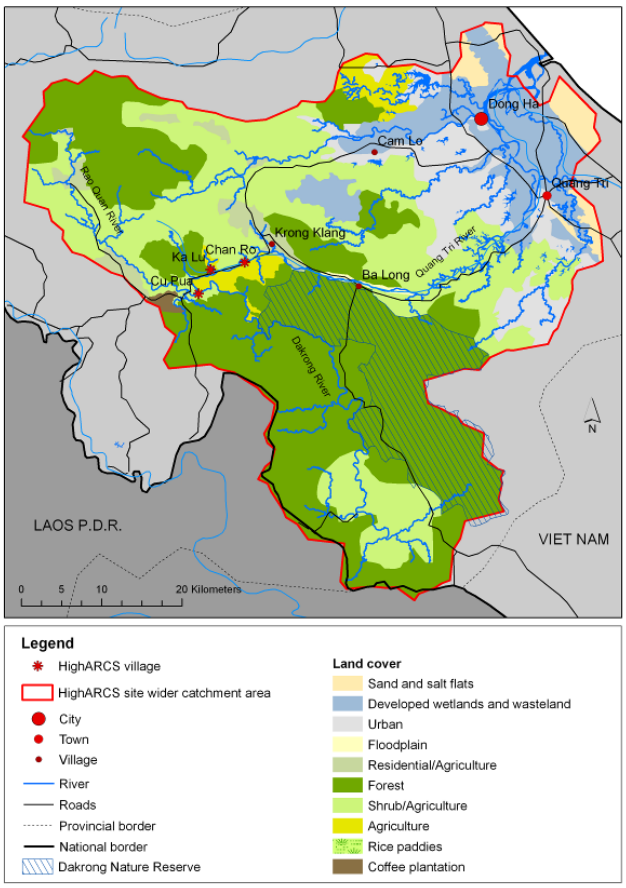


Figure 3. Map showing the HighARCS communities within the Dakrong river catchment (source IUCN)

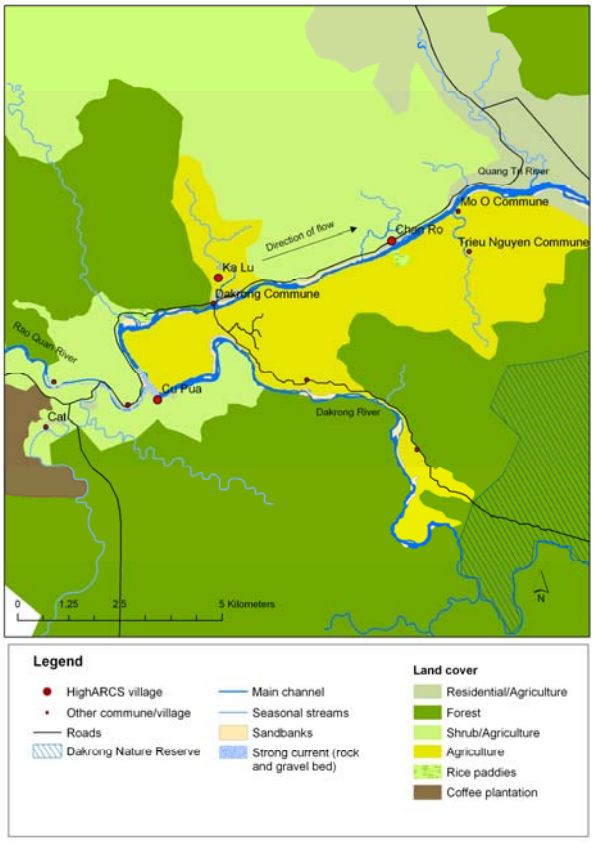


Figure 4. Habitat map of study areas (source IUCN)

Figure 5. Physical characteristics of Dakrong River

Involvement of stakeholders in the HighARCS project is a critically important issue. The stakeholders were identified as anyone who is directly or indirectly involved with aquatic resources either collecting, managing, marketing or using them and they may have been involved in household interviews, focus groups and stakeholder meetings. When participating in the stakeholder Delphi, the stakeholders were divided into groups at: (1) province and district level (people living outside study site, policy making & management); (2) commune level (people living in the study site, involved in fishing or making plans for the commune and management) and (3) village level (fishers and people living in HighARCS villages). Stakeholders have had a significant impact on the formulation of recommendations and will be central to implementing action plans and could be significantly impacted by the proposed actions.

Overall aims of the project at the site

Overall objectives for the HighARCS project include using interdisciplinary approaches to develop knowledge on the importance of aquatic resources in highland areas and formulate integrated conservation, livelihoods and policy action plans. With local communities of Dakrong District in Quang Tri Province (Central Vietnam), the importance of aquatic resources in the livelihoods of people in Cu Pua, Ka Lu and Chan Do villages, threats to biodiversity of fish species in Dakrong River as well as stakeholder ideas have been explored and understood. Action planning was proposed for wise-use, assumed here to be sustainable utilisation for the benefit of local people in a way that maintains the natural properties of the ecosystem for current and future generations (adopted from the definition of wise-use of wetlands, from the 3rd Ramsar Conference of the Contracting Parties

(COP3, 1987) (Ramsar Convention Secretariat, 2010). Better Management Practices aimed at conserving biodiversity and sustaining ecosystem services will be communicated to potential users to promote uptake and enhanced policy formulation.

2. Assessment Methodology

Integrated assessment approach

The Integrated assessment process was developed at the Project Management Group (PMG) meeting in Hanoi (June 2010) in order to develop the most appropriate framework for planning in the HighARCS project. Following the PMG meeting, integrated research activities for the HighARCS project were designed for data collection for WP3, WP4 and WP5. The integrated approach of HighARCS means action plans will no longer take three different formats of Conservation Action Plans, Livelihoods Action Plans as well as Policy Action Plans. Instead, for each study site, one integrated action plan (Springate-Baginsky *et al.* 2008, IUCN 2008) has been formulated addressing aquatic biodiversity conservation, livelihoods and policy issues.

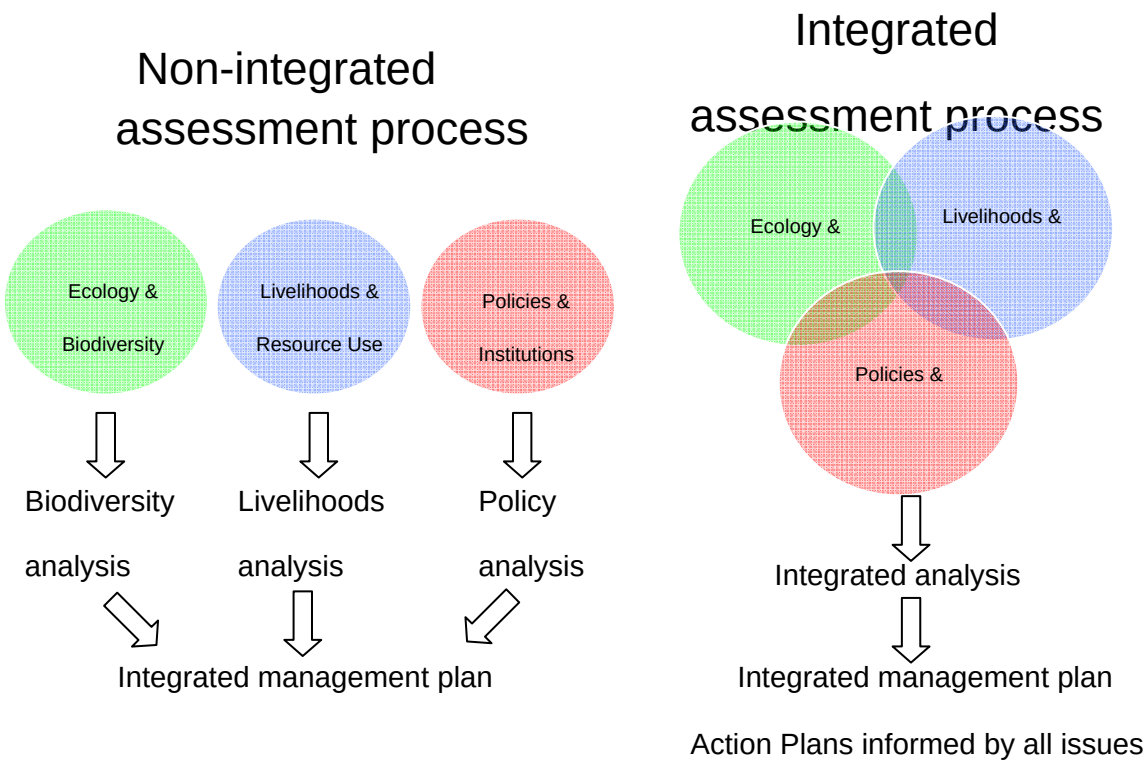


Figure 6. An integrated assessment and action planning approach of HighARCS (adapted from the IUCN Wetland Assessment Toolkit, 2009)

3. Overview of biodiversity and ecosystem service values (WP3)

Results of the WP3 studies undertaken during the first two phases of HighARCS show the fish diversity at the site in Dakrong River in Quang Tri consisted of 38 fish species belonging to 26 Genera, 9 Families and 5 Orders. The Family Cyprinidae accounted for the most species (50% of the total), followed by Gobiidae with 6 species (16%) and Balitoridae with 4 species (10%). There is a possibility that 5 new and endemic species have been found and consequently the number of species recoded in the WP3 survey may be an underestimate of the true fish diversity at the site. In the list of species collected, there were no globally threatened species, one species was globally Near Threatened and six species were listed as Data Deficient, whilst three species on the list of endangered aquatic species in Vietnam were identified. There are 7 species identified as 'high value' out of 15 economically valuable species, with, unfortunately eight species known to be declining at the site (Table 2). It is important that more survey work at the site is undertaken in order to confirm whether or not the specimens collected are indeed species new to science; especially as they may be endemic to a very small area and be of global conservation concern.

Table 2: Fish species identified from the Dakrong River through field surveys.
IUCN Red List categories are EX (Extinct); EW (Extinct in the Wild); CR (Critically Endangered); EN (Endangered); VU (Vulnerable); NT (Near Threatened); LC (Least Concern); DD (Data Deficient). The categories CR, EN and VU are classed as the 'threatened' categories. '*' indicates a draft Red List assessment, that requires peer review.

Family	Binomial	Common name	National Red List status	IUCN Red List status	Economic importance	Population trends at the site
Anguillidae	*Anguilla marmorata*	*Cá Chình hoa*	VU	LC	High value economic species	Rapidly declining
Cyprinidae	*Opsariichthys bidens*	*Cá Cháo*		LC*		
Cyprinidae	*Nicholsicypris normalis*	*Cá Dầm đất suối*		LC* (as *Yaoshanicus*)		
Cyprinidae	*Hemiculter leucisculus*	*Cá Mương*		LC		
Cyprinidae	*Microphysogobio kachekensis*	*Cá Đục đanh chấm*		LC		
Cyprinidae	*Microphysogobio yunnanensis*	*Cá Đục đanh chấm mõm ngắn*		DD		
Cyprinidae	*Squalidus argentatus*	*Cá Đục trắng*		DD		
Cyprinidae	*Acrossocheilus sp1*	*Cá Chát đuôi chấm*		-	High value economic species	
Cyprinidae	*Acrossocheilus sp2*	*Cá Chát xám*		-	Economic species	
Cyprinidae	*Acrossocheilus sp3*	*Cá Chát vây đen*		-	Economic species	
Cyprinidae	*Spinibarbus hollandi*	*Cá Chày đất*	VU	DD*	High value economic species	Rapidly declining
Cyprinidae	*Spinibarbus sp*	*Cá Bỗng vây đen*		-	Economic species	
Cyprinidae	*Onychostoma laticeps*	*Cá Sỉnh gai*	VU	DD*	High value economic	Rapidly declining

Family	Binomial	Common name	National Red List status	IUCN Red List status	Economic importance	Population trends at the site
					species	
Cyprinidae	*Onychostoma gerlachi*	*Cá Sỉnh*		NT	Economic species	Declining
Cyprinidae	*Onychostoma babeensis* Hảo & Hiệp, 2001	*Cá Sỉnh thân cao*		NA	Economic species	Declining
Cyprinidae	*Neolissochilus stracheyi*	*Cá Dầm*		LC	High value economic species	Declining
Cyprinidae	*Garra orientalis*	*Cá Bậu*		LC		
Cyprinidae	*Carassius auratus*	*Cá Diếc*		LC		
Cyprinidae	*Carassioides cantonensis*	*Cá Nhưng*		LC (as *C. acuminatus*)	Economic species	Declining
Cyprinidae	*Cyprinus carpio*	*Cá Chép*		Introduced	High value economic species	Declining
Cobitidae	*Cobitis laoensis*	*Cá Chạch hoa Lào*		LC		
Cobitidae	*Misgurnus anguillicaudatus*	*Cá Chạch bùn*		LC		
Balitoridae	*Schistura fasciolata*	*Cá Chạch suối sọc*		DD		
Balitoridae	*Sewellia sp1*	*Cá Đép thấp*		-		
Balitoridae	*Sewellia sp2*	*Cá Đép cao*		-		
Balitoridae	*Annamia sp*	*Cá vây bằng miền trung*		-		
Bagridae	*Hemibagrus centralus*	*Cá Lăng miền trung*		DD*	Economic species	Declining
Siluridae	*Pterocryptis cochinchinensis*	*Cá thèo*		LC		
Mastacembelidae	*Mastacembelus armatus*	*Cá Chạch sông 1*		LC	High value economic species	
Mastacembelidae	*Mastacembelus sp*	*Cá Chạch sông 2*		-		
Gobiidae	*Rhinogobius giurinus*	*Cá Bống khe*		LC* (as *Papuligobius ocellatus*)		
Gobiidae	*Rhinogobius ocellatus*	*Cá Bống chấm*		LC		
Gobiidae	*Rhinogobius sp1*	*Cá Bống trắng*		-		
Gobiidae	*Rhinogobius sp2*	*Cá Bống ngắn*		-		
Gobiidae	*Cryptrocentrus sp*	*Cá Bống sọc ngang*		-		
Gobiidae	*Glossogobius giuris*	*Cá Bống cát*		LC		
Channidae	*Channa sp1*	*Cá Tràu suối quảng trị*		-		Declining
Channidae	*Channa sp2*	*Cá Sộp quảng trị*		-	High value economic species	Declining

The results from WP3, field observations by RIA1 staff, formal and informal discussions with the various stakeholder groups show that wetland biodiversity and ecosystems provide many benefits for humans living in Dakrong commune in both direct and indirect ways. All stakeholders appreciate the ecosystem services provided by the Dakrong River. However, different groups of stakeholders (Provincial and District level governance; Commune level governance; Villagers) evaluated the ecosystem services as having different levels of importance. The villagers scored the fishes/shrimps for commercial use higher than the other groups while the Provincial and District level governance group prioritised flood control and tourism and aesthetic value higher than the other groups. Potential indicators to monitor the state of ecosystem service and to monitor the impacts of any actions proposed in the IAP include water quality monitoring, water level monitoring, water harvesting monitoring, quantity and quality of fish harvesting, income generated from gold extraction and tourist numbers. These indicators will be developed with local communities and some will be put in place through the IAP.

Through focus group discussions and field visits the key threats to aquatic resources and biodiversity of the Dakrong River at the HighARCS site have been identified. The key threats at the site include the hydropower stations upstream that hold back water during the dry season and discharge water with a high sediment load creating flood surges which affect river transportation and reduce water quality. There are also a number of new dams under construction which will block the river and destroy species habitats and thus impact to aquatic resources and biodiversity in the river. Water pollution from gold mining, agricultural chemicals and domestic waste are also reducing water quality.

4. Overview of livelihoods (WP4)

Livelihoods in each of the three communities are highly diverse. On the whole livelihood strategies are dependent upon agriculture and are subsistence oriented, whereby food is produced for household consumption. However, there is an increasing level of involvement in the cash economy in all villages with more households producing food to sell, as well as making and selling handicrafts. Highland aquatic resources play a supplementary role in the livelihoods of most inhabitants in the valley, as it provides a source of nutrition through (fish and molluscs) as well as drinking water.

There were no apparently significant differences of wealth within the villages, and most households experienced some level of livelihood insecurity. The terms ‘better off’, ‘medium’ and ‘worse off’ were used to define wealth differences, as the livelihoods of most respondents were insecure and none of the households could realistically be classified as ‘rich’. Households classified as ‘better off’ generally had access to more land for agricultural which offered them a more secure supply of food,

allowing them to divert resources and assets into other activities such as livestock rearing or micro-enterprises. Such households were also able to invest more in education and the maintenance, upgrading or expansion of their homes. Another source of wealth for these households included income from skilled or semi-skilled employment, which in turn contributed to their higher investment in education.

Medium households on the other hand, were still able to gain a basic level of food security from their land, although holdings were smaller and less livestock was owned when compared to their richer counterparts. Some medium households had invested in education, occasionally facilitated by access to scholarships, and levels of skilled employment are lower than their better-off counterparts. As a result of their lower income, levels of day to day expenditure are lower than for 'better off' households.

Many households classified as 'worse off' have insufficient land or livestock to meet the household's subsistence needs. As a result they are more dependent upon labour or natural resources to survive. However, there are also more complex factors that affect their situation. For example, some households suffer from a lack of labour. These include households where adult members are unable physically to work due to illness, or households headed by either young newly married couples with no children, or older people whose sons or daughters have migrated and are unable to support them financially. The lower income or food security as a result of a lack of labour or land inevitably reduces the capacity of such households to invest in education, whilst some are unable to speak Vietnamese and this constrains such households from increasing their wealth through access to skilled employment.

Natural resources

There are 16.5 ha of water area in Dakrong Commune and most of the area is accounted for by the Dakrong River. All water resources are common property and can be used by all wealth groups according to their needs. The Dakrong River has mineral resources such as gold and sand which offer an income generating opportunity for people. Therefore access to it is important to local people in villages who are living nearby Dakrong River. Almost all the water sources supporting the villages come from the Dakrong River through a piped water system, however, in Kalu and Chando there is not enough supply for the whole year. In Cu Pua village, local people have to collect water from the river for drinking and washing.

The ecosystem of the Dakrong River is increasingly under threat. According to interviews with households and focus groups, many factors represent threats to the ecosystem including: rising population, economic development on the Khe Sanh plateau upstream, hydro-power dam construction, whilst turbidity from the construction site had undermined the quality of water. Resulting fluctuations in water levels make fishing dangerous while some fish species have been eradicated (e.g. some eel species). Furthermore, it was suggested that the waste released from the coffee factories upstream entered the river and caused skin problems for local people after swimming in the river, and now people have to walk further than before to collect drinking water from more distant streams.

The total land area for cultivated agriculture was 679.6 ha in Dakrong Commune, of which the area of wet rice was 172.3 ha, up-land rice was 280 ha, corn 197 ha, cassava 35 ha, vegetable 4 ha and sweet potato and others 50.5 ha[1]. However, due to the steep slope of the land, in the three villages in the study site in Dakrong there is a lack of land for rice cultivation, especially wet rice land. Only Chan Ro has 0.3 ha area of wet rice land. Most cultivation is of dry rice, corn and cassava. But, the quality was bad, local people's cultivation techniques are limited and dependent upon climate, leading to low rice productivity at only 1.2 ton per ha. 'Better off' and medium households own comparatively more land than worse-off but do not appear to have a significantly higher agricultural income. 'Better off' households may also be able to increase productivity through their greater labour capacity and enhanced investment in inputs, allowing them to generate a greater saleable surplus. Agricultural yields have been falling, however, for all households and soil erosion has been increasing. This may partially be due to the decline in shifting cultivation, which means land is left fallow for shorter periods.

After the war forests were damaged significantly, the Government of Vietnam had a number of programmes to replant forest in conjunction with local people. All the areas of forest have now been re-planted and forests play an important role in Dakrong people's livelihoods. Burning and cutting forest to plant rice field is now no longer allowed, whilst ownership of forest land is comparatively higher for 'worse off' and 'medium' households.

The aquatic resources of Dakrong Rivers are a particularly valuable element of rural livelihoods. The river is a direct source of drinking and washing water. In the villages there is no electricity; therefore micro-generators provide temporary lighting to some better-off households.

[1] data source the social and economic report (Dakrong Commune, 2009)

Agricultural yields are not sufficient to give households food security for the entire year due to poor soil fertility, therefore fishing is a very important source of food, especially in Ka Lu and Chan Do which have the steepest and poorest quality agricultural land. Fishing is small-scale for fish, snails and crabs which are caught using baskets, hand nets or even traditional cross-bows, although catches are generally just 0.5-2 kg per day this is still a valuable source of protein for households.

Worse-off households are more dependent upon fishing and invest more time and resources in fishing. They have more limited access to good agricultural land and are dependent upon common property resources such as the river.

In terms of gender relations, focus groups showed that the contribution of labour by men, women, boys and girls varied with respect to gender and age. There is an observable gender division of labour: men and women had unique sets of skills and ecological knowledge. Although some tasks were carried out by both men and women, there were some tasks which were more often carried out by men and others were more often carried out by women. Women more often go fishing using basket nets or using bamboo traps to catch shrimp. (Cu Pua observation and informal discussion, 12/5) or fishing with a crossbow or hand net.

About age relations, it was evident that there were distinct divisions of labour between children and adults as well as between men and women. Young people played a particularly important role in helping their parents with agricultural activities, collecting firewood and forest produce and fetching water. While these activities were normally carried out with their parents, other activities would be carried out independently. These included looking after their siblings, cleaning the house or tending livestock.

Young people play an important role in fishing activities, generally using baskets or lines to catch fish, while only a few households use hand nets, which are mostly used by men. Girls often catch shrimp in a large group. Children at about 10-12 years old usually fish alongside their parents, alone, or with their friends, using hand nets or baskets. Children collecting fishing and shrimp can combine this with swimming in the river, and consequently they can enjoy themselves while working. Children do not enjoy cutting wood or cutting grass for livestock as the wood is heavy and they have to walk a long way through the jungle with no water and they were scared of snakes and ghosts that live in the forest (*Cu Pua FG with boys/girls, 14/5, ages 14-16)*

Problems identified by stakeholders

There were many problems and difficulties in the study site in Dakrong Commune. First of all, natural resources and soil quality have declined and there is a lack of clean water for those living in villages

as local people still depended on water in the Dakrong River. Secondly, electricity is a big problem raised by some households (General notes from Interviews, 12/5-19/5). There is no electricity in the villages and it is one reason why local people's knowledge was limited; many people did not know how to read and write. Therefore local people lack techniques for planting and animal husbandry. Thirdly, there is no bridge to cross the river (in Cu Pua and Chan Do villages) and a lack of constructed roads to villages (Cu Pua and Chan Do villages), making it especially difficulty in the flood season when people cannot cross the river to reach the hospital when ill. Fourthly, there are many children in the villages and local people lack knowledge of birth control. No addition occupations were reported (General focus group notes, 11/5-29/5). Only some better-off households produced mini electricity hydropower.

5. Overview of institutions, policy and conflict (WP5)

WP5 focused on building an understanding of the policies and institutional framework regulating and managing aquatic resources in the Dakrong District study site and market pressures and conflicts between users and uses. Based on this it was proposed to develop recommendations to serve as an input for the action planning stage later in the HighARCS project.

The main factors concerning institutions, policy and conflicts in highland aquatic resources conservation in the Dakrong River in Central of Vietnam relate to:

Vietnam as a one party-state consisting of three parts: the Communist Party of Vietnam, the Government, and the National Assembly, and the associated political and administrative system which has a complex top-down party-state structure with four levels of state apparatus (central, provincial, district, and commune level). The Government supervises the activities of the Provincial People's Committees (PPC), however devolution of decision-making power to the PPCs has increased over the past two decades. The Provincial People's Committee has a high level of influence on decisions about development and environmental policies and how resource management rules are made and implemented.

The national framework of legislation regulating biodiversity conservation, environmental protection, and conservation and use of aquatic resources is comprehensive. There are a range of limitations relating to overlaps between different legislation and policies and between institutions protecting and institutions managing aquatic resources.

There is also a lack of detailed guidelines for implementation of laws and policies at sub-national levels, which combined with a weak capacity, contribute to weak implementation in practice. A range of stakeholders are involved in biodiversity and conservation and the use of aquatic resources

and there are presently many development pressures on and threats to biodiversity and aquatic resources.

A brief description concerning the legal framework and institutional organisation that governs access, exploitation and conservation of aquatic resources is presented below. Figure 7 provides an overview of the key institutions related to biodiversity and aquatic resources conservation and management at all four administrative levels.

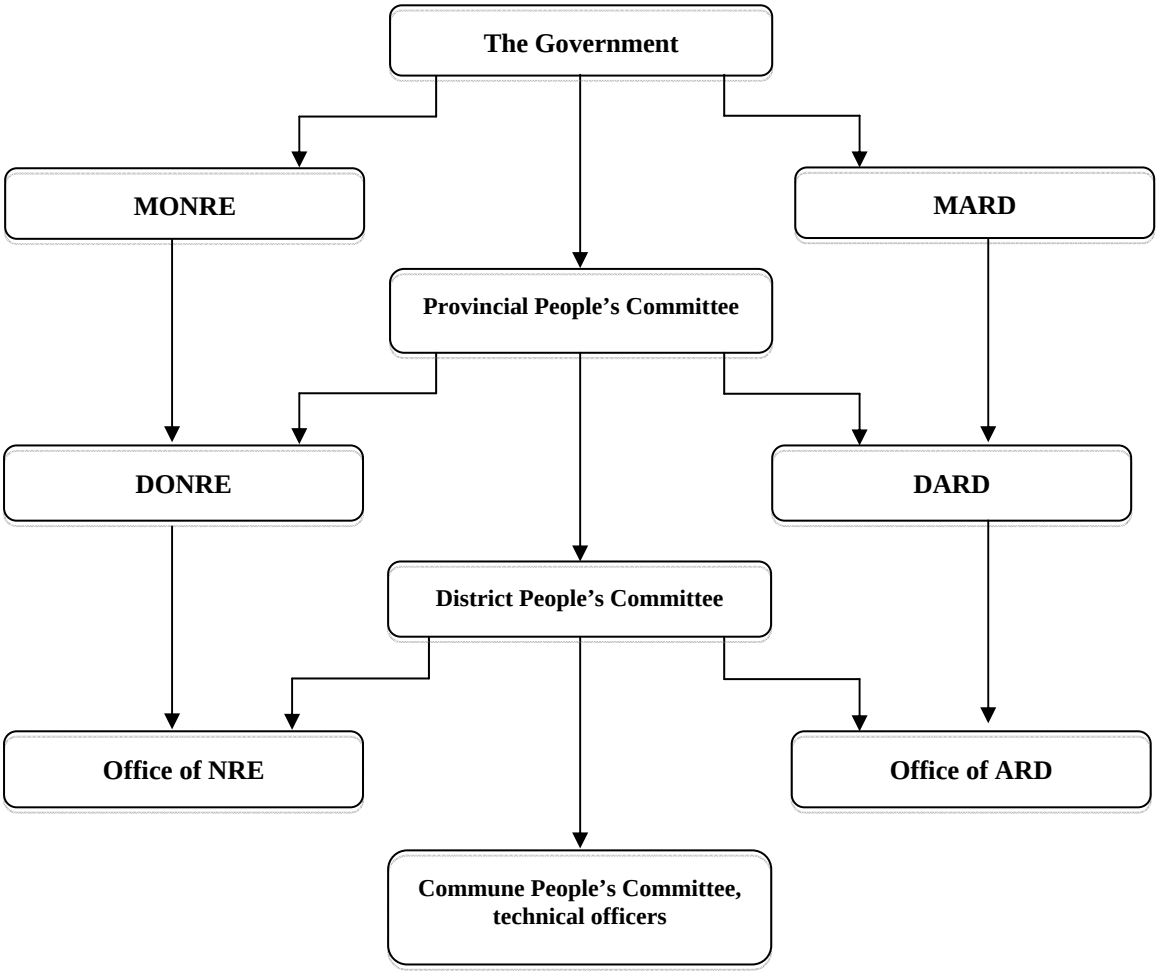


Figure 7: Key government institutions at all level involved in aquatic resources conservation and management

The Government of Vietnam performs unified state management of biodiversity and mandates MONRE as the lead state agency for management of biodiversity (Article 6 of The Biodiversity Law

(2008)). Other ministries, ministerial-level agencies and People's Committees and departments also execute specific functions assigned by this law and by the government. MONRE and MARD are two key ministries related to biodiversity and aquatic resources conservation. These ministries are accountable to the government for delivery on the functions assigned to these ministries through laws and policies.

6. Threats and conflicting interests between development and aquatic resources conservation in Quang Tri Province

Stakeholders related to highland aquatic resources conservation

Stakeholders involved in biodiversity and conservation of highland aquatic resources include:

- Fishers: people whose livelihoods are heavily dependent on fisheries resources, with part or their total income related to fishing.
- Traders: wholesalers, middleman or small traders in fish and aquatic products.
- Consumers: people who use aquatic product as daily food or restaurants who cook aquatic products.
- Managers, staff from central to local agencies who are involved in agriculture, fisheries and environment management.
- Researchers: academics and environmentalists who participate in the study of fisheries resources or have knowledge of aquatic resources in mountainous areas.
- Non-governmental organizations: groups active in the fields of aquatic resource conservation, environmental management and hydroelectric power generation management.

Conflicting interests between users and uses of aquatic resources

There are many development pressures on, and threats to aquatic resources in Quang Tri Province, including hydropower development, gold and mineral mining, agricultural cultivation, industrial activities and deforestation.

Conflicting interests in hydropower generation and aquatic resources conservation

The development strategy of the Vietnam electricity industry in the period of 2006-2015 is geared to meeting demand in 2025 and gives priority to the development of hydropower and encourages investment in small-sized hydropower plants. It is estimated that the total capacity of hydropower plants will reach 15,000MW by 2020. The Government of Vietnam encourages domestic and foreign enterprises to build small and medium scaled hydropower plants (The Thien Nien Net, 2011).

In Dakrong, hydropower stations such as Dakrong 1 in Huc Nghi Commune with a capacity of 12MW and Dakrong 2 with a capacity of 14.4 MW are under construction; Dakrong 3 (8MW) has not yet been constructed. Dakrong 4 (21 MW) in Ta Long Commune and Rao Quan hydropower stations have been completed. The current dams are all located upstream of the HighARCS site along the Dakrong River and Dakrong 2 is located at the HighARCS site. Development of hydropower is creating changes in river streams and flow velocities and regimes, thus leading to sedimentation and erosion. The impact of hydropower on rivers is generally well-known and should have been assessed when the larger hydropower plants were submitted for Environment Impact Assessment. Further information is presented in the WP3 report concerning which aquatic species may be impacted.

Conflicting interests between mineral exploiting and biodiversity conservation

In Dakrong District, development of the mineral exploiting sector is given priority. The district intends to focus investment on the exploitation of sand and grit from the Dakrong River (in Ba Long and Mo O Communes). Investment in infrastructure and services for gold mining is ongoing in A Vao, A Bung and Ta Long Communes, but operators are reportedly using local labour and good management to limit environment impacts and increase revenue for the district. Currently, in Dakrong District, there are several places for gold mining. In Dakrong River at A Vao Commune, hundreds of people came to prospect for gold in 2010. The gold miners set up camps, using explosives and other destructive means to try and locate and extract gold deposits. In addition, local people use self-made instruments for gold mining that create noise in the Dakrong River

Conflicting interests between agriculture and biodiversity conservation

In Dakrong, there is a plan to develop areas for agro-forest products. The plan encourages planting of orchards and industrial trees (principally rubber and pepper) and provides land for forestry plantation (Quang Tri Planning and Investment Department, 2011).

Conflicting interests between fisheries and aquatic conservation

Capture fisheries have led to negative impacts on natural resources conservation in Dakrong Districts. The master plan of Dakrong District encourages local people to adopt integrated farming systems (pond-garden-livestock) at a household scale. There is no fishery policy in the master plan, even though fish is an important food source for local people and recently aquatic resources have been highly exploited and indiscriminate fishing methods employed. Anecdotal evidence suggests poison and electrical equipment are still being used illegally. Limited awareness of conservation needs and difficulties experienced with local livelihoods has contributed greatly in combination with other threats to the degradation on fish populations. Therefore awareness raising is included in the IAP.

Local authorities believe that raising awareness of fishing laws and aquatic resources is important for biodiversity conservation. If fishing is strictly banned people will lose their source of income and livelihood so there is no easy solution for this issue (Interview, 9/2010). Thus, it is important to educate people about the role of biodiversity in the livelihoods of local people in the long-term and create alternative jobs for local people. Moreover, improving access to and productivity of aquaculture within safe ecological limits e.g. developing or using native local species and methods to restrict escapes could provide alternative livelihoods options.

Conflicting interests in factory development and environmental protection

In the Dakrong Master Plan, some animal feed factories, food processing, handicraft, textile and wood processing facilities will be built in the district in the period 2009-2020 (Quang Tri Planning and Investment Department, 2011). In terms of environment management, the waste from these factories may create a negative impact on the environment as well as water quality and biodiversity.

Implementation of policies in Quang Tri

Biodiversity conservation & Environmental protection

Quang Tri Province has paid attention to the conservation of biodiversity and issued a number of policies and implementation plans (see report HighARCS D5.1 for further information); notably the "Action Plan on protection of biodiversity, biosecurity to 2010 and orientation to 2020 in Quang Tri Province" (Quang Tri online 2010). From 2007 investment for resources and environment protection increased and the Department of Natural Resources and Environment (DONRE) for the province collaborated with other departments and organized classes, propaganda and dissemination. And thorough NQ 41/TU Resolution, Decision No. 79/2007/QD-TTg training in biodiversity for employees in all departments, agencies as well as leaders of the political and social organizations at provincial, district, town and city levels. Quang Tri Province also established the Environment Unit under Quang Tri DONRE which operates in nine out of ten districts. Furthermore, Quang Tri Provincial People's Committee (PPC) established three nature reserves to protect biodiversity; Dakrong, North Huong Hoa nature reserve and Con Co island marine protected area.

Quang Tri PPC issued "Direction No 09/CT-UB in 1993 on Environment Protection" and "Direction No 14/Ct-UB in 1996 on Environmental Impact Assessment Reporting". In 2007, Quang Tri Province produced an action plan for environment protection in Quang Tri Province to 2020, which gives priority to the programmes on rural environmental protection, biodiversity protection and education on environmental management.

Aquatic resources conservation

In 2006, Quang Tri Province People Committee approved the "Decision No 53/2006/QD-UB on fishery development planning to 2010". In 2007, the Department of Exploitation and Protection of Fisheries Resources in Quang Tri Province proposed a program to protect and develop aquatic resources in Quang Tri province in the period 2007-2010 as follows: education and raising awareness of aquatic conservation within the community; restoration, regeneration and development of fisheries resources; protection and conservation of the biodiversity of aquatic organisms (Quang Tri Department of Agriculture and Rural Development, 2007). However, the Ministry of Agriculture and Rural Development has given less attention to fisheries programmes and many programmes were proposed but not approved. In Quang Tri leaders have recognized the importance of aquatic resources; however, there has not been a uniform approach to carrying out these proposals (Key informant interview 01/2010).

The priority for Quang Tri includes: surveys of aquatic resources in Quang Tri; breeding indigenous fish species to restock aquatic resources; developing models for community management of fisheries resources; developing and implementing action plans for aquatic resources conservation. These could prove critical and it should be ensured that HighARCS project work supports and does not replicate initiatives from the government or NGOs. There may be ongoing work that can be included within the IAP and where HighARCS could provide support or add value.

Limitations in the conservation of biodiversity in Quang Tri

The following outcomes were from the stakeholder Delphi undertaken as part of the HighARCS project in 2010 but most of it dealt with institutional and legal issues and was less concentrated on livelihoods and WP3:

- Implementation of policies in biodiversity conservation is not carried out especially as fishing in the sea, lakes, rivers and streams by electric shocks, explosives, toxic etc. is still evident.
- Rules are not strong enough to prevent illegal activities affecting biodiversity conservation.
- Management systems in districts and communes are not strong enough and there is a lack of qualified staff.
- Management of biodiversity is a part-time task for staff and collaboration between organizations is inefficient or management functions are duplicated.
- Financial investment for biodiversity conservation is limited which makes implementation of policies difficult and there is neither equipment nor facilities for inspection and biodiversity monitoring.

Implementing regulations at district level

In Dakrong District there is one employee in the Department of Agriculture and Rural Development responsible for the field of animal husbandry and aquaculture, but there is no specific policy on aquatic biodiversity conservation (Key informant interview; Department of Agriculture and Rural Development of Dakrong, 2010).

The Department of Natural Resources and Environment has mapped rivers and streams of the district, however, the department is mainly responsible for land and soil management and do not undertake specific tasks regarding aquatic resource conservation (Key informant interview; Department of Natural Resources and Environmental, 2010). Recently, illegal gold and mineral mining has occurred in Dakrong which has caused huge negative environmental impacts. The District People's Committee has carried out many campaigns to solve this but the number of polices is limited and the gold miners are intelligent and have managed to escape whenever they know the police are coming (Key informant interview; Department of Natural Resources and Environmental, 2010).

Implementing regulations at commune level

Throughout Dakrong, there is neither policy nor regulation on aquatic conservation at the commune level. Local people claim the fish resources are degraded owing to soils erosion; hydropower stations; sand mining; flushing out of residues from coffee production. Local people said that there are only a few people involved in fishing while studies under HighARCS revealed that fishing on a daily basis is an important source of food for local people.

7. Synthesis chapter

The following section summarises the main outputs from WP3, WP4 and WP5 and highlights the main challenges to reconciling aquatic biodiversity conservation and wise-use.

Main finding from WP3	**Main finding from WP4**	**Main finding from WP5**
- Five new fish species may have provisionally been identified at the study site. - Recorded fish species an under estimate of total fish fauna. Three species on the Endangered species list of	-Hard climate condition characterised by droughts and floods -Poor quality soil, lack of productive land, high slope -Low agriculture yield resulting	- Low awareness of local people and staff of aquatic resources conservation - Weak collaboration in management at different offices - Lack of staff for aquatic

Vietnam (all of which are of high economic value and rapidly declining at the site). One globally NT species. Eight DD species. Many economically exploited species. - Biodiversity of fish species is threatened with populations of eight fish species known to be declining. -Destructive and unstable fishing practices continue -Water pollution from illegal gold and sand mining, from hydropower operation, from soil erosion due to deforestation, chemical from coffee planting in neighbouring district as well as waste from factory and town from neighbouring district	in not enough food - Poor infrastructure -Lack of water for drinking and domestic use -Limited electricity in Cu Pua and Ka Lu - Livelihood difficulties -Lack of finance for product investment -Low education -Disease affecting both human and animal health	conservation - Lack of finance for information transfer - Lack of access to information - Weak enforcement of laws and control measures

8. Action planning process and methodology

Objectives of IAP

The objectives of the integrated planning approach adopted for the HighARCS project is to combine action to enhance biodiversity, strengthen livelihood as well as promote stronger management of institutions. Key steps in the approach developed for the formulation of integrated action plans in collaboration with stakeholders are summarised below:

- Engaging dialogue with local communities and local authorities during the activities of the first phases of HighARCS
- Awareness raising
- Prepared an Integrated Action Plan (IAP) based on HighARCS WP3, WP4 and WP5 outcomes
- Stakeholder meeting discussions
- Revised Integrated Action Plan
- Finalized IAP: Who do what? by when? How to carry out? How to monitor & evaluate?

- Implementation
- Monitoring & Evaluation

The process included methodological reflections about the role of the HighARCS team as facilitators, trainers, knowledge providers and action-researchers. Through the steps outlined above, the process proceeded well and good relations were established with the local stakeholders.

Box. Integrated Action Planning methodology (sources: HighARCS Integrated Action Planning Guidelines)

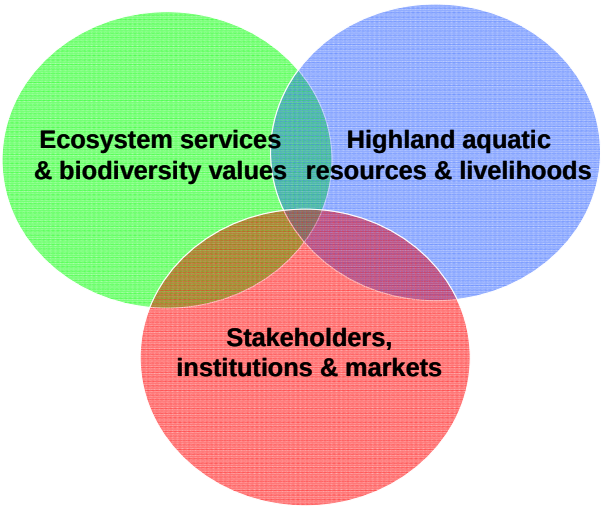
Integrated Action Planning is central to the HighARCS project and was included as a mechanism to engage stakeholders in joint assessment and decision-making with respect to highland aquatic resources planning and management. Three strands of action planning were foreseen focusing on conservation, livelihoods and policy, however, it was decided to adopt an Integrated Action Planning approach that would:

a.) address perceived conservation, livelihoods and policy needs and deficiencies;

b.) evaluate proposed actions with regards potential negative impacts on conservation and livelihoods or conflicts with policy and existing management arrangements;

c.) identify appropriate indicators relevant to conservation, livelihoods and policy for monitoring and assessing impacts of Integrated Action Plans (IAPs).

A series of steps for moving from research findings and provisional conservation, livelihoods and policy action plans in some instances, to implementation of IAPs by communities, stakeholders and possibly facilitation by HighARCS team members at each of the study sites was agreed.



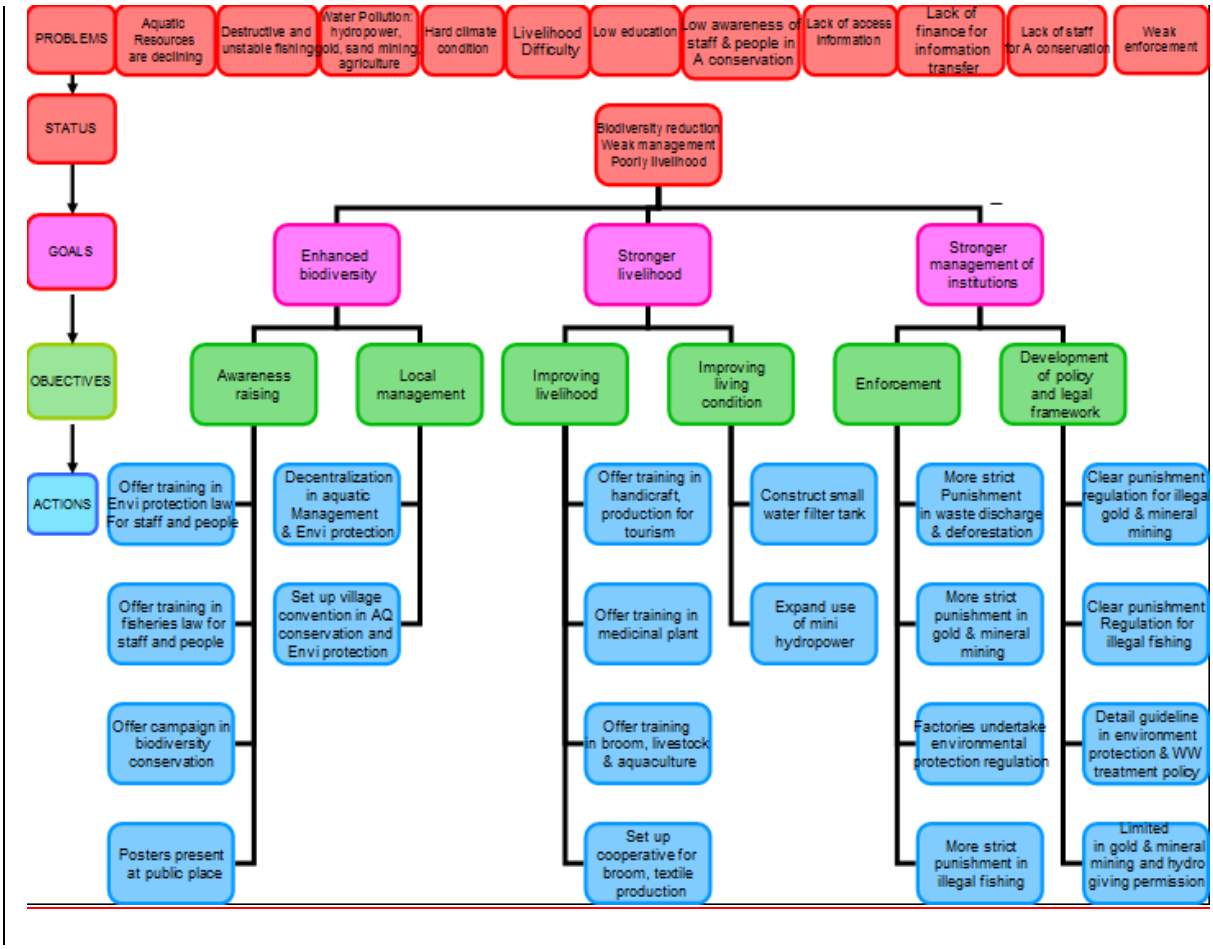


Figure 8. Finalised Integrated Action Plan for the Quang Tri study site

Figure 8 presents a summary of the finalised Integrated Action Plan for the Quang Tri study site which was formulated initially by the HighARCS team and revised after stakeholders meetings. The evidence for each of the problems mentioned was presented in detail in reports of WP3, WP4 and WP5. The diagram has highlighted short, medium and long-term actions being proposed and indicated that the HighARCS team can lead on some of the actions but that this will depend on close cooperation with local communities. The IAP was presented in China PMG meeting in August 2011.

Outputs of WP3, WP4 and WP5 highlighted problems at the study site in Dakrong. Based on the goal and objective of the HighARCS project and problems and status of communities at the site actions were proposed, although many of these relate to more than one of our objectives and goals. For example if the management issue identified relates to “declining aquatic resources and biodiversity at the site leading to decreased food security and quality of life”. The objective would be “to improve awareness of biodiversity conservation and its role in the provision of livelihoods for both government officials (at village level) and public (stakeholders)”. This would require various actions to address the different knowledge demands of the respective stakeholder groups.

9. Management proposals

It is proposed actions that will solve the Management Issue(s) of the site. The proposed actions need to be achievable with the resources, stakeholders and be realistic. The actions and the monitoring both required to be sustainable post HighARCS project.

Initial proposals

Proposal 1: Introduce stricter regulations for coffee factories and hydro companies to reduce pollution levels

Objective: Improve water quality by identifying sources and levels of pollution, improving awareness among different stakeholder groups of their impact on water quality and improving the enforcement of existing pollution regulations.

	Co Pua	Chen Ro	Ka Lu
Men	Med priority	Low priority (ranked 8th)	Low priority (ranked 10th)
Women	Med priority	Med priority (ranked 7th)	Low priority (ranked 10th)
Girls	High priority	Med priority (ranked 5th)	High priority (ranked 2nd)
Boys	High priority	N/A	High priority (ranked 2nd)

Reasons for prioritization

- Respondents complained that pollution from dirty water affects the health of all the people in the village. For example, when the dam was being built, many fish died. Now they believe the coffee factories are causing pollution and that this had led to a decline in fish stocks. It causes skin complaints also when they swim in the river.
- From discussions with local people, the district has already been informed. The village leader of Co Pua for example, sent a letter to the district about water pollution from coffee factories. This was raised in the HighARCS SOS meeting.
- There did seem to be some uncertainty as to the source of pollution. The Co Pua leader said that after their complaints and action by the district, the factories had stopped putting organic waste in the water, and it is now used to make fertiliser. Some villagers therefore felt that organic waste was no longer a problem. However, they said that now although they cannot see the waste, it is still there as they can smell the coffee, some even said it had got worse since the consultations with the district. They also said that run-off from pesticides used for rice cultivation by Kinh people up on the Khe Sanh Platteau was also a problem. Significantly, this is not only with coffee, but with wet rice cultivation. Focus Group (FG) respondents said that when people in Khe Sanh began coffee cultivation, there was an increase in pests, and this also affected other crops, so the overall use of pesticides has increased. FG respondents in Da Krong

however, made it clear that they rarely use pesticides. Another possible source of pollution raised in Co Pua was the biannual 'cleaning' of the hydropower station upstream. This reportedly causes oil and other pollution to enter the river. Respondents were not clear however, of the exact mechanism of pollution.

- According to the District Environment Department, waste from Khe Sanh town was the primary source of pollution – both waste water and rubbish from the market.
- In Chen Ro, this was not considered such a high priority, perhaps because far fewer households engage in fishing. Women FG respondents also felt that the government already provided factories etc with regulations, so little needs to be done.

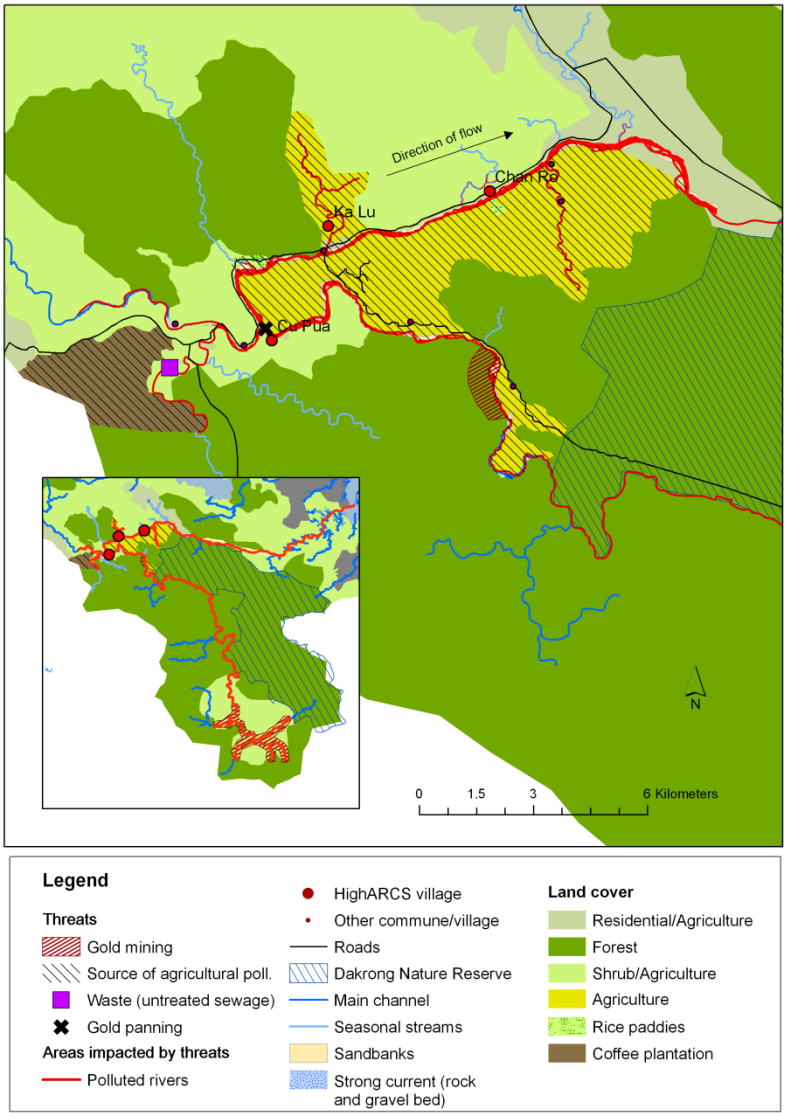


Figure 9. Sources of water pollution to the HighARCS site in Dakrong (Source: IUCN)

Activities

- Develop water quality monitoring at suitable sites to identify sources and levels of pollution in the Dakrong River. Use the maps to identify the suitable sites
- Based on results from water quality monitoring, we will engage with the local government to seek better enforcement of pollution regulations
- Develop an education and awareness campaign on the impacts of pesticide use targeted at farmers on the Khe Sanh plateau
- Develop an education and awareness campaign on and the impacts of household and commercial waste disposal into the river targeted primarily at the market in Khe Sanh.
- To raise awareness of pollution in the Dakrong river and improve communication and understanding between the different stakeholder groups.

Potential problems

- Identifying the cause of pollution – although an analysis of water quality could be part of the action plan itself.
- Seeking commitment from the local government to enforce regulations.
- Sources of pollution were reported to not be in Da Krong district but Hoang Hoa, around Khe Sanh. The fact that both regions fall under different administrative umbrellas may create some challenges for effective implementation of projects.

Who will implement this? How will they do this? Over what timescale

- water should be analysed for monitoring water quality and investigating pollution.
- district environmental office in both Da Krong and Hoang Hoa would need to actually send letters to the coffee factories and other industries and seek to enforce regulations.
- the HighARCS team could take a lead in a poster campaign.

What will the indicators of success be? Over what timescale will monitoring continue?

- Another set of water quality tests could be carried out after one year.
- Further consultations with local people could be completed to assess whether perceived water quality and fish stocks had increased.

Objective	Improve water quality by identifying sources and levels of pollution, improving awareness among different stakeholder groups of their impact on water quality and improving the enforcement of existing pollution regulations.			
Activities	Measurable outputs	Implementer	Indicators (monitoring)	Timescale
Develop water quality monitoring at suitable sites to identify sources and levels of pollution in the Dakrong River	Water quality monitoring scheme set up. A report produced after 6 months of monitoring.	RIA1 It may training people to take over water quality monitoring once project is finished (e.g. local government Or other stakeholder group)	Water quality data at different sites along the Dakrong river generated every month. Results report produced.	Water quality will be recorded seasonal y or once a month until the end of the HighARCS project.
Based on results from water quality monitoring, we will engage with the local government to seek better enforcement of pollution regulations	Meeting held, and report produced outlining discussions and actions.	RIA1	Government figures showing number of people prosecuted for breaching water pollution regulations	Meeting will be held after 6 months of monitoring scheme.
Develop an education and awareness campaign on the impacts of pesticide use targeted at farmers on the Khe Sanh plateau				
Develop an education and awareness campaign on and the impacts of household and commercial waste disposal into the river targeted primarily at the market				
To raise awareness of pollution in the Dakrong river and improve communication and understanding between the different stakeholder groups				

Proposal 2: Improve local people's knowledge about law and regulations from government about environmental protection.

This proposal is about improving local people's knowledge about laws for environment protection in general. It is not just about forests protection, but also for better fisheries management.

	Co Pua	Chen Ro	Ka Lu
Men	High priority	High priority (ranked 3rd)	Med priority (ranked 7th)
Women	High priority	High priority (ranked 3rd)	Med priority (ranked 5th
Girls	High priority	Med priority (ranked 5th)	High priority (ranked 1th)
Boys	Med priority	Med priority (ranked 4th)	High priority (ranked 1th)

Reasons for prioritization

- FG with men in Co Pua and girls in Chen Ro raised the issue that flooding was increasing due to deforestation.
- There was a perception that local people lacked knowledge of how to most effectively manage forests.
- In Chen Ro, the men felt that deforestation had increased the levels of mud in the river, also harming fish stocks.

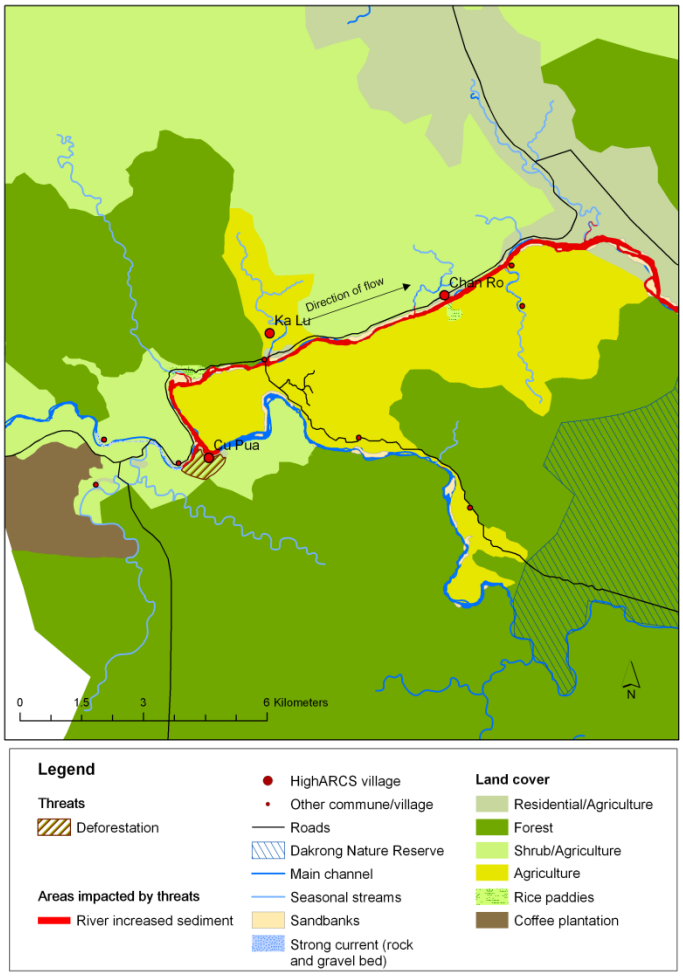


Figure 10. Threats from coffee farming and deforestation affecting the Dakrong River

Activities

- Arrange training for local people on effective and sustainable forestry methods
- A contest about understanding of law/regulation and best practices in forests and fisheries and their implications for the conservation of biodiversity. The contestants could be students at primary and secondary school (from 9-15 years old/ grade 3-9) in the district. The form of contest might be poster presentation within class, oral presentation for some excellent candidates or written paper. The expectation under this proposal is that knowledge of local people about environment protection in general will be improved.

- Support for communities and awareness raising through local radio, poster, training for local authorities about fishing and forest regulation and better practices. For example a broad poster will be put in public areas such as commune offices and village leader's houses to assess how effective it is as a communication tool. The contents should depict in pictures the rules and practices relating to conservation of aquatic resources, for example, using suitable net sizes for harvest, not taking selected fish species or fish below a certain size and not targeting particular species during their breeding season, etc. The existing rules from the government will be reiterated as to date they have largely failed to reach poor communities.

Who will implement this? How will they do this? Over what timescale

- The HighARCS team could arrange training and instigate the contest and poster campaign
- Government experts would be best placed to actually provide the training.

What will the indicators of success be? Over what timescale will monitoring continue?

- A reassessment of changes to local knowledge after six months and one year. The same set of questions covering things on the flagship species sheets/poster i.e. species identification, life histories, problems, fishing methods and conservation needs will be carried out at the beginning of the awareness raising campaign and then after 6 or 12 months to see how much awareness has improved by age, gender and among different stakeholder groups. In addition to identify if the new knowledge has been put in place. By assessing whether illegal size nets are still being used or if the level of deforestation has changed.

Proposal 3: Construct water tanks for more easily available drinking water

Reasons for prioritization

- Shortage of clean water is the biggest problem outlined in both Chen Ro and Co Pua villages. In Kalu this was not considered a problem as they have a reliable water supply.
- There was frustration in both villages as they had previously had water supplies, but these were now defunct. In Co Pua, a well was built, but there is hardly any water. Three letters were written to the government but no response.
- In Chen Ro, the water supply system was destroyed in recent autumn storms. The supply was originally built as part of the governments 135 programme. The idea is that the government provides the infrastructure and the village people are expected to pay for and provide labour for maintenance. While this worked well previously, the damage is so severe this time that they cannot afford to repair it. It may not the best supply strategy if severe storms are set to increase in frequency with climate change and may make communities more vulnerable. The pipe is damaged near the water source in the hills to the south. The tank above the village into which water flows is now empty. The supply for the neighbouring village, Khe Ngai, was damaged in 2007. Water comes from the same river. It also has not been repaired. Repairing the supply in Chen Ro was considered increasingly urgent, as the small stream they get their water from at the moment will have dried up by May. After that they will have to get their water from the river.
- Water supply is a particularly serious concern for women and girls who bear a disproportionate responsibility for collecting water from the streams when the village supply is out of action. They have to climb up quite high to get to the source.

	Co Pua	Chen Ro	Ka Lu
Men	High priority	High priority (ranked 2nd)	Low priority (ranked 11th)
Women	High priority	Med priority (ranked 2nd)	Med priority (ranked 6th)
Girls	High priority	Med priority (ranked 5th)	High priority (ranked 3th)
Boys	High priority	High priority (ranked 2nd)	High priority (ranked 3th)

Potential problems

- Given the considerable expense involved, we have to depend on the commitment of the local government to allocate funds. This is particularly difficult given that many households lost their water supply following recent storms. How does the government prioritise one village over another? According to the local environment department, there are 56 drinking water projects in the district, but many were destroyed in the 2009-2010 storms. It will take

time to make the necessary repairs. The district government said they were still waiting for the budget allocation from the Central Government to repair the supplies.

- In Chen Ro, we were informed that the village leaders had already written to the commune, but they had received no response. The question is how to increase the chances of actions having an impact in the future?

Activities

- In this context, the only thing we can do is to inform the government of the water problems and the possible options. Then they could decide how to allocate funds. The type of intervention that might be appropriate depends on the village:
    - In Ka Lu, no intervention necessary.
    - In Chen Ro, the local people simply want their water supply repaired. We can raise their concerns with the local government during stakeholder meetings. The local people even said they were willing to provide the labour if the government can provide the raw materials.
    - In Co Pua, the village is spread out in three primary clusters. In FGs it was suggested that the government could either build one large tank in each cluster, or build a small tank for each household, for which households would need to take a loan. In the past some government schemes had covered 70% of the cost while villagers gave 30% towards the costs. There was a worry that when communal water facilities are provided, nobody looks after them. For that reason some respondents stated they prefer private small tanks. This however, is unlikely to be feasible.

What is the likely timescale of the intervention? Who will implement this? How will they do this? Over what timescale?

- The scale of such an intervention means it must be implemented by the local government and its contractors.
- Local people agreed in focus groups that they would provide labour in the case of Chen Ro, to repair their damaged supply system; they just need materials.

What will the indicators of success be? Over what timescale will monitoring continue?

- Indicators of success will be an assessment of the number of households in Co Pua and Chen Ro that have access to clean drinking water after one year.

Improved livelihoods in terms of improved quality of water for drink is proposed, however, it may be outside the capacity of the HighARCS project in terms of financial and not relate directly to conservation of fish biodiversity.

Proposal 4: Expand the use of and improve mini-hydro power devices

Reasons for prioritization

- This was considered a high priority for all respondents in Co Pua and Chen Ro. Ka Lu has a reliable electricity supply, so it was ranked as a low priority there. Young people in particular would value electricity because it is difficult to study in the evenings. They depend upon using oil lamps which are not really sufficient. Almost all respondents raised this as a key issue during focus groups, both young people and adults.
- They would also value TV as this is a valuable source of agricultural and livestock related knowledge. Girls in Co Pua said it was a source of educational knowledge that can help them with their studies.

	Co Pua	Chen Ro	Ka Lu
Men	High priority	High priority (ranked 1st)	Low priority (ranked 10th)
Women	High priority	High priority (ranked 1st)	Low priority (ranked 9th)
Girls	High priority	High priority (ranked 1st)	Low priority (ranked 11th)
Boys	High priority	High priority (ranked 1st)	Low priority (ranked 9th)

Activities

There are three types of mini-hydro dam – small, medium and big. The largest can be used for 5 households and the smallest for just 3 households, if they supply only lighting. If they are to be used for TV etc, then one small hydro is required at least for one household. The use of some bigger devices to supply light to several households would be most practical.

In Co Pua, there is the best potential to use devices as there are several sections of fast flowing river around the community. In Chen Ro however, there are few sites to use the devices. The river is slow and far from the village, while the one small fast stream which currently has one tiny device only sometimes has sufficient water for it to operate.

There are several ways we could potentially help based upon our discussions in Co Pua.

- Based upon meetings, we could assess who requires power the most i.e. lowest income with greatest number of children. Both the men and girls in Co Pus suggested three large devices for each of the three clusters in the community (there are three sections to Co Pua)
- Facilitate setting up of a user group to manage the devices. This group can also be responsible for maintaining the devices.
- In the FG respondents informed us that they would supply the wooden frames, but they cannot afford the generators. We could try to seek a commitment from the local government to provide these, otherwise seek a contribution from households.
- We could bring a technical expert to the field to identify the most efficient way to set up the devices, and wire them to the household.

For Chen Ro, options are far more limited, and respondents agreed with this. We were informed during FGs that what they really needed was to be linked up to the electricity grid. There are many households, so it is conceivable that this may happen soon. The village is also relatively concentrated, unlike Co Pua which is spread out.

- We can ensure that the local people's voices are heard by the district government during stakeholder meetings, so their interests are taken into account when allocating resources.

Potential problems

- Large sums of money invested by the local government are required for both initiatives. We may not receive their support.
- The release of water from the hydro dam in Co Pua can damage devices. We were told however, that the hydro station informs local people in advance, so they can lift them from the water.
- Some of the households in Co Pua on the far side of the village from the road may be relocated soon to the area above the road on the opposite bank. They would therefore be a lot further from the river, with a road in the way.
- It was felt in Chen Ro that it would be very difficult to 'share' their hydro devices. Every household wants one. The village was felt to be too big with 86 households. This situation could lead to conflict. That is another reason why connection to the national grid was only viable option.
- Commerce and industry representatives we spoke to said that there were limited financial resources from the government to invest in electricity provision for households and 1400

households have no power. The focus of service provision is normally on larger population centres

Who will implement this? How will they do this? Over what timescale

- Local government would have to provide the resources to invest in hydro devices
- We could assist in accessing government support for setting up self-help or other suitable groups.
- Local people said in FG discussions that they would take responsibility for providing the frames for the devices and would maintain them in the long term.

Proposal 5: Learn about the production of medicinal plants

Reasons for prioritization

- This was given low priority for several reasons. In Co Pua, women informed us that people mostly use manufactured drugs, so there is little point in growing medicinal plants.
- Male respondents in Co Pua felt that this would be a waste of valuable agricultural land. Also, they feel a priority is planting trees to prevent erosion and flooding.
- In Chen Ro, men felt that due to soil erosion, medicinal plants do not grow well. Women agreed that productivity could be low, but felt that perhaps they could do a trial with 2-3 households and see what the results are.

	Co Pua	Chen Ro	Ka Lu
Men	Low priority	Med priority (ranked 7th)	Low priority (ranked 9th)
Women	Low priority	Med priority (ranked 6th)	Low priority (ranked 11th)
Girls	Med priority	Low priority (ranked 7th)	Med priority (ranked 7th)
Boys	Low priority	N/A	Med priority (ranked 7th)

Who will implement this? How will they do this? Over what timescale

- Communes would need to take assistance from the Agricultural Department of Dakrong to implement this.

Proposal 6: Training in improving livestock production

Reasons for prioritization

- Livestock disease was a significant concern. Many people had lost animals due to disease in recent years. This is loss of a large investment and a significant asset.
- A new problem raised in Chen Ro FGs was that of the disposal of animal waste. When we spoke of environmental regulations, this was brought up. All FGs in the village raised this issue. They said that animals would be left to wander around the village freely, and would leave their waste around where the children play and around houses.
- A previous project – ACEF, had provided 15 cows for 15 households. Recipients had to cover half of the cost. After 3 years if you no longer wanted the cow it would be given to other households. Respondents had positive views of this project.

	Co Pua	Chen Ro	Ka Lu
Men	High priority	Low priority (ranked 4th)	Med priority (ranked 4th)
Women	Med priority	Med priority (ranked 5th)	High priority (ranked 2nd)
Girls	High priority	High priority (ranked 1st)	Med priority (ranked 4th)
Boys	High priority	Med priority (ranked 4th)	Med priority (ranked 4th)

Activities

- We were informed that visits by government veterinary staff were the most effective way to disseminate knowledge, and direct training is how most technical knowledge comes into the village. We could seek a commitment from the local government for a series of training programmes in the three villages. We were informed by respondents that this would be easy to arrange, and that the head of village could arrange this. In Co Pua they reportedly had received training before in methods to treat disease and building buffalo houses.
- In the knowledge and awareness raising activities for proposals 2 and 9 include sections about managing livestock waste.
- Consider financial viability of training to build animal houses with possible innovations including raised goat houses where manure is collected below for use as fertiliser.

Who will implement this? How will they do this? Over what timescale

- Agricultural Department of Dakrong would be asked to provide technical experts to provide training.

What will the indicators of success be? Over what timescale will monitoring continue?

This proposal may not do much to improve the sustainable use and conservation of aquatic recourses. It may result in less reliance on fish recourses. Negative implications of more livestock might be pollution and increased demand for water.

Proposal 7: Training in production of broom

Reasons for prioritization

- Training to produce brooms was prioritised in all of the villages as it is a high value product which can be created almost entirely using local forest resources.
- It is an essential source of cash, particularly in Co Pua village where it is already a well established livelihood activity. Women go to the forests and collect the material; the brooms are made and then sold to Dong Ha.
- There were three primary needs
    i. In Co Pua, there was reportedly not always enough material to make brooms, or makers did not have time to gather material, but they lacked capital to buy the material. There was a project before (ACEF government project) which provided the materials, and they repaid them when the brooms were sold. Materials were sourced from a company near Khe Sanh: 1 kg of material costs 21,000VND (although we were told by girls this was only 5-8000VND so should be checked), and can make 2 brooms with 1 broom costing 30,000VND this suggests a good profit. This project has been discontinued now.
    ii. To sell the brooms, households normally need to travel to Dong Ha which is 60 km from their homes. This was raised by boys and women in Co Pua as causing difficulty. According to boys in Co Pua, the price they get at the local Khe Sanh market is not good, so they travel themselves to Dong Ha.
    iii. In Chen Ro, local people do not have as much experience of making brooms, so would like training. There is a good source of materials there though. Many local people go up to the forests in Sep and Oct to collect the materials and sell them, but few actually make the brooms. The materials are sold for 2000VND per kilo to intermediate traders they meet on the road. It is clear that this is a significant difference in price for what the material is bought for from Khe Sanh as recorded in Co Pua village. It would therefore be more worthwhile for households to make their own brooms.

	Co Pua	Chen Ro	Ka Lu
Men	High priority	Low priority (ranked 9th)	Med priority (ranked 5th)
Women	High priority	Med priority (ranked 4th)	High priority (ranked 3th)
Girls	High priority	Med priority (ranked 6th)	Low priority (ranked 8th)
Boys	High priority	Med priority (ranked 5th)	Low priority (ranked 8th)

Activities

- A contact with a company in Khe Sanh could be proposed with a request that they set up a similar system to before, whereby Co Pua villagers receive materials which can be repaid in cash when the brooms are sold. However, the respondents were quite clear that they did not want to receive cash loans to buy materials, only materials. If they receive cash, it was claimed that it would be wasted buying alcohol and cigarettes etc. This may not be necessary for Chen Ro.
- In Chen Ro, we could make contact with the district to request they send someone to Co Pua to give training in producing brooms. There are some households who do not know how to make the brooms in Co Pua so they could also be consulted. Furthermore, training could help households improve the quality of brooms.
- We could set up a marketing cooperative, whereby one person takes the brooms en masse to Dong Ha to sell, and profits are shared. This would cut out the need for repeated visits and cut out intermediate traders.

Who will implement this? How will they do this? Over what timescale

- Training by the government commerce and industry section. They said this would be possible but concrete commitment needed.
- Marketing cooperative could be set up with our assistance in collaboration with commune
- We could make contact with company in Khe Sanh regarding supply of materials, but their commitment would be necessary for the success of this intervention.
- It is a possible low price of brooms at local market then broom producer/material collector has to sell to intermediate traders. It would be possible to promote direct trading arrangement between communes to cut out intermediate traders performing a service and in cutting cost so may not be so straightforward.

What will the indicators of success be? Over what timescale will monitoring continue?

Agreements between communities and numbers of brooms produced or sold by communities.

Potential problems

To produce broom, resources are needed and may result in damage to the forest and required forest products may become less accessible and consequently the sustainability of this may be questioned.

Proposal 8: Training in production of handicrafts for tourists

It is proposed to improve livelihoods by producing local handicrafts and thus improve local people's income. This initiative is centred on reducing the harvest of aquatic resources from the river and as a result should promote conservation of aquatic biodiversity.

Reasons for prioritization

- This was given low priority in Co Pua and Chen Ro primarily because the villages see few tourists, unlike Kalu, so they saw no potential for the production of handicrafts.

	Co Pua	Chen Ro	Ka Lu
Men	Low priority	Low priority (ranked 10th)	High priority (ranked 2nd)
Women	Low priority	Low priority (ranked 10th)	Med priority (ranked 4th)
Girls	Low priority	N/A	Low priority (ranked 9th)
Boys	Low priority	N/A	Low priority (ranked 10th)

Proposal 9: Improve local people's knowledge about fishing regulations and law of fisheries protection.

This proposal differs from that presented under Proposal 2 in that it is focused on laws concerning fisheries protection and promoting Better Management Practices for fisheries conservation.

Reasons for prioritization

- This was only medium priority, as it was not as important as electricity and water provision. Some respondents felt that they knew all there was to know (i.e. do not fish with poison or electricity). The boys in Co Pua felt there was no need for training on this as fish stocks were already very low, making fishing less important.
- Falling fish stocks were still of concern for most households.
- Some people in Hoang Hoa use electricity to catch fish at night illegally according to Co Pua villagers. In Chen Ro, it was claimed people come from Krong Klang to do this. They then escape by power boat.
- In some villages, people also poison fish using the root of a certain tree and there may be residues constituting a public health hazard.

	Co Pua	Chen Ro	Ka Lu
Men	Med priority	Med priority (ranked 6th)	High priority (ranked 3th)
Women	Med priority	Low priority (ranked 8th)	Med priority (ranked 7th)
Girls	Med priority	Med priority (ranked 7th)	
Boys	Med priority	Low priority (ranked 8th)	Med priority (ranked 5th)

Activities

- A contest about understanding of law/regulation and Better Management Practices in fisheries and conservation of biodiversity of aquatic resources. The contestants could be students at primary and secondary school (from 9-15 years old/ grade 3-9) in the district. The form of contest might be poster presentation within class, oral presentation for some excellent candidates or written paper.

- Support for communities and awareness rising through local radio, poster, training for local authorities about fishing regulation and Better Management Practices. For example posters could be put in public areas such as the commune's office and village leader's house. The contents should present pictures depicting rules for the conservation of aquatic resources e.g. suitable net sizes to use for harvest and which fish species and sizes should not be harvested by season, etc.

- Another option is a simple HighARCS notebook/calendar (including simple and practical fishing regulations and HighARCS recommendations) to be given free give to household involved in project and distributed through local officers.

- It is the intention to cooperative with Fishbase and link to the evolving flagship species initiative with key life history, conservation issues and concerns and Better Management Practices and regulations.

What will the indicators of success be? Over what timescale will monitoring continue?

- A set of questions will be administered at the beginning of the awareness raising campaign and then after 6 or 12 months to see how much awareness has improved by age, gender and among different stakeholders.

Proposal 10: Increase fish stocks

Reasons for prioritization

- This question was left quite vague, so we did not receive very rich information. Nevertheless, many of the issues raised for proposals 1 and 2 apply for this. It was useful though to see how local people valued rich fish stocks.

	Co Pua	Chen Ro	Ka Lu
Men	Med priority	Low priority (ranked 8th)	Med priority (ranked 6th)
Women	Med priority	Low priority (ranked 9th)	Low priority (ranked 8th)
Girls	Med priority	Low priority (ranked 9th)	Med priority (ranked 5th)
Boys	High priority	Med ranked 6th	Low priority (ranked 11th)

Activities

- The primary activities are those outlined for proposals 1 and 2

Potential problems

It was agreed by some that they would like to have plenty of fish in the future so their children continue harvesting (Men's group in Kalu). However the women's group did not rate it as highly. There may be little point to try and enhance stocks without addressing underlying problems causing the decline i.e. pollution, habitat and ecological disruption, overfishing and use of indiscriminate methods.

Revised Proposals

The initial 10 proposals presented above were formulated based on assessment by Fraser Sugden and the RIA1 team carried out in March 2011 and based on outputs of WP4 while outputs of WP3 and WP5 had not been completed. During subsequent discussions between the RIA1 team members and Prof. Soren Lund and Trine Glue Doan it was agreed to develop further an integrated action plan based on all WP outputs. The following Table was developed to summarise the revised proposals.

RANK	PROBLEM	SOLUTIONS	ACTION PLANS
1	Low awareness of local people in aquatic resources conservation	Awareness raising	- Enhance local people's knowledge about fish stock and aquatic environment issues - Awareness raising in aquatic resources conservation
2	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 - Better and more strict management of destructive

			fishing
		Training capacity	Train local staff in aquatic resources conservation
		Local management in aquatic resources	- Decentralization in aquatic resources management - Build village regulation in aquatic resources
		Awareness raising	- Enhance local people's knowledge about fish stock and aquatic environment issues - Awareness raising in aquatic resources conservation
3	Hard climatic conditions (lack of water, complicated topography, climate change)		
4	Water pollution (agriculture, industry waste, hydropower dam)	Development of policy and legal framework	- Develop policy in environment protection and wastewater treatment policies. - Undertake environmental protection regulation
		Enforcement	- Enforce environment protection regulation - Stricter punishment in pollution - More strict in giving permission in gold and mineral exploiting - Stricter regulation for coffee factories and hydro-companies
		Training capacity	- Train local people to reduce pollution
		Awareness raising	Increase awareness in forest regulation protection
5	Exploiting gold, sand, stone	Enforcement	Stricter punishment for environmental pollution activities
		Policy	More strict in giving permission for exploiting
6	Weak enforcement	Enforcement	- Stricter punishment
		Training	
		Local management	- Decentralization in aquatic resources management - Build village regulation
7	Lack of access to information		- Build village regulation - Awareness raising
8	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 - Training in production of brooms - Training in livestock and aquaculture
		Supporting policy in co-operative (handicraft, agriculture, textile)	- Setting model co-operative in broom, textile production (because people waste money they borrowed, they don't know how to make benefit from it)
9	Lack of finance, no budget for information transfer	Supporting policy in transferring information	- Fund raising from Gov, NGO
10	Lack of staff and staff less access on policy on aquatic resources conservation)	Local management	- Decentralization in aquatic resources management (Communities based management)

Final Proposals

The proposals were refined by the RIA1 team and presented at the PMG meeting in China and these are presented in the table below with objectives focussing on:

1. Enhancing the biodiversity of aquatic resources
2. Improving livelihoods and living condition
3. Stronger management and institutions

Specific objectives	Activity	Indicators	Main responsible agency	Monitoring &Evaluation
Raise awareness of local people on the conservation of biodiversity and aquatic resources	Communication tools: campaign in biodiversity conservation; HighARCS calendar; poster presents at public place	1 contest for school children (poster/oral/presentation/written) 1 poster at commune station Conferences, festival, field trip	RIA1, Darkrong commune	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
	Training in law environment protection; regulation and fisheries law for staff and local people	1-3 training for commune		
	Atlas of fish species in Dakrong river	Atlas of fish species and for flagship species	RIA1, FIN and IUCN	
	Publication	Articles/news of HighARCS will be posted on Quang Tri website, TV, radio program by local language	RIA1, FIN	
Local management for better conservation aquatic resources	Decentralization in aquatic management and environment protection	-Setup management group -Quantities of fish collected	Commune People Committee & village	Group of management people Performance of its assessed after 6 or 12 months
	Setup village convention in aquatic conservation and environment protection	3 conventions for 3 communities	RIA1, villages, commune, district people committee	-3 conventions for 3 communes -Participatory assessment its affect
Improve livelihoods and living conditions	Expand using mini hydropower	mini hydropower	villages, commune, district people committee	No. of mini hydropower is increased Quality assessed by participatory
	Construct water tank and water filter	water tank		No. of water tank is increased Quality assessed by participatory

	Training and setup cooperative of brooms, handicraft, textile produce for tourism production	Training cooperative established	district people committee	Number of training Number of participants Cooperative Quality assessed by participatory
Development of policy and legal frame work	Limited in gold and mineral mining and limited new hydropower factory	Policy	Province District	Changing in policy/master plan (limited project for new hydropower; factory permission; budget for conservation biodiversity aquatic resources; building staff capacity
	Detail guideline in environment protection and wastewater treatment policy	Detail regulation	Province, district	Detail regulations
	Clear punishment and regulation for illegal fishing tools; gold and mineral mining	Detail regulation	Province, district	Detail regulations
Enforcement	More strict punishment in illegal fishing tools	punishment; More staff monitoring	village commune district	Number of species conserve Illegal fishing tool reduced
	More strict punishment gold and mineral mining and deforestation	More staff monitoring	village commune district	Water quality in Dakrong river is improved Habitat maintain Forestry cover
	Factory is strict undertake environment protection regulation	undertake protection environment agreement	factory; district	Number of factories signing and following environment protection agreement

Proposal 11. Continue fish sampling survey in order to have more complete list of fish species and fish fauna in the Dakrong River study site.

Reasons for prioritization:

One major action is proposed based on the final results of WP3. There were only 38 species found during surveyed from Jan to Jun 2011 which belong to 26 genera, 9 families and 5 different orders (Nguyen et al., 2011). There are 15 economically exploited fish species and the study found three vulnerable species mentioned in the list of endangered aquatic species issued by Ministry of Agriculture and Rural Development in 2008. There were 5 possible new and endemic species identified (Nguyen et al., 2011). Given this development a key action is to conclude a comprehensive fish survey for the Quang Tri study site.

Activities

A key action for the IAP is to continue fish sampling in order to have a more complete list of fish species and fish fauna in the Dakrong River. Addition results are needed to promote action on conserving and developing the sustainable use of the aquatic resources in the Dakrong River.

Potential problems

Timescale of the intervention: Fish sampling continues for 2 years from Jan 2011 to Jan 2013

Implement: RIA1 staff should take responsibility for fish sampling in cooperation with local people and sampling at local market. Ichthyologist, Mr. Nguyen Van Hao, has over 50 years experience in identifying the composition of fish fauna in Vietnam and is cooperating with the RIA1 team on the analysis of fish samples. The results should be compared to published reference materials e.g. Mai Dinh Yen et al. (2004) results from a survey done in the National Park upstream. In addition comparing differences (if any) due to changes in the environmental condition. Results of the fish survey will be reviewed by selected experts and others can be recommended through the IUCN specialist groups if needed, including taxonomic experts to review and help publish new species (if present) and carry out a Red List assessment. Support from the IUCN freshwater fish specialist group can be sought. Identification of new species through the IAP processes would be a major conservation finding and could be published in Zootaxa in cooperation with fish taxonomists at IUCN.

Indicators of success:

- Complete list of fish species and fish fauna in Dakrong River at study site in Dakrong District.

- Clarification whether new fish species were identified in surveys

Proposal 12. Develop atlas of fish species in Dakrong River, Dakrong District, Quang Tri Province

Based on outputs from fish sampling and survey work develop an atlas of fish species in the Dakrong River, Dakrong District providing a more complete list of fish species and fish fauna in the study site.

There may be legal implications and a need for new legislation, updated species lists, awareness raising and flagship status, more survey work, assessing them for the IUCN Red List, and revised assessment of potential conservation actions.

Contents of the proposed atlas could include:

INTRODUCTION OF HighARCS PROJECT
STUDY SITE IN DAKRONG DISTRICT, QUANG TRI PROVINCE, VIETNAM
CHARACTERISTICS OF HABITAT IN DAKRONG RIVER
FISH COMPOSITION IN DAKRONG RIVER, DAKRONG DISTRICT
Cypriniformes
Siluriformes
Perciformes
Anguilliformes
Synbranchiformes
.....
THREATEN TO FISH BIODIVERSITY AND ECOSYSTEM IN DAKRONG RIVER
Development of hydropower
Deforestations
Agriculture and domestic waster
Overfishing
Gold and mining
Others
ACTION PLAN FOR SUSTAINABLE USE AND CONSERVATION OF FISH SPECIES IN DAKRONG RIVER

The following information is proposed for presentation in the atlas including bilingual English and Vietnamese:

Species:	Loài cá:
Classification:	Phân loại:
Scientific name: (and synonym)	Tên Latin và tên đồng vật:
English name:	Tên tiếng Việt:
Vietnamese name:	Tên địa phương:
Local name: (e.g. Pako, Van Kieu language):	Hình ảnh cá:
Figure of fish:	Đặc điểm hình thái:
Short description/Morphology:	Phân bố:
Distribution:	Mùa vụ khai thác:
Biology:	Kích cỡ đánh bắt:
Fishing season:	Ngư cụ khai thác:
Size/ weight/age:	Giá trị sử dụng:
Fishing gear:	
Using value:	
IUCN Red List Status:	Hiện trạng trong Danh lục đỏ IUCN:
References:	

Drafts for awareness raising activities that are being addressed are presented below (Figures 11 to 15).

Figure 11. Possible promotional activities: brochures, poster; conservation printed in T shirt

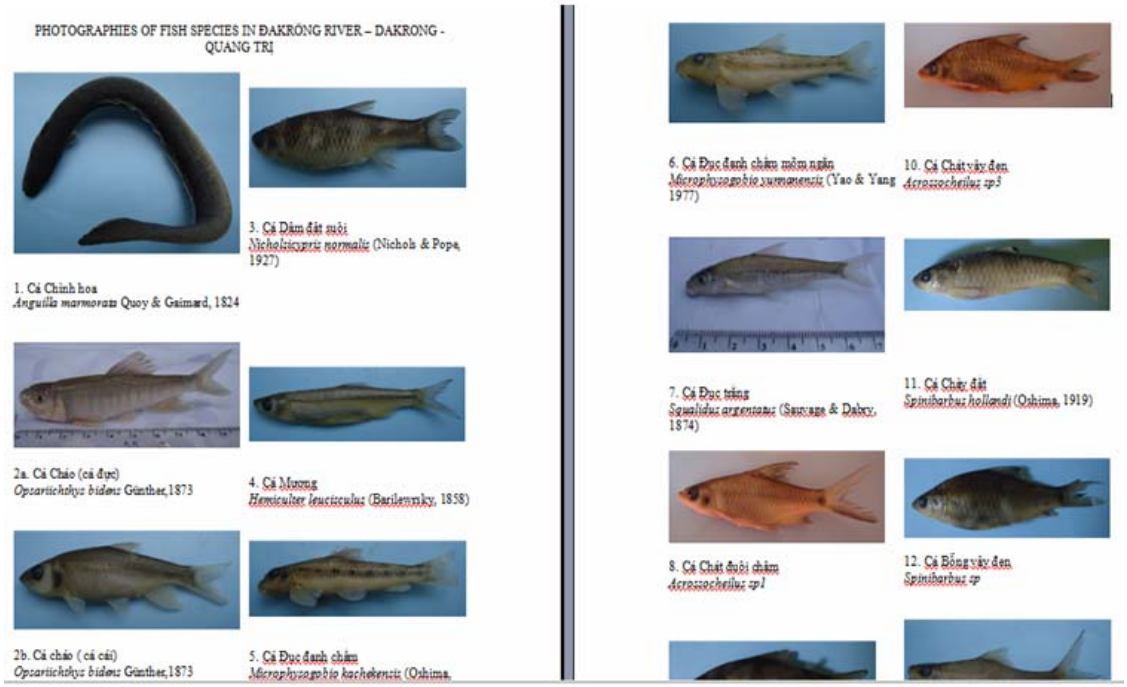


Figure 12. Atlas of fish in Dakrong River in Quang Tri/ Atlas of flagship species in Dakrong River

Figure 13. Publication of HighARCS

Figure 14. Example images of local management

Figure 15. Example of cooperative at local study site as well as develop mini hydropower

However, the success of IAP should be considered against the prioritization and focus of HighARCS aims and objectives, scale of pilot and possible funding, timing agreed. Whilst final agreement would include details of who will do what and by when and specify how this will be carried out and monitored and evaluated. And these aspects will be elaborated further in subsequent project activities and interaction with stakeholders.

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www.thesaigontime, 2010)

www.vietnam-immigration.org/en/river-dakrong-in-quang-tri-province.html

Annex

QUANG TRI ACTION PLANNING FOCUS GROUP

Introduction

Based on our research with you last year, we have identified a number of possible interventions to address some of the livelihood and environmental problems you raised. We would like to use this meeting to discuss what we propose and hear your opinions.

Questions and activities

1) Prepare the following list of **objectives** on cards.

- *Improve local people's knowledge about government environmental regulations for rivers.*
- *Improve local people's knowledge about government environmental regulations for forests.*
- *Construct water tanks for more easily available drinking water*
- *Expand the use of and improve mini-hydro power devices*
- *Learn about the production of medicinal plants*
- *Support in improving livestock production*
- *Support in production of handicrafts*
- *Development of tourism services in village*
- *Introduce stricter regulations for coffee factories and hydro companies to reduce pollution levels*
- *Improve fish stocks in the river*

a) Ask respondents to tell us which of these they feel would **most improve** their lives

b) Ask the respondents if there are any **other interventions** which we have not mentioned that they feel will be effective?

c) If there are any other interventions, then why are these considered important, and where would they be placed on the ranking.

2) Go through each intervention one by one. Ask respondents:

a) Why this activity is valued high or low in the ranking

b) Who would benefit?

c) Who may be negatively affected?
d) What they feel would be the most effective way to meet these objectives. (e.g. Who would be involved locally to facilitate intervention? Where would be the best place to pursue these activities?)
e) What contribution could you make to meet these objectives
f) What problems do you perceive may be present with these interventions?
g) Which institutions/departments should be assisting with interventions such as this? Why have they not done this?

3) What do you feel would be most effective way to increase fish stocks in the river?

Interventions which could be worth discussing include:

- Educating local people about environmental regulations
- Decreasing the levels of fishing
- Entering discussion with coffee companies and hydro company to find ways to reduce the amount of waste released in to water.
- Any others?

4) How do people here normally learn new information about:

a) Agricultural techniques,
b) Fishing techniques
c) Where the best fishing grounds are
d) Livestock raising
e) How to manage forest
f) New technologies e.g. mini-hydro or water tanks
g) tourism and handicrafts opportunities and activities
h) pollution events or river water quality
i) Medicinal plant properties and production opportunities

5) What problems do you face gaining new information?

6) Do you have any other ideas for interventions?

Intervention and prioritisation by respondents	Reasons for prioritisation / problem addressed	Livelihoods, biodiversity or policy focus?	Activities to be carried out	Timescale of intervention	Geographical scale of intervention	Who will take the lead?	Who will finance intervention	Indicators of success	Problems/risks
1) Stricter regulations for coffee factories and hydro companies to reduce pollution. Educational measures to reduce pollution from other sources upstream **(med to high priority)**	-Increased pollution in river due to waste from coffee factory; dam construction and cleaning of turbines; -Waste from Khe Sanh market also a problem, as was fertiliser run-off from wealthier Kinh farmers on plateau. -Has led to reduced fish stocks; skin disease while washing	All three	-Educational campaign for farmers re use of pesticides/fertiliser -Seek commitment from local gov to enforce regulations for coffee factories -Poster campaign in Khe Sanh regarding appropriate disposal of market/hh waste -Arrange stakeholder meeting oriented to find a solution		Entire valley from Khe Sanh to Krong Klang	- RIA team could take lead in arranging poster and educational campaigns with farmers and residents of Khe Sanh -Gov would have to take lead in better enforcing regulations for coffee factories etc. RIA could just play mediating role		-Consultations with stakeholders, particularly in villages, after one year -Test of water quality before and after interventions	-Uncertainty over cause of pollution. Some said factories no longer release waste. A water quality test may first be necessary. -Difficulties seeking commitment from local government to enforce regulations -Sources of pollution bridge two districts with different administrations
2) Increase awareness about forest regulations and protection **(high priority)**	-Respondents cited an increase in flooding due to deforestation. -Reportedly increased water turbidity -Perception in villages that they lack knowledge of deforestation	Biodiversity and livelihoods	-Arrange training on effective and sustainable forestry methods -Arrange contest about law/regulation and best practices in forests with school children -Awareness raising through poster campaigns -Distribute HighArcs info booklet		All three study villages in Da Krong valley	-The HighArcs team could take lead in arranging training -HighArcs team could take lead in instigating the contest and poster campaign	-The government experts would have to actually provide/finance the training. -RIA/HighArcs could finance school contest as it requires few resources -Could RIA/HighArcs fund the poster campaign	-Questionnaire could be distributed to boys / girls and men/women before the intervention and after, to gauge changes in awareness	
3) Construct water tanks to provide more easily available drinking water **(high prioritisation)**	-Clean water shortage biggest reported problem in Chen Ro and Co Pua -Co Pua water supply out of action since Autumn 2010 -Women have to climb high up the hillside to collect water	Livelihoods	-In Chen Ro, the local people simply want their water supply repaired. -A tank could be buit in each of the three clusters in Co Pua village		Chen Ro and Co Pua	-We can raise the concerns of Chen Ro villagers with the local government during stakeholder meetings although we can not actually repair the supply. -For Co Pua, we could create user groups to construct tanks	-Government would have to fund the repairing of Chen Ro water supply, but the local people even said they were willing to provide the labour if the government can provide the raw materials. -Gov or NGO would have to fund tank materials for Co Pua, although local people could provide labour and possibly	-Has water supply been repaired in Chen Ro? -Have tanks been built in Co Pua?	-Regarding failed water supply in Chen Ro, we were informed that leadership has already written to commune but with no response. Will our input make a differences -Heavy burden of gov already to repair water supply after storms. Still awaiting budget allocation.

							limited contribution (e.g. 30%)		-Regarding tanks in Co Pua, local people felt communally owned infrastructure such as tanks were never maintained.
Intervention	**Reasons for prioritisation / problem addressed**	**Livelihoods, biodiversity or policy focus?**	**Activities to be carried out**	**Timescale of intervention**	**Geographical scale of intervention**	**Who will take the lead?**	**Who will finance intervention**	**Indicators of success**	**Problems/risks**
4) Expand use of and efficiency of mini-hydros **(high prioritisation)**	-Very high priority to access electricity -Easier for young people to study -Could see TV to learn about agricultural techniques etc.	Livelihoods	-Assess who needs power the most according to no of children/economic wellbeing, and provide generators -Develop user group to manage devices, possibly allowing shared use of larger devices.		-Co Pua, and some possibilities in Chen Ro. Ka Lu village already has a power supply so this is not applicable there.	-HighArcs could take lead identify poor households requiring power most -HighArcs could take lead to set up user groups. HighArcs could also hire technical expert to assist in wiring of new, larger devices if necessary	-User group creation needs limited financing. Local contributions to the user group could be used to purchase frames for devices. External support may be necessary to purchase actual devices. Who??? -Devices for poor households could not be financed by HighArcs- seek commitment from local NGOs, Gov?	-How many hhs have access to power before and after implementation	-Release of water from hydro dams damages devices -Large sums of money required – uncertain financing. -Some hhs in Co Pua may be relocated soon to the area above the road on the opposite bank. They would therefore be a lot further from the river and with a road in the way. -Limited options for hydro devices in Chen Ro due to slow water
5) Promote medicinal plants production **(low prioritisation)**	-Would provide income generating opportunity. -Would protect soil stability -However, low priority from respondents	Livelihoods and biodiversity	-Offer training in medicinal plant production			-HighArcs could take lead in arranging training	-Gov would have to finance training	-How many hhs have shifted to medicinal plant production after 1 year	-Lack of interest in medicinal plant production -Perception they would not grow well due to poor soil quality -Felt it would be waste of agricultural land
6) Training in livestock production **(med to high prioritisation)**	-Livestock disease significant concern -Animal waste around village considered a problem in Chen Ro	Livelihoods	-Offer veterinary training -Training to build animal houses		All study villages of Da Krong valley	-HighArcs could take lead in arranging training	-Gov would have to finance training	- Do follow up analysis after intervention (how many have received training, do they feel knowledge has improved etc)	-How do we ensure people attend training. -There should be training in the village itself, with practical demonstrations and effective follow up.
7) Training in	-High value product	Livelihoods	-Local people in Co Pua			-HighArcs team could	-Making contact with the	-Is there changed	-Risk of price fixing and

production of brooms **(high prioritisation)**	that can be made using forest products -Already established as successful enterprise in Co Pua		wanted to receive materials in advance to be repaid following sale of broom, as had occurred in past project. -In Chen Ro plentiful raw materials for broom but limited experience – respondents requested training -Set up marketing cooperative			contact company in Khe Sanh regarding forward supply of materials -HighArcs could take lead in setting up cooperative, possibly with help of gov commerce and industry section. -Gov commerce and industry section would need to take lead in training.	company for forward supply of materials could be done with minimal cost -Setting up cooperative could be done with minimal cost -Gov would need to meet expenses for training	hh incomes following intervention	reduced bargaining power with forward contracts. Setting up marketing cooperative may help as it could also be involved in the sourcing of materials as well as sale of product.
Intervention and prioritisation by respondents	**Reasons for prioritisation / problem addressed**	**Livelihoods, biodiversity or policy focus?**	**Activities to be carried out**	**Timescale of intervention**	**Geographical scale of intervention**	**Who will take the lead?**	**Who will finance intervention**	**Indicators of success**	**Problems/risks**
8) Training in production of handicrafts for tourists **(low priority)**	-This was not considered important in Chen Ro and Co Pua as they see few tourists.	Livelihoods							-Few tourists in Chen Ro and Co Pua, so limited market.
9) Improve knowledge of fish stocks and associated aquatic environmental issues **(medium prioritisation)**	-Concern that fish stocks were falling -Illegal activity by people from towns -Was considered only medium priority though as it was important for livelihoods, but not as critical an issue as electricity supply and clean water provision		Interventions could be combined with those for plan no 2 on forest protection. -Arrange training on sustainable fishing methods -Arrange contest about law/regulation and best practices in fishing school children -Awareness raising through poster campaigns -Distribute HighArcs info booklet -Raise concerns about illegal fishing with local government			-The HighArcs team could take lead in arranging training -HighArcs team could take lead in instigating the contest and poster campaign	-The government experts would have to actually provide/finance the training. -RIA/HighArcs could finance school contest as it requires few resources -Could RIA/HighArcs fund the poster campaign	-Questionnaire could be distributed to boys / girls and men/women before the intervention and after, to gauge changes in awareness	