



CRBOM Small Publications Series No. 32

Adaptive water-sharing in the Vu Gia-Thu Bon Basin

by

Pham Phuoc Toan

**Center for River Basin Organizations and Management,
Solo, Central Java, Indonesia**

March 2011

The '*Small Publications*' are intended for knowledge-sharing and dialogue. In some cases they may present facts, information and lessons learnt. In other cases, they provide news, opinions, ideas or open questions for discussion.

They express the opinions of the author(s) and not those of CRBOM.

They can be freely copied and disseminated.

Contributions are most welcome - in English or in Bahasa Indonesia.

The author:

Pham Phuoc Toan,
Department of Natural Resources and Environment, Quang Nam Province, Viet Nam
toanqwrn@gmail.com

CRBOM
Center for River Basin Organizations and Management,
Solo, Central Java, Indonesia
www.crbom.org
info@crbom.org

Contents

| | |
|---|----|
| Acknowledgement..... | i |
| Acronyms and abbreviations..... | i |
| Summary..... | ii |
| Location map..... | ii |
| 1 Introduction..... | 1 |
| 2 Background..... | 1 |
| 2.1 The Vu Gia-Thu Bon Basin..... | 1 |
| 2.2 Water allocation..... | 1 |
| 3 Sharing the water..... | 2 |
| 4 Management options..... | 3 |
| 4.1 Supply management..... | 4 |
| 4.2 Demand management..... | 4 |
| 4.3 Other measures..... | 4 |
| 4.4 Livelihoods..... | 5 |
| 4.5 Poverty alleviation..... | 6 |
| 6 Bottom line..... | 6 |
| References and literature..... | 7 |
| Appendix A: The Vu Gia-Thu Bon Basin..... | 8 |

Acknowledgement

The paper is extracted from work done by Department of Natural Resources and Environment, Quang Nam Province, in connection with regional collaboration under ADB's *'Managing water in Asia's river basins'* (RETA 6470), with indispensable support by Mr. Tran Huu The and Dr. Chu Manh Trinh. Also, good use has been made of background documents and presentations from the 5th and 6th NARBO training in 2009 in Hoi and Da Nang, respectively, facilitated by Dr. Peter Oliver, both of which applied the Vu Gia-Thu Bon Basin as a general case study.

Acronyms and abbreviations

| | |
|--------|---|
| GDP | : Gross domestic product (the total value of goods and services produced per year within a country) (or within a province or a river basin) |
| IWRM | : Integrated water resources management |
| NARBO: | : Network of Asian River Basin Organizations |

Summary

The Vu Gia-Thu Bon Basin is one of the many Asian river basins where agriculture is the largest water user. The sector provides food security and livelihoods, but its relative contribution to the economy is moderate, while industry and services are growing rapidly. The water resources of the basin are fully utilized in the dry season, and a gentle re-allocation is required in support of continued economic development pulled by sectors other than agriculture. In this connection it is important to prevent negative side effects, such as loss of rural livelihoods, which can in turn accelerate an ongoing net migration to urban areas.

This paper summarises the background for adjustments of the traditional water-sharing and suggests some management options for consideration.

Location map



1 Introduction

This paper summarizes challenges and options related to adaptive water-sharing - a gradual re-allocation of water in response to new demands.

The water-sharing agenda in the Vu Gia-Thu Bon Basin is taken as an example.

2 Background

2.1 The Vu Gia-Thu Bon Basin ¹

The basin covers most of Quang Nam Province and Da Nang City, and a small part of Kontum Province. Its area is 10,350 km² and the population is 1.4 million.

Da Nang is well connected by sea, road, railway and air. The basin has a 1,500 MW hydropower potential and rich assets for tourism and recreation, including spectacular mountains, protected forests with a unique biodiversity, two World Heritage Sites (Hoi An Town and My Son Sanctuary), nice beaches, and coral reefs off the coast.

Please refer to Appendix A for more information.

2.2 Water allocation

Agriculture

Agriculture is important for food security, and is the predominant sector in terms of livelihoods. Also, agriculture is by far the major off-stream water user. At the same time, however, the sector's contribution to the economy is moderate, and rather stagnant, while industry and services are developing rapidly.

In these respects, the basin resembles many other Asian river basins.

Aquaculture

Aquaculture is practised in freshwater and brackish regimes of the basin. The area, presently around 7,000 ha, is increasing by 7 percent per year:

- Brackish water (mainly prawns): 2,000 ha, producing around 8,500 t/year; and
- freshwater (fish): 5,150 ha, producing 11,000 t/year

Processing capacity increases from year to year, and so does the export value. The export value of aquaculture is over 30 million USD, or 30 percent of the total export value of Quang Nam Province.

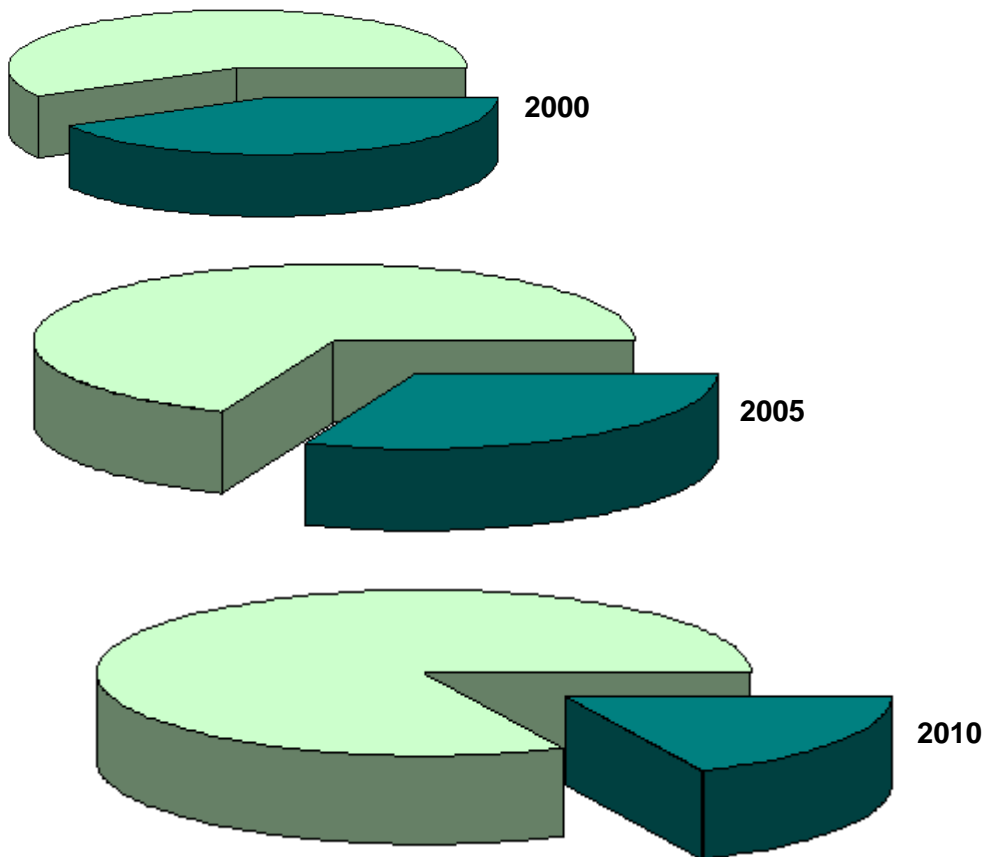
¹ Vu Gia is pronounced 'vu za'

3 Sharing the water

The figure below shows that a dramatic development has taken place within just one decade. As recently as in 2000, agriculture contributed 42 percent of an economy of 537 billion VND. Ten years later, the sector contributed just 18 percent to an economy of 765 billion VND. This is not because agriculture has declined. Rather, the sector has remained fairly stagnant, while industry and services have grown rapidly.

The trend is quite likely to continue in the time to come. It will generate new demands of water, over and above the demands of today. The exact implications are difficult to predict - a software firm requires much less water than a food-processing industry to generate a similar revenue (or per employee) - but the value generated per m³ of water is normally much higher in industry, manufacturing and services than in traditional irrigated agriculture.

Figure 1: A smaller slice of a bigger cake



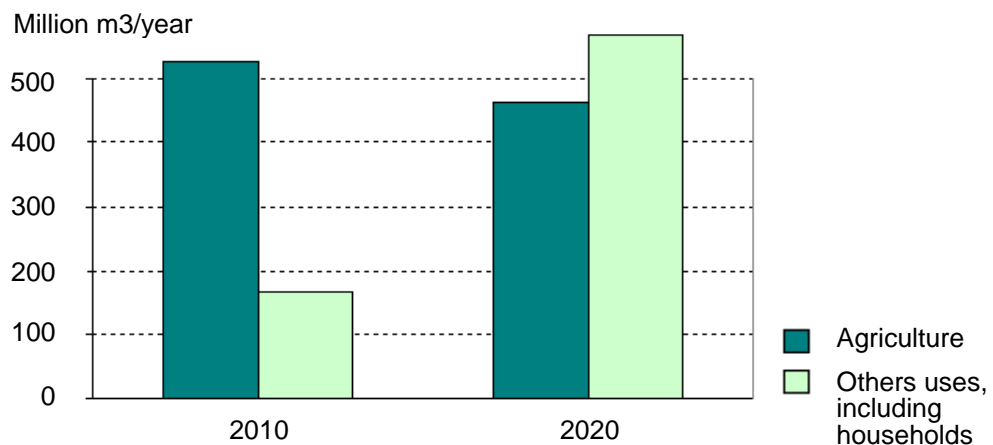
The pies show the relative contribution of agriculture to the economy of Quang Nam Province. They are scaled to reflect the economic growth

■ Agriculture
■ Industry and services

Water for production does not need to be allocated according to GDP contribution; but it is important that the allocation reflects the economic development needs. 'Business as usual' is not possible, because of population growth and urbanization, and external competition in an opening economy, not to speak of the many opportunities offered by new technology and trade.

Once water is fully used (in a part of the year, perhaps), a re-allocation can be a zero-sum game.² If someone needs more, someone else must have less. Increased supplies to households and growth sectors (manufacturing, industries, services) are only possible if supplies to agriculture are reduced. This is illustrated below, for the city of Da Nang. The allocation for agriculture is reduced by 12 percent, even if the total supplies are expected to increase by 49 percent, from 691 million m³ per year in 2010 to 1,030 Mm³ per year in 2020.

Figure 2: Present and planned water allocation, Da Nang



4 Management options

The needed re-allocation must be gentle, and with due regard to negative side effects - notably loss of livelihoods in the agricultural sector. This will support a reasonable urbanization rate and allow for orderly growth of the cities. Towns must grow, and will, but best at a rate that allows for facilities, infrastructure and services to grow accordingly.

Below are listed some general policy implications, in random order. Some of them are clearly relevant for the Vu Gia-Thu Bon Basin. Others may be less relevant, but are included for the sake of completeness. Several of the measures are in a state of implementation.

² Additional storage capacity can increase the water availability; and so can an untapped sustainable groundwater resource

4.1 Supply management

- Storage capacity: Large and small reservoirs, in-stream storage, as feasible from case to case.
- Joint management of surface water and groundwater.

4.2 Demand management

- Water uses must be regulated. There is a particular scope for strict regulation of new, water-dependent industries, because these can adapt more easily than existing ones with older technology - and sometimes even saving water, energy and money at the same time. The regulation must cover both surface water and groundwater.
- Gentle demand management in all sectors, as well as households, encouraging prudent and economical use of water. (Perhaps this can be expanded to a broader perspective, combining with demand management of electricity, and promotion of better waste and sewage generation and disposal practices). Traditional measures are awareness campaigns, green certificates for good practices, raw water fees (including groundwater), sewage fees, and tradeable water rights and tariffs.

Demand management is not without risks (of impeding the socio-economic development). The risks are lower if measures are gentle, transparent and predictable. Some measures can initially be applied to new industries (while including existing ones in the course of time). (Normally, industries respond more readily to water demand management than it is the case of households and for agriculture. This is because more options are available for adjustments).

4.3 Other measures

- Improved water efficiency in all sectors, as well as households. Efficiency improvement is a general aim, considering the need to improve the income of the farmers, in an increasingly competitive environment, while, at the same time, producing more food with less water. This comprises the water efficiency - ton per m³ of water output - as well as the economic efficiency - value generated per m³ of water.
- Interaction must be maintained between development of irrigation and cultivation. Upgrading one without upgrading the other is not optimal. An integrated (IWRM) approach can highly increase the returns on the efforts.
- Soil management will become more important (and the benefits more visible) when water is sparse and in connection with diversifying the cultivation on lands that are not well suited crops other than rice.
- Use of fertilizers must be guided by education and site- and crop-specific guidance, on which fertilizer to apply, and when, and how much. This will augment the benefits and prevent farmers from wasting their money - while at the same time, protecting the aquatic environment.
- In the same way, use of pesticides must be kept at acceptable levels, supported by education and awareness campaigns and supportive extension and weather forecast services.
- Continued research is required, including international networking, knowledge-sharing and active collaboration. Local experimental stations can provide important knowledge about suitable crops and cultivation, for example whether new practices that have worked well elsewhere will work equally well in the Vu Gia-Thu Bon Basin. Results must be made available to the end users by pilot and demonstration activities, and well functional extension services.

Agricultural development must be cautious and gradual. There is always a risk of unforeseen adverse side effects when implementing new crops, new technologies and new production systems, even when implementing existing and well proven technologies in new places. If everyone grew water melons the market would fail.

- Expansion of agricultural revenue and employment (diversification, agri-processing, value chains): A value chain perspective can support generation of revenue and livelihoods, for example by encouragement of agri-processing, including innovative products, and partly undertaken de-centrally by small and medium enterprises. An added emphasis on quality (as a supplement to quantity) can provide revenue and livelihoods in a context of finite water availability.
- Strengthened organization of farmers (like in water user groups) can facilitate efficiency improvements, other kinds of technological development, and access to markets. This can require capacity-building and support to networking, allowing farmers to learn from each other - within the basin, at the national level, and possibly across borders.
- Gentle, pro-poor market regulation can be applied in support of shifting to new products (perhaps biofuel), and in support of a common national aim of affordable food prices while at the same time maintaining an income of the farmers that at least exceeds their production cost. A high predictability will support the intended outcome and reduce the risk of adverse effects.
- Disaster preparedness (for floods, drought and pests) must be in place.
- Branding of products and related marketing can, sometimes, add attractive value at a moderate cost (think of Thailand's Hom Mali rice).
- Provision of credit, including microcredit: This is a general precondition for investment and innovation. Some kind of risk insurance can make it possible for the farmers to keep their land in case of emergencies and social shocks (like illness in the family).
- Education, broad and deep, is an overruling development priority, in this basin like everywhere else.

4.4 Livelihoods

Livelihoods is an overruling consideration in its own right, along with economic growth, poverty alleviation and environmental quality. Even a rich river basin is not really prosperous unless the majority of its people have sustainable occupation.

Some years from now, most people will live happily in urban centres. But this will require expansion of urban housing and infrastructure, and adequate urban employment opportunities, which, in turn, will require investments and time. In the meantime, livelihoods must be preserved or new ones generated where they are needed, and preferably including rural areas.

A smooth transition is facilitated by measures such as

- education;
- support to economic activities in rural areas, such as manufacturing and industries (including processing of agricultural outputs); and
- tourism-related livelihoods.

These measures are presently being implemented.

4.5 Poverty alleviation

In Quang Nam Province, poverty has been reduced by over 6% per year since the late 1990s. Between 2001 and 2004, some 27,000 households were lifted out of poverty. Still, poverty remains a challenge, particularly in the mountain districts and among ethnic minorities. The average poverty rate in the mountain districts is 36 %, well above the provincial average of 14 %. Rough estimates suggest that ethnic minorities account for 70-90 % of the total number of poor households.

This is largely because of poor conditions for agriculture: Scarcity of arable land, steep slopes, and ongoing soil erosion. The average area of paddy rice land per capita in the uplands is only 204 m², compared with 376 m² in the rest of the province.

Conditions are unsustainable and cannot be remedied merely by agricultural development. Suitable land is inadequate. Additional sources of income must be made available and accessible outside agriculture and outside the mountains.

6 Bottom line

For quite some time, the economy in this basin has been in a state of evolution, with the relative significance shifting from agriculture to industry and manufacturing and further on to the service sector, including tourism.

This change is highly relevant to the management of water resources, which must support the new opportunities while, at the same time, avoid undesired side effects (such as losses of traditional livelihoods in agriculture, or environmental degradation).

The required adaptation can be smoothed by continuous improvement of water efficiencies for all water users, and of production efficiencies in agriculture and processing industries. The aim in this connection is higher outputs per m³ of water in the short term, and higher value generated per m³ in the longer term. The development can be facilitated by

- improved storage capacity (small-scale and large-scale);
- joint management of groundwater and surface water; and
- promotion of contemporary technology, supported by research and gentle regulation.

Development opportunities include for example

- (i) water security: Safe water and sanitation, water for cultivation and other production, and consolidation of sustainable livelihoods;
- (ii) preparedness and mitigation capacity related to disasters and climate change; and
- (iii) a healthy river basin: Wastewater and solid waste management, and improved water quality.

There is a need of institutional capacity-building for basin-level management, including modalities for smooth dialogue within the basin and among sectors. The related knowledge base may be consolidated in support of timely and appropriate decisions on water allocation and protection of the aquatic environment.

An integrated (IWRM-based, inter-sector and inter-agency) approach can highly add value to any viable measures, because many of these are related and can add value to each other.

Also, it is important to observe a balance between immediate and long-term needs and opportunities, both in terms of revenue, livelihoods and a healthy environment.

The basin has a rich potential for continued development. It has abundant natural resources, including land, water, forests and hydropower. The outlook is bright for a prosperous future, with sustainable livelihoods as a common denominator across the basin and among the various sectors of the economy.

References and literature

- ADB (Dec 06): Water for the poor - partnerships for action - Viet Nam. Final report, RETA 6123: Promoting effective water management policies and practices (Phase 3)
- ADB and DONRE, Quang Nam Province (Mar 09): Vu Gia-Thu Bon Basin, Viet Nam - development needs and opportunities. Working paper 2, prepared under RETA6470: Managing water in Asia's river basins
- Doan Thi Tuyet Nga (Feb 09): Danang City's water demand. Presentation at the 5th NARBO IWRM Training, Hoi An, by Da Nang Water Resources and Flood Protection Branch, DARD, Da Nang City
- DONRE (Jan 11): The Vu Gia-Thu Bon Basin. Basin profile prepared under RETA6470: Managing water in Asia's river basins
- Huynh Van Thang (Nov 09): Overview of the Vu Gia-Thu Bon River Basin. Presentation at the 6th NARBO IWRM Training, Da Nang
- IWC (Feb 09, revised Nov 09): Situation analysis of the Vu Gia-Thu Bon River Basin, Central Viet Nam. Prepared by Kristal Burry, Peter Oliver and Phuong Lien Tran, International Water Centre, for the 5th and 6th NARBO Training in Hoi An
- Huynh Van Thang (Nov 09): Overview of the Vu Gia-Thu Bon River Basin. Presentation at the 6th NARBO IWRM Training, Da Nang
- Nghia, To Trung (05): Strategic plan for IWRM of the Vu Gia-Thu Bon Basin organization. Chapter in Ti Le-Huu (ed) (05): Good practices on strategic planning and management of water resources in Asia and the Pacific. ESCAP Water Resources Series No. 85
- Thi Thanh Van Ngo (Apr 10): Paddy cultivation - 20 years from now. CRBOM Small Publications Series no. 20, Center for River Basin Organizations and Management, Solo, Central Java
- Trinh, Chu Manh (Sep 10): Vu Gia-Thu Bon River Basin system profile. Presentation at the 1st Stakeholder Workshop held under the project 'Managing Water in Asia's river basins (ADB RETA 6470)
- WWF (Nov 05): Agricultural development in Quang Nam Province, Vietnam: Assessing policy impacts. Briefing note by WWF Macroeconomics Program Office, based on a longer paper written by Le Van Hung (formerly WWF Indochina) and Tu Van Khanh (FPD Quang Nam)

Appendix A: The Vu Gia-Thu Bon Basin

Appendix extracted from DONRE (Jan 11)

The Vu Gia-Thu Bon Basin at a glance

Area: 10,350 km²

Population: Around 1.8 million (173 p/km²)

Average rainfall: 2-4,000 mm/year (increasing towards the mountains)

The basin covers major parts of Quang Nam Province (with its total population of 890,000) and Da Nang City (with its total population of 1.5 million), as well as a small part of Kon Tum Province. The population of Hoi An is 122,000.

The impacts of disasters are high, with 23 people per million of population killed on average each year, and damage costs equivalent to about 7% of the basin GDP per year.

With its abundant natural resources, including land, water, forests and fisheries, the basin has a rich potential for continued economic development.

The basin also has a high conservation importance.

The Vu Gia-Thu Bon river system originates on the eastern side of the Truong Son mountain range. Its upper part is short and steep with a narrow riverbed, steep banks and many cascades. The system meanders once or twice. In the middle and downstream reaches, the riverbed is rather wide and shallow. In the downstream reach, the banks become low, allowing overflow into fields and villages during the flood season.

The system is formed by two main rivers: The Vu Gia and the Thu Bon. The Vu Gia has many tributaries. The Thu Bon originates at the borders of the three provinces of Quang Nam, Kon Tum and Quang Ngai at an elevation of more than 2,000 m. It enters the sea through the Dai estuary near Da Nang.

Figure 3: The basin and its river network



In the downstream area, there is an exchange of flow between the two rivers. The Quang Hue cross-connection influences the raw water flow to Da Nang City (in the dry season) and the flood flows (in the wet season).

The total annual rainfall varies between 2,000 mm in the low areas and 4,000 mm in the mountains. There is a pronounced seasonality.

Specific development needs and opportunities include for example

- the mountainous uplands: Flash flood mitigation; hydropower, water storage and reservoir operation; land management; rural livelihoods development; and community-based tourism;
- the central parts of the basin: Agricultural productivity, agricultural value chains; aquatic habitats, environmental flows, connectivity; drought management; flood protection; groundwater development; morphological management; and water storage and allocation;
- the river mouths and the coastal zone: Aquaculture productivity and sustainability; mangroves, wetlands, aquatic habitats; flood protection and typhoon preparedness; salinity control; and morphological management;
- Da Nang City: Flood protection and saline intrusion; and raw water availability

Figure 4: From upstream to downstream



**Center for River Basin Organizations and Management,
Solo, Central Java, Indonesia
www.crbom.org, info@crbom.org**