

The Bang Pakong River Basin Committee

Analysis and summary of experience



François Molle

with contributions from

Thippawal Srijantr and Parichart Promchote



Table of contents

1	Background	8
2	The Bang Pakong river basin and its problems.....	8
3	The Bang Pakong River Basin Committee and its evolution	14
4	Analysis of the roles of the RBC and of DWR.....	15
4.1	Data collection.....	15
4.2	Water use inventory.....	16
4.3	Water allocation.....	16
4.4	Planning, funding and screening of projects and investments.....	20
4.5	Planning of large infrastructures and "water demand/needs"	21
4.6	Operation and management	26
4.7	Conflict resolution	27
4.8	Capacity building and awareness raising.....	28
4.9	Coordination with other agencies	29
5	Redefining the role and structure of the RBC.....	30
5.1	National policy level.....	30
5.1.1	Definition of roles and responsibilities	30
5.1.2	Data collection and integration.....	31
5.2	DWR and RID level	31
5.2.1	Masterplan, project screening	32
5.2.2	Inventory of water use.....	35
5.2.3	Water pollution control	35
5.2.4	Staffing, Capacity building	36
5.3	RBC level	36
5.3.1	Water allocation	36
5.3.2	Financial sustainability.....	40

5.3.3	Structure, sub groups, selection of members.....	41
6	Building constructive collaboration in the Bang Pakong river basin.....	42
7	References	45
8	Annex	47
	RBO Structure (General)	49
	RBO at National level	49
	RBO at River basin level.....	49
	RBO at regional level.....	49
	RBO-1 & 2.....	50
	RBO at National level	50
	RBO at River basin level.....	50
	RBO at regional level.....	51
	RBO-3: Bang Pakong River Basin Committee.....	52
	RBO at National level	52
	RBO at River basin level.....	52
	Lists of all key informants were met during 13-17 July 2009	59
	Lists of all key informants were met during 20-24 July 2009	61

Summary for decision-makers

The Bang Pakong river is characterised by rather abundant rainfall, very limited runoff during the dry season, a small potential for storing water, large areas of irrigated land and aquaculture, hubs of industrialization, difficulties to manage and prevent sea water intrusion, and water resources planning and management processes largely left to the discretion of the Royal Irrigation Department.

The basin is considered water short in the dry season but what allocation models record as water shortages (potential uses not fully met by allocation of available supply) are often artificial: many irrigation areas are much larger than the area potentially supplied by using actual available stocks; the shortage is not due to the lack of water but to the oversizing of some irrigation areas with relation to available supply (and its viability): irrigation areas in the middle and lower part of the basin, which were formerly growing only one traditional rice crop, have the potential to be upgraded in order to grow a second crop or adopt aquaculture, if enough water is made available. The basin is somehow doomed to be water short in the absence of strict planning of allocation and development of water resources. In the absence of water treatment and the lack of water to dilute pollutants, and with water fully committed to cities and irrigation, pollution problems remain severe. Likewise sea water salinity now creeps into the basin up to Prachin Buri because of overuse of water in the dry season.

The Bang Pakong River Basin Committee was established in 2001 and then revised in 2003, when the Bang Pakong Dialogue was launched with the objective to promote participation in technical works and build up the potential and capacity of the River Basin Committee. The Committee has been instrumental in solving several water related conflicts and in mobilizing non-state actors around basin problems, raising awareness and participation. Together with its secretariat, ensured by the Department of Water Resources of the Ministry of Natural Resources and Environment, it has however faced difficulties to change decision-making procedures with regard to water management and development and has had limited success in restoring environmentally and socially sound management.

It is well understood that the lack of official support to the theoretical mandate of the RBC, and more generally MoNRE, is at the root of its weakness in achieving its objectives and in dealing with other government agencies and ministries. The forthcoming Water Law might help clarifying roles but will probably not be sufficient to solve all problems and to allow DWR to work as a regulator. It is therefore suggested – irrespective of future decisions and when they will occur - to build a more positive relationship with other agencies and stakeholders, by instilling trust and positive incentives to collaborate. Endowed with limited power the DWR has so far chosen to develop a number of activities, some of which are perceived by RID as an encroachment on its own mandate. This is particularly the case for the recording of hydrological data and for the planning of small-scale water related projects. Although it is understandable that the DWR tries to expand its activities and compensate for the lack of collaboration from other departments, this may also, however, undermine and jeopardize both its current relevance and its future role as a regulator.

At the national level it is suggested that DWR makes available the hydrological data collected to both RID and the public at large: this goes beyond showing daily values of water levels on a website. Historical series of data should also be accessible. There is nothing especially

secret or threatening about such data and by making it fully accessible the DWR would show that it departs from a culture of secrecy that is common in many public agencies but which is quite in contradiction with both the concept of IWRM and the role of the regulator.

Requesting budget for small-scale water related projects could also be reconsidered. Many agencies are already mediating local demand for such projects and provincial RID offices (let alone DOLA and other ones) have long been involved in such projects. It is doubtful that the DWR should be involved in the funding and technical screening of such projects, especially because it does not have the technical staff to respond to the demand. Multiple planning avenues lead to unexpected hydrologic effects (e.g; dredging of ditch or canal, construction of dikes,... may have an impact on the flows within the larger system), and sometimes in the same project being submitted at the same time by two organizations.

Although it is understandable that the DWR tries to raise its profile and budget, and attempts to show water users in the basin that it is having beneficial activities, this competition creates great and unnecessary attrition with other agencies. This makes it all the more difficult to establish any kind of positive loop and partnership. However, the involvement of DWR in such project planning is a decision that comes from the highest level; while the situation is as it is, RID's technical advice should be mobilized so that competition is lessened and duplication of projects avoided.

Major issues such as funding of the Committee, inter-agency centralised water data management, and regulatory power (concerning for example control of pollution or decision over the construction of dams) strongly depend on political decisions at the higher level: such decisions go against established vested interests and amounts to a redistribution of bureaucratic power: whether this is going to happen lies, of course, much beyond the issue of River basin management in general and the Bang Pakong in particular. However it is clear that a harmonization is needed between initiatives such as

At the river basin level, it is suggested that the Secretariat should include local staff from relevant agencies, notably the Royal Irrigation Department; the regional office of DWR and the Committee are unlikely to acquire and build a technical capacity of their own and this capacity should rather be built by coordinating existing technical bodies. This does not mean, however, that people in the Committee should not be able to understand basic technical issues and capacity building on water sharing, the consequences of the planning of new dams and new irrigation areas, the implication of changes in rice cultivation, etc should be strengthened. DWR should in particular also increase its capacity in conflict management, negotiation, establishment of multi-stakeholder platforms, etc by recruiting staff with an adequate profile.

As discussed in this report the question of planning of new dams and irrigation areas is crucial: current procedures unfortunately mostly aim at increasing demand (irrigation areas that may grow crops in the dry season), often much beyond the availability of water (especially in years with supply below the overage): each time a new dam is constructed, with the prospect that water can be released to solve downstream problems of water quality, water scarcity, or salinity intrusion, this new resource is paralleled by an increase in demand that is even higher than the new potential supply (at least in some of the years). *Scarcity is therefore artificially and endlessly generated.* While more farmers are able to grow more crops and to increase their income, the cost of developing 1 ha of irrigated land or 1 m³ of storage becomes so high that spending public money cannot be justified anymore. More crucially, the overcommitment of additional resources means that there is no slack in the system (some water in reserve in some reservoirs, to deal with shortages). The river system is made

increasingly artificial; rivers are hardly flowing anymore in the dry period; and the whole system becomes very sensitive to hydrologic variability. The new Huay Samong dam is a good example of additional resource that is already virtually committed to 20,000 ha of land (half of it in the existing Tha Hew scheme which would be upgraded to grow crops in the dry season), and possibly to waiting fields in the Bang Pluang irrigation project. It is likely that in deficit years a shortage will be experienced. Shortages in dry years will generate further calls for developing new resources and more water will have been mobilised at a very high cost and for a limited return, with benefits for the irrigation sector but hardly any for the environment and the overall regulation of the basin. This is not an isolated story and can also be observed with the The Phra Prong and Si Yat dams.

RID's policy is still largely based on the perception that it has a mission to endlessly develop water resources, largely independently of their social, economic and environmental consequences. Checking this logic is only possible with the Committee (or DWR) having enough power in the decision-making process which, at the moment, is unlikely to happen; yet RID's decisions might be, perhaps, influenced by organising meetings to discuss openly these issues and raise the understanding of provincial authorities. At the moment decisions on dams, in particular, remain little open to scrutiny or discussion: the recent decision to build a dam located near former sites of mining activities (in the Khlong Luang basin) - unless design options have been changed in order to avoid the risk of contamination - is worrying and a perfect example of why the Committee (and the Ministry of Environment) should be involved in the decision.

The planning of dry-season dam releases in the three main sub-basins (Nakhon Nayok, Phra Prong, Tha Laot) must be done together with RID staff, with DWR merely coordinating the discussion with, and participation of, other stakeholders. The RID could be made accountable to a "joint dry-season analysis group" which could meet at the beginning of the season to establish targets and at the end, to examine how water has been allocated and managed, and whether and how main objectives (such as the establishment of a minimum flow at some point in the basin) has been respected. In case a special event arises during the season, the Committee could be convened to take special decisions accordingly.

The key question is: what are the reasons and the incentives why RID would shift from a mode of management that is mostly "reactive" and based on experience to a stricter scheduling and to enforcing allocation plans? and if it were to do so, why would it do it in collaboration with or under the control of DWR or of the Committee? There is no easy response to these questions but 1) more harmonious relationships between agencies, avoiding encroachment on respective duties, 2) capacity building and additional financial means and incentives, are fundamental steps.

It is also been noted that technical studies should be carried out to increase knowledge on the relationships between water levels, discharge, tide and salinity. These studies should be (at least partly) entrusted to the RID instead of being contracted out, as a way to show they are full partners. The evolution of cropping patterns in the Bang Pluang project and West Bank of the Nakhon Nayok river in relation with changes in salinity must be better understood in order to anticipate what could happen in case more freshwater is stored and released upstream in the dry season.

With regard to irrigation management proper, there is a need for RID to better plan allocation within the Tha Laot and Nakhon Nayok irrigation schemes, where more water is being made available during the dry season (KU, 2008): questions of efficiency and equity between head-

end farmers (some of them growing three crops per year) and tail-end farmers have to be addressed.

With all the existing constraints - in terms of interagency relationships, limited political support, scarce funding, access to data, staffing - the strategy of both the DWR and the Committee should be focused on what is achievable. Activities carried out as part of the Bang Pakong Dialogue project have shown the relevance of having a government agency, together with a stakeholder Committee, being able to intervene in situations of conflicts, or more generally in issues where coordination of several sectors and agencies is needed. The Committee has been involved in several conflict resolution exercises. The conflict around Klong Saraphee appears to have been quite exceptional but stands as a perfect illustration of how social learning and multi-stakeholder platforms can bring a solution to a local problem. Other examples of conflicts addressed by the Committee occurred in the area of *amphoe* Bang Nam Prieu, on the west bank of the lower Nakhon Nayok river, and in the lower Phra Prong subbasin (pollution problems).

The Committee should probably, and this was an earlier realisation of the past Committee, continue to focus on particular hot issues, trying to bring together stakeholders concerned, and the data and the expertise needed. Further very important issues such as control of allocation and use, and screening of large-scale projects should of course also be addressed: but this is hard to achieve if the political and bureaucratic situation at upper levels is not changed accordingly.

1 Background

The Seventh National Plan (1992–1996) provided strong incentive to the development of guidelines for water resources management in all 25 basins of Thailand (Sacha et al., 2001). This appeared to be a desirable policy, especially in the basins where intra and inter-sectoral competition for water was highest. Basin studies, with analyses of existing resources, uses, and problems were carried out for each of the 25 basins during the period of this plan. These studies were followed by a policy to gradually establish RBOs in these 25 main basins, the task of setting them up being incumbent upon the Office of the National Water Resources Committee (ONWRC). Three pilot RBOs received early support from the World Bank (Pasak river) and from the ADB (upper-Ping and lower-Ping rivers) (Apichart, 2004).

After the advent of the Ministry of Natural Resources and Environment and ONWRC being transformed into the Department of Water Resources (DWR), work on continued on strengthening a number of RBOs with the support of ADB or FAO, especially the upper Ping (Thomas, 2006), the Nan river (TWRA, 2008) and the Bang Pakong river: in the latter substantial investments in capacity building, technical studies (Kasetsart University, IWMI) and conflicting resolution (Dialogue) have allowed a better perception of the potential and problems associated with the setting up of RBOs in Thailand. This report takes stocks on these past activities and outlines a few possible options for the future. It is based on two week of field work in the Bang Pakong basin and three days of interviews in Bangkok. The complexity of the basin cannot be fully grasped in a such a time frame and conclusions are necessarily tentative.

2 The Bang Pakong river basin and its problems

The Bang Pakong River has a basin with an area¹ of around 18,000 km² and discharges into the Gulf of Thailand. Tidal influence is pronounced, with brackish water reaching 170 km upstream during the dry season when freshwater runoff is minimal (KU, 2006). Rainfall varies – by and large – between 1000 and 2000 mm and most of the runoff (8.6 billion m³ or Bm³) is generated in the Northern subbasins (Nakhon Nayok, main Prachin Buri, Hanuman (60%) and only 10% of runoff occurs in the dry season.

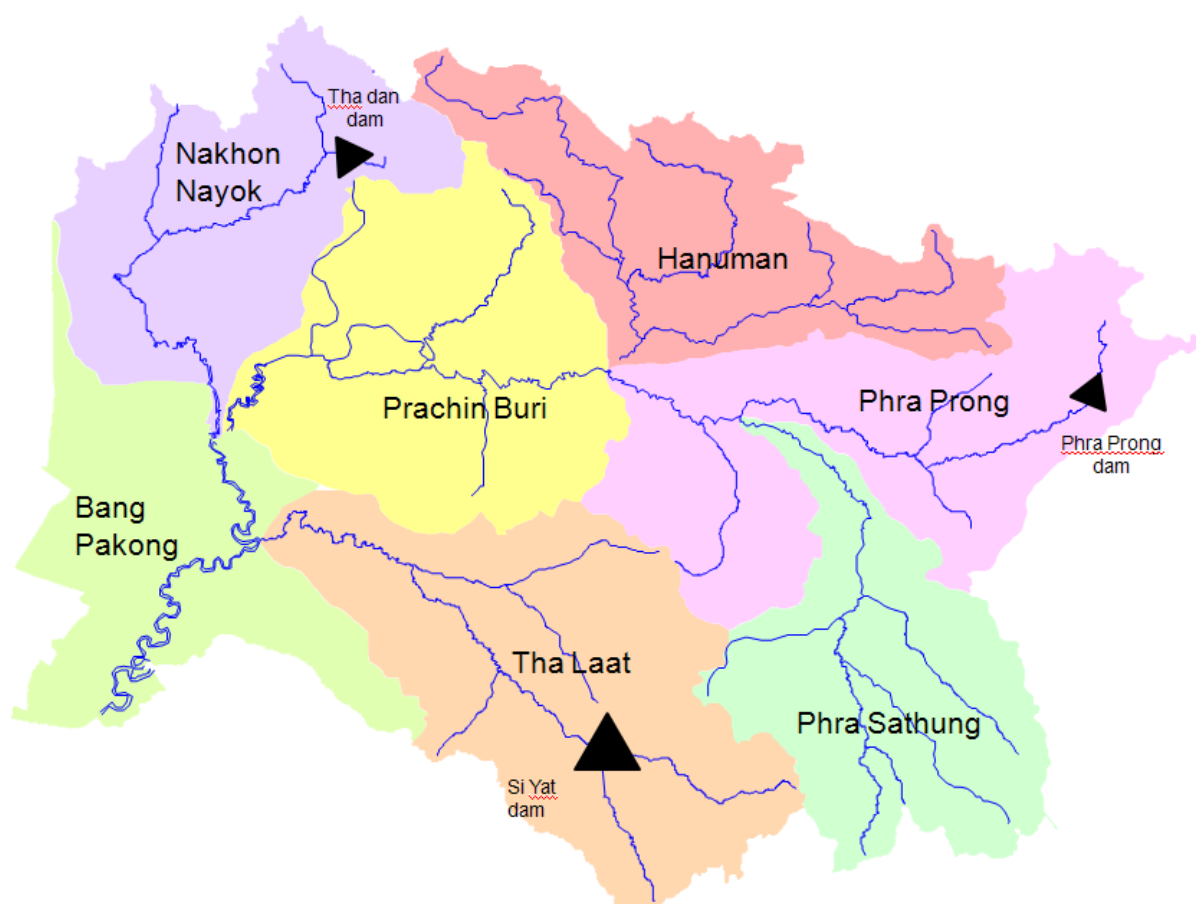
It is apparent from table 1 that storage capacity allowing water use in the dry months of the year is quite limited (around 800 million m³ or Mm³). Many plans for an additional storage have been designed in the past but there is no available adequate site for a major reservoir. At the moment the bulk of water storage is ensured by three reservoirs (indicated on the map): the Nakhon Nayok - or Tha dan (225 Mm³), the Phra Prong (110 Mm³) and the Si Yat dam (376 Mm³ – now raised to 420 Mm³, and to which can be associated the smaller Khun Dan Prakarnchon reservoir, located on a tributary of the Tha Laat river). Small-scale local water resources (ponds, small dams, weirs, etc) are also very important, although scattered.

¹ For some reason unclear to the author the Klong Luang sub-basin, which joins the Bang Pakong river close to its estuary, is often not computed as part of the basin (this is why it does not appear in the table below and in the maps of many reports), although it should. This report refers to the Bang Pakong river only and does not consider the Tonle Sap river basin. It must also be noted that the lower boundary of the basin, which defines its intersection with the Chao Phraya Delta, is arbitrary. The lower East bank of the Chao Phraya receives and releases water from/to both of its sides and the concept of a river basin is not relevant in this area.

Table 1. The Bang Pakong river basin and its subbasins

Sous-bassin	Phra Sateung	Phra Prong	Hanu-man	Main Prachin	Nakhon Nayok	Tha Laat	Bang Pakong	Total
Storage (Mm3)	11	117	3	14	240	376	0.3	762
Irrigated Area (rai)	43,589	75,209	43,126	706,442	114,400	214,328	177,65	1,101,603
Irrigated Area (ha)	6925	12,229	7012	114,869	18,602	34,850	28,886	192,000

Figure 1. The Bang Pakong river basin and its main subbasins and reservoirs



Irrigation areas in the basin are estimated at about 200,000 ha and are concentrated in the lower part of the basin (figure 2). They include major irrigation projects (or parts of them) under the control of RID regional office (Tha Laat, Nakhon Nayok, Rangsit Tai, Phra Ong Chaiyanu, etc) and medium or small projects managed by provincial offices (Tha Hew, Bang Pluang, etc). Most of these projects are quite old and plans to develop further irrigation are now limited to small areas under planned reservoirs, while intensification in existing areas is a central issue. Most farmers in the basin are said to be indebted, tenancy is widespread and socio-economic conditions as a whole not very favourable.

Fisheries have dramatically developed in the past 10 years. A few years back over 2300 fish cages could be found in the Bang Pakong River (300 families). It was reported that in some cases the density of the cages was such that it even conflicted with the law, which imposes

that at least 25 meter of river width be maintained unencumbered in order to allow navigation. Only 300 to 400 remain at the moment, primarily because of pollution but also disease problems.

Fisheries have also developed within the irrigated areas. The boom in shrimp farming, which started some 15 years back, together with the expansion of fish farming has completely reshaped the landscape of the lower basin (see figure 3) see figure 3.

Recently, however, price fluctuations, problems with diseases, and difficulties with managing brackish water inland, have almost done away with shrimp farms; in most cases these have now been replaced by fish farms (or rice).

Figure 2. Main irrigated and industrial areas (adapted from KU, 2008)

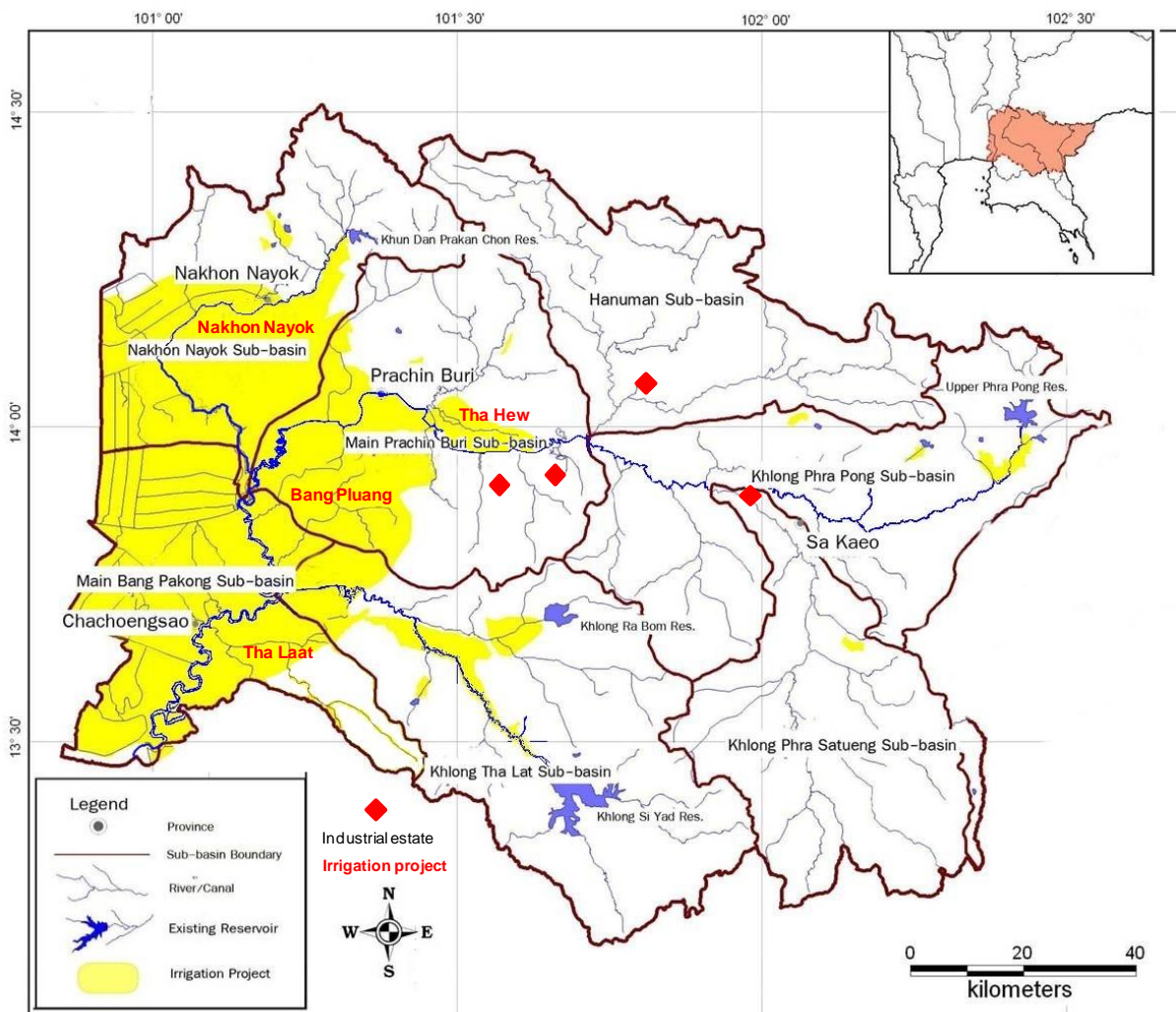
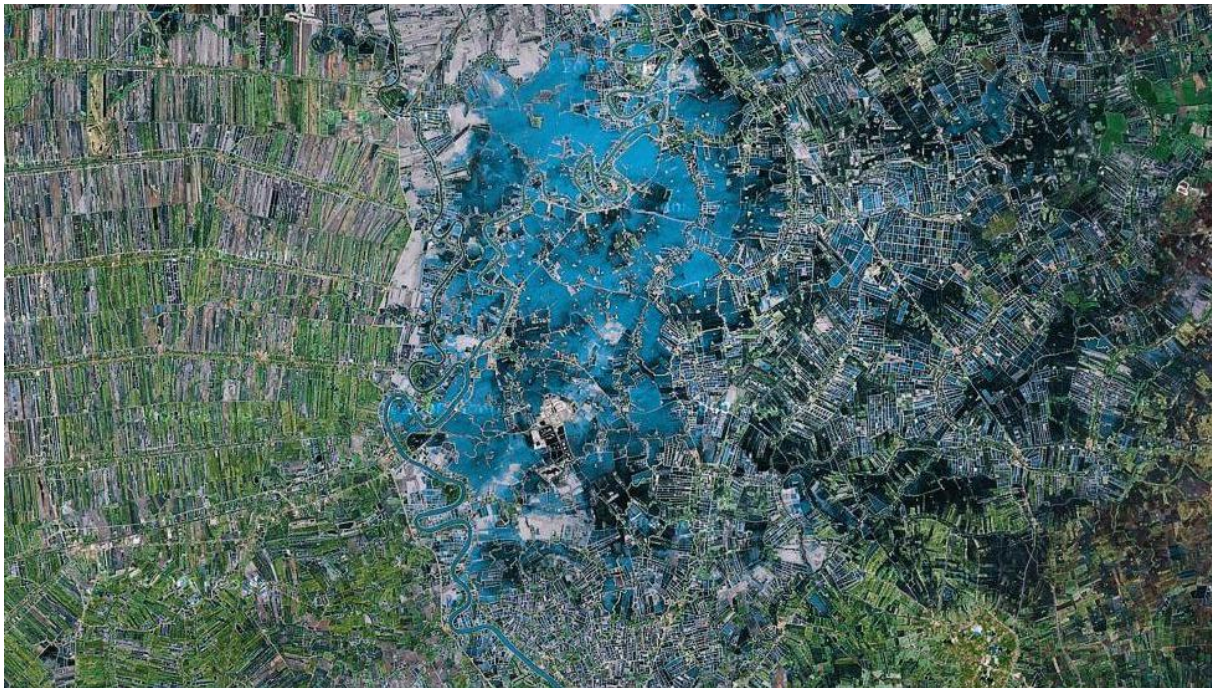


Figure 3. Expansion of aquaculture in the Bank Pluang project



Pollution has increased sharply. Although pollution problems created by the "Jareun Sakew" cassava processing factory are as old as the factory itself (40 years or so), problems in general have become more severe with the industrial estates planned by the BOI 20 years ago, and which earmarked Kabinburi (and of course the lower part of the basin, close to the estuary) as an area supposed to receive industries. The "304 industrial Park" in Prachin Buri province includes 40 factories and has a storage capacity of 20 Mm³ (a request has been made to expand and pump an additional 40-50 Mm³ from the Prachin Buri river). While other regions in the country were targeted for natural resources conservation, these areas were expected to receive industrial centres, export districts, urbanisation, and become "*a hub for Indochina*". The Phra Phrong dam was developed in 1993 to support these industries (but also additional irrigation areas).

While much attention has been given to large industries, because of the severe problem they have at times created, it is believed that the pollution of small-scale local industries (*usahakam chumchon*) is also very important. Although pesticide use is a big problem in the basin, as elsewhere, the Pollution Control Department considers that the main impact is not so much on water quality but, rather, on the direct poisoning of the people who use it.

Some progress has been made regarding pollution control: it is for example considered that 60% of the pig farms can now treat their waste. The United Paper factory involved in the Khlong Saraphee problem (see later) is also now said to be "zero discharge". The old cassava processing factory in Kabinburi has experimented with anaerobic treatment in order to produce biogas but its capacity is not sufficient. All in all the attention devoted to pollution problems remains quite limited when compared with the magnitude of these problems.

Very few cities have treatment stations for their effluents at the moment. Nakhon Nayok, for example has no station and just use the river for flushing and diluting waste. Despite a 80%

subsidy proposed for a 62 million baht station, there was limited political support for this investment.²

Urban water use has been growing too. Many farmers blame salinity intrusion on the East Water company, which abstracts water in Bang Pakong district (in the estuary) during the rainy season and in Bang Klaa, upstream of Chachoengsao, during the dry season. Another company, "Industrial Water", abstracts water from the main canal of Tha Laat irrigation project. The magnitude of the impact of such abstraction during the dry season is unclear. East Water reports withdrawals of about 200.000 m³ per month in January, February and March (and almost nothing, or even stops operation, in very dry years). This corresponds to a discharge of 80 l/s; if these data is correct these withdrawals are unlikely to be responsible for the increase in salinity problems.³

In the past, saline intrusion would only occur near Chachoengsao in January, February and March. Orchards on raised beds would stop drawing water from the river or pump it at low tide when the salinity would be lower. Because of growing water abstraction, the influence of salinity can now be felt during six months, and much further upstream than was the case in the past: this situation has been somewhat improved in the Nakhon Nayok river, where the new Tha Dan dam now helps controlling the salinity which once used to creep up to the regulation weir of the Nakhon Nayok irrigation project. In the Prachin Buri river, under present circumstances natural runoff in the dry season together with the water released from the dam is more or less in equilibrium with water use and sea water intrusion. If supply is reduced and use increased, as is typical in a dry year, saline water tends to reach further upstream in the Prachin Buri river in the month of March. This disrupts rice cultivation in the Bang Pluang project. While salinity generally stops short of reaching Prachin Buri city (which sources most of its water from the river), in one year it did reach much further upstream, up to *amphoe* Hat Yang.

A major feature of the basin is the Bang Pakong dam constructed a few kilometres upstream of Chachoengsao (figure 4). The idea of the dam originated from studies by JICA and a consultant from a Thai university who proposed the combination of 10 upstream dams, which could store a total of 2 billion cubic meters for use in the dry season, with a downstream dam which would impede the intrusion of sea water (and conserve 30 Mm³ of freshwater inland: Sathapornvajana, n.d). Despite the very negative experience of a similar dam in the south of Thailand, the dam was completed in 1998. Closure of the dam in the dry season resulted in widespread and spectacular negative impacts: downstream of the dam, water level at high tide was increased resulting in saline water intrusion inland, flooding, and landslide. Upstream of the dam, water stagnated and pollution (from pig farms and industries) quickly peaked. The suppression of the tidal effect inland also prevented supply of lateral fields which used to benefit from an inflow of water by gravity at high tide.

² In addition there were problems and conflicting views on where the station should be or could be located.

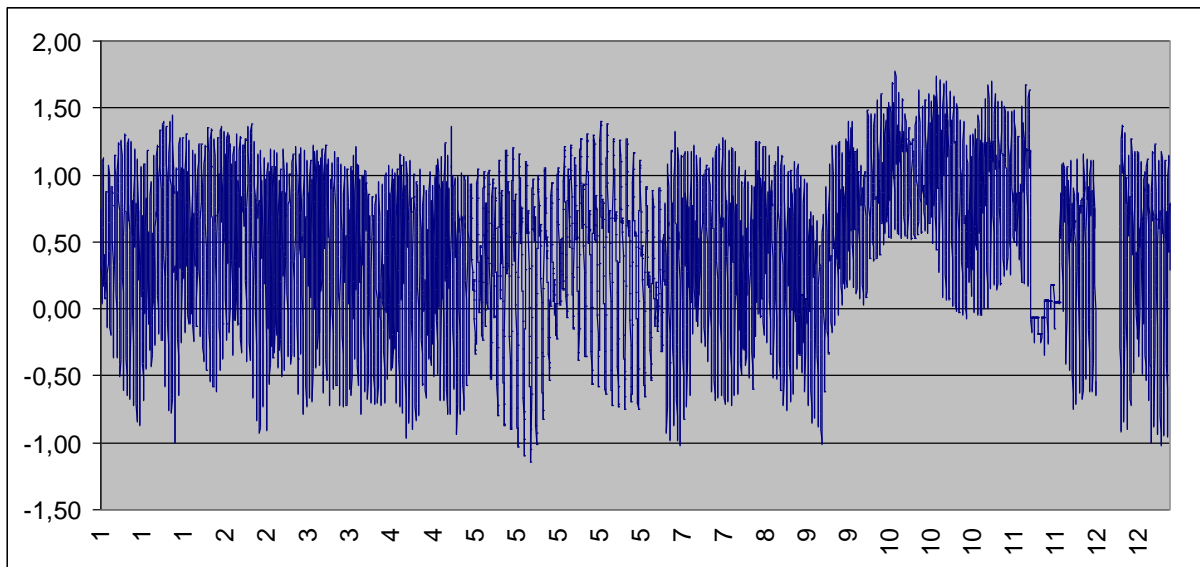
³ Contrary to common wisdom who has it that "water is sucked away by industries upstream... [while] fresh water in the Bang Pakong River is also sent by a private company through a pipeline to feed Chonburi province nearby, leaving people in Bang Pakong area in trouble" (Daorueng, n.d.).

Figure 4: The Bang Pakong dam



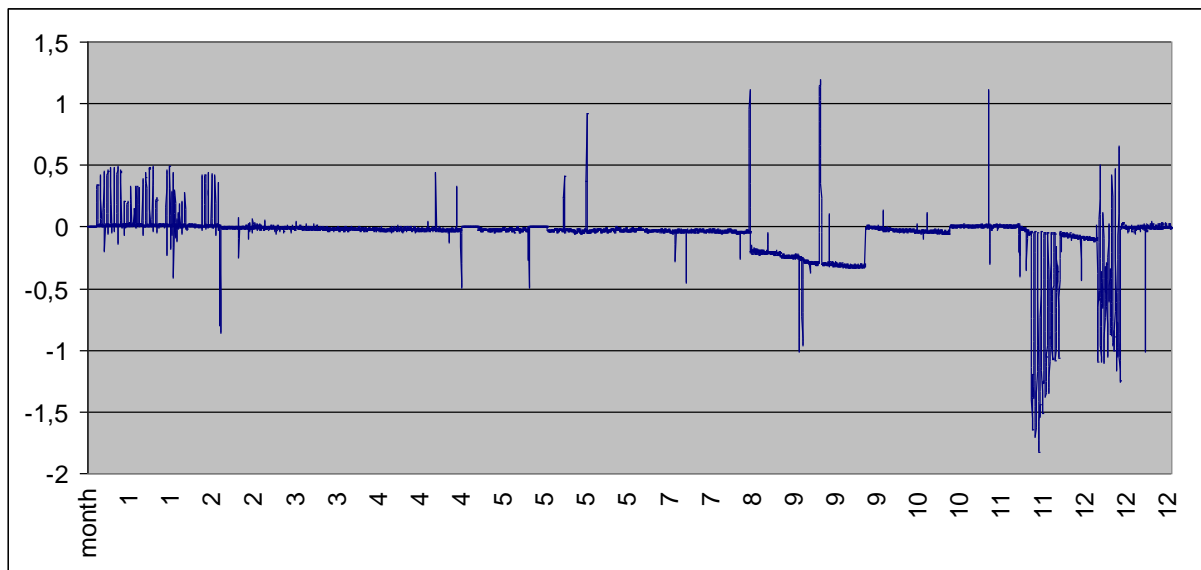
The Bang Pakong dam issue is still unresolved. Technical studies have tried to come up with an intermediate management (between closing it and leaving it fully open) that would still make use of the dam and bring some benefit in terms of salinity control without incurring the big problems observed earlier. It is still unclear whether and how the dam is operated (some report that it is left open because of a lack of agreement between people and the RID); figure 5 and 6 below, which shows data for 2008 suggests that the dam is left open most of the time and is of little use⁴; financial loss extends to the pumping station and canal that has been constructed to supply water to 40,000 rai along the left bank of the River, around Chachoengsao city.

Figure 5. Water levels upstream of Bang Pakong dam (2008) (DWR data)



⁴ Figure 6 shows that the gates were closed a few hours each day in November December and January: in January, in particular, the gate was closed at low tide in order to keep freshwater inside; in November and December the gates were closed at high tide probably to ease drainage inland.

Figure 6. Difference between upstream and downstream water levels at the Bang Pakong dam



Last the northern part of the Bang Pakong river basin is formed by the Khao Yai national Park, a famous tourist hotspot. The park has been under pressure (for example because of a new road that cuts across it or the Tha Dan dam constructed inside) and six other planned smaller dams are located inside the park.

In sum, the Bang Pakong river is characterised by rather abundant rainfall, very limited runoff during the dry season, a small potential for storing water, large areas of irrigated land and aquaculture, hubs of industrialization, difficulties to manage and prevent salt water intrusion, and water resources planning and management processes largely left to the discretion of the Royal irrigation Department.

3 The Bang Pakong River Basin Committee and its evolution

The Bang Pakong River Basin Committee (BPRBC) was established in 2001 and then revised in 2003 (see its composition and mandates in Annex 1: KU, 2006).

With the objective to promote participation in technical works and build up the potential and capacity of the River Basin Committee, the Bang Pakong Dialogue was launched in 2003, with the support of FAO, IMMI, UNEP and ADB, and included two two-year phases. The project included a situation analysis with a collection of data (hydrology, ecology, socio-economic, etc). During the second phase, three subprojects addressed the issues of *Water allocation in Bang Pakong-Prachinburi*, Capacity building of River Basin Committee, and the promotion of the participation of stakeholders in water management through campaigns and activities were meant to strengthen understanding and awareness about water management.

According to KU (2006) the Pilot and Demonstration Activities (PDA) received budget from ADB to implement the Bang Pakong Dialogue Initiative aims to help the Bang Pakong River Basin Committee (RBRPC) to create a network that would implement principles of water resources management at the level of the river basin. The internal management of the BPRBC would be scrutinized in order to make the Committee more competent. "Another objective would be to study how water allocation can be implemented by the BPRBC and how it will be perceived and involved by the people at the grass root level, identifying the driving force for

people participation, and providing recommendations to the future plan for water resources management in the Bang Pakong river basin and the rest of the country".

In 2008 Kasetsart University submitted a second report on the issue of water allocation in the basin. In 2009, following a decision to renew all RBO membership in Thailand, a new Bang Pakong River Committee was elected (see composition in Annex).

4 Analysis of the roles of the RBC and of DWR

This section reviews several roles associated with the RBC/DWR and briefly assesses the Committee's performance with regard to these activities.⁵

4.1 Data collection

Data collection is considered as one of the main tasks of the DWR which, ideally, should collect and manage the different sets of data collected by the different departments and ministries that deal with water. Unfortunately the current state of water data collection is institutionally fragmented. The Meteorology Department is under the Ministry of Information and Communication; the Royal irrigation Department collects its own rainfall/flow data, in addition of diversion flows to main canals; data on water quality can be found at the Pollution Control Department or at the Ministry of Industry; other data are kept by organisations such as the Ministry of Marine or the Electricity Generation Authority of Thailand.

This fragmentation is not necessarily a problem if there is a capacity to collect, organise and process all this data and to make it available to all government organizations, if not to the public at large.

Although the DWR should in theory be responsible for such collection, it has not been granted this mandate, nor the administrative power to implement the transfer of data kept by the different organizations.

Faced with this situation, the DWR has decided -in the Bang Pakong basin- to generate its own data by setting up a network of sensors and a system of telemetry that send data automatically to Bangkok's office. These data include water level at 16 points in the basin, as well as water quality variables at 6 of these points (EC, DO). The system is officially justified and designed to provide early warning of flood events.

No connection exists between the data collected by DWR and by RID and no exchange of data has been set up (several informants reported the clear unwillingness of either part to share data). There are instances where water levels are recorded by both departments at the very same point in the river⁶...

In theory it is probably not the role of the regulator to collect data in the field; one may consider that DWR has been forced into such investments partly because of the unwillingness

⁵ It is often not easy to distinguish between the roles of DWR and of the Committee. This is because the regional office of DWR is providing the Secretariat to the Committee and also because DWR is providing the funds of all activities, together with some technical expertise that the committee is currently lacking.

⁶ RID records its data manually (except for water level in Prachin Buri) while DWR recording is automatic.

to cooperate shown by other organizations.⁷ This, in turn, can be related to the lack of definition of its mandate. However, this does not necessarily justify such investments and the benefits drawn from the data collected at a rather high cost still remains to be shown.

In summary, exchange of data between state organisations is limited and the lack of release of these data to the public at large is also perceived as insufficient.

4.2 Water use inventory

Understandingly, the regulation of the management of a river basin starts with the identification of the users or interventions that have an impact on the water regime in terms of quantity, quality, timing, or sediment load.

Such an inventory has been made impossible by the non-cooperative behaviour of other departments but also by the lack of availability of certain data, such as the water used and discharged by main industries; or the water diverted from the river system to some major irrigation areas.

Attempts have been made to collect data through the involvement of the public in some pilot areas, such as the Tha Laot sub-basin, but these seem to have been little successful. In most instances users do not record the volumes they use and in most cases are not really interested to provide information which, they think, has the potential to translate into water charges.

Just like hydrological data, this situation leaves everyone, not just the DWR, without the possibility to develop a clear picture of water uses and flows in the basin: this is clearly a major obstacle to managing the Bang Pakong river basin in any sense of the term.

4.3 Water allocation

Water allocation is not an issue as long as available water resources are greater than water demand, including that required to sustain ecosystem health. Until the late 80s and early 90s competition for water was still low in the Bang Pakong river basin. The development of industrial parks, the expansion of irrigated areas, the shift from single to double rice cropping, the spread of aquaculture (that incurs losses by evaporation of water bodies during 12 months) have changed this situation.

However, as is the case in the rest of Thailand, it is very important to distinguish between the rainy and the dry season: the former roughly corresponds to the June-December period, while the latter covers the January-May period (rainfall typically starts in April, however). During most of the rainy season the problem is rather managing excess water, or flood, rather than scarcity. This is not always true since the early rainy season might have several dry spells (typically in July) during which supply to paddy fields is insufficient.

Water shortages, competition, and attendant water quality problems will occur during the dry season and generally increase from December onwards, until the first rains. Lack of water in the dry season is typically dealt with by storage. The basin's storage capacity is presently is around 760 Mm³, that is, 9% of the annual average runoff. However this percentage must be

⁷ it was reported (but not checked) that in the case of the problem of water supply and water quality experienced in Ban Nam Prieu district (see later), there was some unwillingness from RID to provide clear data.

decreased by the dead-storage volumes of all the reservoirs and must also be considered in dry years, when most reservoirs have not filled up during the rainy season: it is, of course, in such years that problems will be the most severe.

The problem of allocation can therefore be summarised as defining how limited resources (stored water at the end of the rainy season) will be shared and used during the dry season; and how this distribution will be modified in years when storage is much under normal or average values. It stands to reason that an agreement on water allocation starts with the identification of who is willing to use how much water, and where, during the dry season. It also starts with the identification of minimum flows at different points in the river that allow water quality to remain at good levels, in terms of both pollution and salt contents.

Four workshops held between January and June 2006 under the Bang Pakong Dialogue initiatives have addressed the issue of water allocation (KU, 2006). Members of the Committee commented on the lack of data and technical capacity to address this issue and requested that the Secretariat of the Bang Pakong River Basin Committee (BPRBC) should get more support from the DWR and other technical agencies. One of the workshops focused on the subbasin level, on the Phra Prong watershed.

DWR and the RBC have devoted a fair share of their budget and efforts to develop an allocation model (Mike basin and WEAP). Far too much expectation is associated with these models.⁸ This is due to the mistaken view that allocation models are able to define allocation rules. These models are chiefly useful to assess the degree of vulnerability of given patterns of water use; they use historical series of hydrological data to estimate the frequency of events such as shortages of a given magnitude. One should not lose sight of the fact that such models are quite crude and suffer from several insufficiencies. In the case of the Bang Pakong, the following shortcomings can be mentioned:

- Many water users are often not identified; the amount of water use by identified users (pumping stations for irrigation; urban or industrial users, etc) is not always known; this amount often varies with the year and is often higher in dry years, when problems are the most serious. The quantity of water used by farmers, or their "demand", also varies with their willingness to grow rice, which is tightly correlated to market prices.
- Return flows from these users are even less known. These flows also vary with the degree of shortage (abstraction of water from drains will increase in irrigation areas) and with the storage capacity of many factories which have large ponds to receive their waste water (and release it at unknown dates).
- Hydrological data are often limited: the contribution of many small lateral tributaries is unknown; the base flow (the recharge of the river by groundwater during the dry season) is also not well known; they vary depending on the preceding rainy season.
- In the case of the Bang Pakong, as noted earlier, there are also large uncertainties about river discharges in the reach of the river influenced by the tide. Likewise, inflows and outflows between the Nakhon Nayok river and the irrigation areas of its Western bank, or between the Prachin Buri River and the Bang Pluang project, are

⁸ Somsak Suddee, former director of Water Resource Regional Office 6, was reported to say that "It quite difficult to use WEAP model to support the decision on water allocation because it cannot integrate theories, livelihood and nature of areas".

complex (they depend on the tide, the salt content of the river, whether and how much the gates are open) are virtually unknown (especially in the latter case). Between Prachin Buri and the sea, where most of the water use takes place, in the dry season water is largely managed based on water levels and salt contents. Not on water quantities.

- Storage at the end of the rainy season, both in the canals and the fishponds, is not well accounted for, although this corresponds to a very important resource in the dry season.
- Water "needs" are calculated based on crop evapotranspiration but the question of efficiency, that is, of the relation between the amount of water that must be diverted to the system and the amount of water eventually consumed by the crops is also full of uncertainties. Some of the schemes, like Bang Pluang project, can be considered to have a very high efficiency in the dry season because most of the water is internally recycled and return flows to the river are small. Other projects like Nakhon Nayok project, with its lower part now being improved in order to be able to grow dry season crops, probably have much lower efficiencies.
- The way dams are managed (e.g. in terms of risk, or level of flood control) is not well known and cannot be easily represented by clear-cut rules. This problem is somewhat attenuated in the case of the Bang Pakong by the fact that none of the dams is generating energy (which would introduce more constraints and uncertainty on how the dams are managed).
- The different levels of priority in allocation are also not always corresponding to reality; industries are sometimes recorded as having a lesser priority than agriculture but practice is often different. What allocation models record as water shortages (potential uses not fully met by allocation of available supply) are often artificial: many irrigation areas are much larger than the area potentially supplied by using actual available stocks; the shortage is not due to the lack of water but to the oversizing of some irrigation areas with relation to available supply (and its viability).

The BPRBC realized that water allocation has to be decided based on the management rules of each main reservoir in the basin and it tried to clarify these rules by working together with the government agencies concerned and putting forward its responsibility regarding this matter (KU, 2006). According to KU (2006), *"the BPRBC has developed an involvement of the Governors of main provinces in the river basin on water allocation of the 4 reservoirs, which has to be coordinated with the RID, the main agency in implementing this performance. Allocation plan for each reservoir was formulated but it lacked a comprehensive allocation plan for the entire river basin"*. While allocation was one of the main issues to be addressed by the Committee and the Dialogue initiative, it was not possible to identify tangible output from these activities, not only at the basin level but also regarding the subbasins.

Problems of allocation also occur at the irrigation project level, but this is the prime responsibility of RID, although water user groups are theoretically involved and these groups have representatives in the Committee. Typical problems of canal management can be seen in different projects where head-end farmers grow three crops of rice while head-end farmers may grow only one. This situation can be observed in the Tha Laat and Nakhon Nayok projects. In the latter case, RID is trying to setup water user groups in order to have representatives with whom it could set up better and agreed upon scheduling.

Box 1. On the concept of water requirements

"Average water demand in 2004 for overall basin is 2,480 MCM/year approximately whereas existing water storage in the basin is only 901.44 MCM, or 9.36% of the average annual runoff. The trend of such problem is becoming crucial". "The study has shown that in 2004, the water shortage was 12.27 MCM in all scenarios".

This kind of statement suggests that water demand is much higher than the available supply but this is wrong because most of these demands occur in the wet season, when storage is not involved (this, however, does not mean that storage is sufficient in the basin), and because part of the demand that is not met is due to the overextension of irrigation areas with regard to available supply.

It is important to clarify that there is no such thing as a water "need" or "requirement": although water requirements are more or less identified for certain users (say, a city, whose water use is well known and does not vary much in term) one must understand that these terms are very misleading if and when generalized: they convey a wrong picture of the basin, making people believe that there are definite quantities that can and should be supplied at given precise nodes of the system.

In fact the uptake of water by different users in the Bang Pakong basin is largely uncontrolled: nobody can prevent a given city to increase its abstraction by 20% if need be (if, for example, in dry weather increases demand), not only for lack of power but also because nobody is monitoring withdrawals in real time; the same applies to the close to one hundred (collective) pumping stations drawing water from the river system; and this also largely holds true for RID-supplied irrigated areas that have many intakes, like the Bang Pluang irrigation scheme.

In addition, many farmers start the dry season cultivation after harvesting the crop grown during the rainy season, capitalising on residual field wetness and the water still available in canals, drains, and ponds. This makes it very difficult for RID not to continue supporting these crops, once they have been established (pressures from politicians receiving pressing calls from their constituencies will generally be exerted), and therefore to plan water deliveries in advance.

Therefore, "demand" tends to be defined as "as much water as people are able to abstract when and if they wish", considering the maximum irrigation area that could possibly access water from the system. And this area is growing, under both the action of the farmers themselves and of public agencies, usually far beyond the water that will be available in a dry or even normal year (see box 2).

While a strict enforcement of planned cropping patterns could theoretically be envisaged in gravity irrigation systems where water supply is largely controlled by RID (Nakhon Nayok, small-scale projects) it will be close to impossible to achieve that in areas like the Bang Pluang project, where part of the inflow from the river to the irrigated plots is done through the management of gates handled by the farmers themselves: this is the major constraint to regulation and allocation since any additional freshwater might just be absorbed by an expanding irrigation area (see box 3).

It is too often expected that the Water Law is what is missing to allow control of water use and allocation ("*without the water law we cannot control*"). While this is true (the law is probably a necessary condition) it would be wrong to think that the law by itself will be

sufficient. Indeed, states and governments tend to overestimate the capacity of the administration to inventory, let alone control, water use (and supply) in a basin. It is sometimes "*suggested that it is in the interest of the individual water users to register these uses so that the total water allocation can be made taking these uses into account. Also by registering such abstractions the users may obtain a higher level of certainty that the water will remain available in the future*" (KU, 2006). Unfortunately there is no reason why registering would automatically lead to higher certainty: improving the reliability of supply requires increases levels of communication between RID and users, joint discussions on allocation plans, and a degree of control which is hard to establish and enforced.

4.4 Planning, funding and screening of projects and investments

Members of BPRBC observed that their work was to fulfil a program designed by the Department aimed at forming working groups down to the level of sub-districts as a mechanism for collecting projects and proposals for water developments in those areas. The members noted that submitting such proposals under the integrated budgetary plan may not be sufficient to make their work in river basin management effective (KU, 2006).

The DWR has spent substantial time and effort in the planning of local water projects. Subdistricts and districts were asked to identify water projects and interventions which would be collected and supported by the DWR/basin Committee and would be included in the annual provincial plan. "*The Committee members expressed very strong views that, in formulating integrated plans for the river basin, most of the projects were proposed by government agencies with little input by the people's networks. Furthermore the members perceived that some of the projects proposed by the network do not get budget allocations*" (KU, 2006). Smaller projects are indeed proposed by local administrations and incorporated in the provincial plan and they can be discarded at any stage, either by the Province itself or later, when reviewed by the budget bureau. As for large projects, which are the most important in reshaping the availability of resources but also in creating negative externalities - there is frustration with the Committee members that these projects are handled by RID and decided at the central level with little or no input from them or from other basin stakeholders (Sakda in DWR, 2006).

Identification of local projects by the DWR is criticised because several other administrations are already mediating local demand for such projects, including provincial RID offices that have long been involved in such projects and consider this as part of their duty. Other agencies involved include the Department of Local Administration (DOLA; from the ministry of Interior), the Department for Disaster Prevention and Mitigation, the Department of Land Development (which in particular digs ponds), and other ones. Last year, for example, 53 projects totalling 200 million baht and proposed by the DWR only, have been included in the provincial plan and selected for funding. It was also stated several times that because of the nature of these parallel processes, and because no clear-cut spatial coordinates or description of the projects existed, it happened that one particular project was presented by subdistricts to both the DWR and the RID and appeared twice under two different names in the provincial plan...

Another problem related to the requests made by the subdistricts is that these are made without a general view of water management in the Province or in the basin. For example dredging a ditch or canal may have an impact on the flows within the larger system; constructing a dike in a particular place may just increase flood damage somewhere else; RID credits itself with the capacity to identify such basin or systemwide problems and sees the

lack of technical capacity of the DWR to screen projects according to such considerations as potentially detrimental to water resources management.

During the last meeting, in July, of the lower Bang Pakong Committee, the Committee was asked to greenlight a budget of 3 billion baht for the coming year "because the government needs it quickly"; apologies were made for the top-down procedure that left no time for any consideration of the projects themselves. Promises were made that it would be different next year, but this anecdote illustrates the fact -commented by many interviewees- that the Committee doesn't have any real power in screening projects. It is widely observed that some of the projects proposed by subdistricts districts are later discarded by the province, or simply don't get funded by the Budget Bureau.

Emphasis has recently been placed by the Minister of Natural Resources and Environment on the necessity to have the planning process going through a provincial commission. This commission must screen the project proposed by all the Department and agencies, whether these are formally under provincial authority or depend from the centre (like RID, energy generation or road construction). This is why the new river basin Committees have provincial working groups.

4.5 Planning of large infrastructures and "water demand/needs"

As mentioned earlier, the planning of large water infrastructures - notably reservoirs and irrigated areas - are largely left to the discretion of RID. As stressed in RID's website its "Sufficient Supply of Irrigation Water for Agriculture" strategy is "aimed at extending irrigation system to cover the country's agricultural areas by the construction of large scale and medium scale irrigation projects as well as water development for rural and community area projects" (www.rid.go.th/eng/stg.html; emphasis added). RID's age-old conception is that it is entrusted with the duty to dam every single stream that happens to offer a convenient site for building a reservoir, and has some agricultural land that can be irrigated in its vicinity. Indeed, in the case of the Bang Pakong river basin, RID displays maps of the basin that show "existing" and "planned" reservoirs, with "planned" reservoir envisioned in almost every suitable stream.

One of the problems associated with dam construction is that they are not primarily planned to relieve problems of water scarcity or water quality degradation further downstream but, rather, to increase the area that can be irrigated. Since these areas -constructed by RID- together with the spontaneous increase in water use by people around the reservoirs and along the waterways, tend to exceed the potential of the newly developed water source, new reservoirs -in the mid-term- do little to solve the problems and sometimes make them worse.

There are three main reasons for this state of affairs: first, RID has a culture of construction and is interested - for a number of reasons - in building more infrastructures; second, new infrastructures are associated with new benefits in terms of increase in production that can be more easily computed in the cost benefit analysis of the project and make it financially more attractive; third the district or the Province in which the reservoirs are to be located are reluctant to support the construction of a new dam if it is not associated with the political advantage of extending the benefits of increased water supply to more local people. One of the difficult issues is the "sense of place" of local populations, which consider that rivers flowing nearby are "theirs": people living around the Si Yat dam, for example, don't understand that they cannot receive water through piped systems, while downstream areas are planned for irrigation.

Somewhat paradoxically new projects tend to increase water use and water depletion in the upper parts of the basin and, therefore, to compound water quantity and quality problems in downstream areas during the dry season. This is all the more true because RID is also constantly involved in increasing access to river water by adjoining land: weirs are being constructed, or planned, to retain dry season flows in the river, raise the water level, and facilitate inflow by gravity or pumping to nearby plots. Such interventions that lead to a greater uptake of water in the dry season include (see figure 8):

- the construction of five weirs on the Tha Laat river: the four upper ones will retain water to be used by pumping stations; the lower one is already constructed and diverts water to the lower part of the Bang Pluang project.
- Weirs are also planned for the reach of Prachin Buri river located between Kabinburi and Prachin Buri itself: they will facilitate water use by pumping in the upper Bang Pluang project, and also possibly in the Tha Hew project, if and when plots are increasingly improved (bunded and leveled) to allow dry season cropping.
- A recent weir (see figure 7) can be seen on the Phra Sateung river, close to its junction with the Pha Phrong river (near Sakew): water is now retained in the dry season and can be used by the nearby industrial park as well as by farmers.

Figure 7. Rubber (inflatable) weir on the lower Phra Satung river



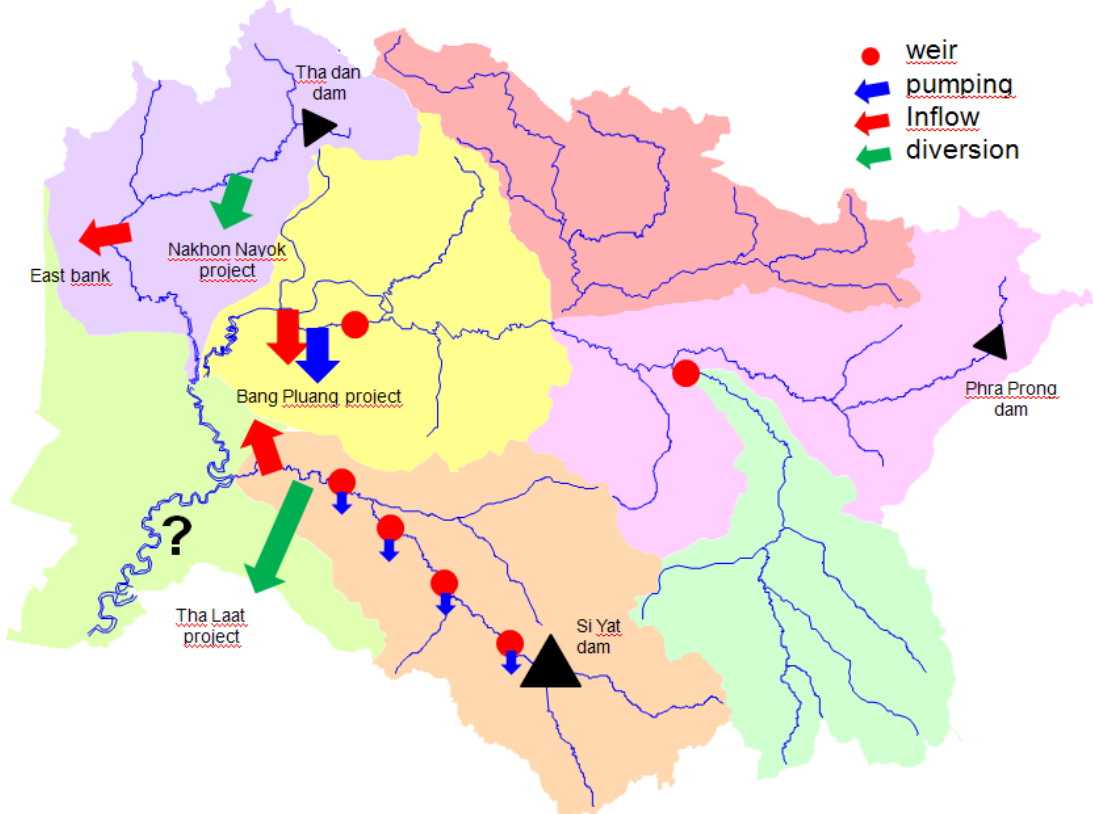
- The major intervention to increase dry season cropping can actually be seen in the Nakhon Nayok project: the lower part of this project used to be cropped with traditional rice varieties that were sown and grown on natural land (see box 2). Work is under way to improve drainage, extend canals, and level the land. While the prospect that all farmers in the Nakhon Nayok irrigation project might one day grow a second crop is very positive in terms of livelihoods and rural income, the sad reality is that the capacity of the Tha Dan dam is too small to allow dry season cropping on the whole area of the project.

Such improvement of the land to grow rice in the dry season (see box 2) has taken place in the Bang Pluang and Tha Laat projects during the last 15 years. The Tha Hew project - just like Nakhon Nayok project - and perhaps in the future the Khlong Saraphee area are likely to be transformed in the same way if water is made available to farmers in the dry season. This is surely very desirable from the point of view of local farmers, who can increase their income (and RID rightly points to the benefits it provides to farmers); *but* this increases "water demand", often much beyond the potential of the new water resources that have made this transformation possible.

The consequences of such continuous development of both the capacity of withdrawing water in the dry season and of the agricultural area "waiting for water" are substantial:

1. all these interventions tend to capture and use up (deplete) the water available in the river system during the dry season, whether this water corresponds to natural runoff or to water released by the dams.
2. Because the potential to use water invariably exceeds available water, scarcity is thus endlessly (and artificially) generated: more and more farmers expecting water, in greater numbers in dry years, will be disappointed and will fuel further plans for developing more resources. With their emphasis on construction, line agencies will be all too happy to provide increasingly costly solutions.
3. In terms of water requirement, or water needs, it would be wrong to take the potential water use as the value that has to be fully satisfied. This potential, by design, cannot be realized in many years.

Figure 8. Example of recent or planned projects tapping more water resources in the dry season



RID claims that these developments only use "excess water", or the additional water stored in new reservoirs and behind weirs (in the river bed) and will not change the residual flow in the dry season. But in practice its lack of control on the overall water abstraction and the difficulty in not delivering water to cropping areas once they are planted makes it difficult to control water flows at the basin level.

Box 2. Rice intensification

25 years ago virtually all the paddy areas of the basin were cropped with a single crop of rice. Traditional varieties of deep water rice or floating rice were sown in dry conditions before the flood and would be harvested after water recedes. Canals and dikes would help regulate the flood pattern and paddy fields were large tracts of natural land, without bunds and not leveled. In the past 20 years paddy land on both sides of the lower Bang Pakong river as well as in the Bang Pluang projects have shifted to high yield varieties generally planted once before and a second time after the flood period. This means that irrigation water must be provided either by irrigation canal or through pumping from natural waterways and drains (some farmers abstracts water by pumping directly from the river; others, located further inland and on slightly high ground, also have to resort to pumping). This also means that the land must be leveled and banded, to allow the control of water. In areas where water supply is abundant and the flood controlled it is even possible to grow three crops per year. Such transformations have been widely observed in part of the floodplain of the Chao Phraya river as well as in the lower part of its delta (the delta flat, that includes the lower West Bank and East banks).

Once farmers have done these investments they will request more water for intensification. Conversely, whenever and wherever water is made available in the dry season farmers are encouraged to improve their land and shift to high yield varieties. At present, the lower part of the Nakhon Nayok project - which used to grow one traditional rice crop during the flood - is being improved to grow dry season rice and make use of the new supply of the Nakhon Nayok dam. Tha Hew and Klong Saraphee irrigation areas are the two remaining areas where only one crop of rice is grown. Tha Hew will undergo the same changes if it is considered as part of the command area to be built in parallel with the Huay Samong dam⁹ (which, despite controversy because it straddles the boundary of the national park, is said to be now slated for construction).

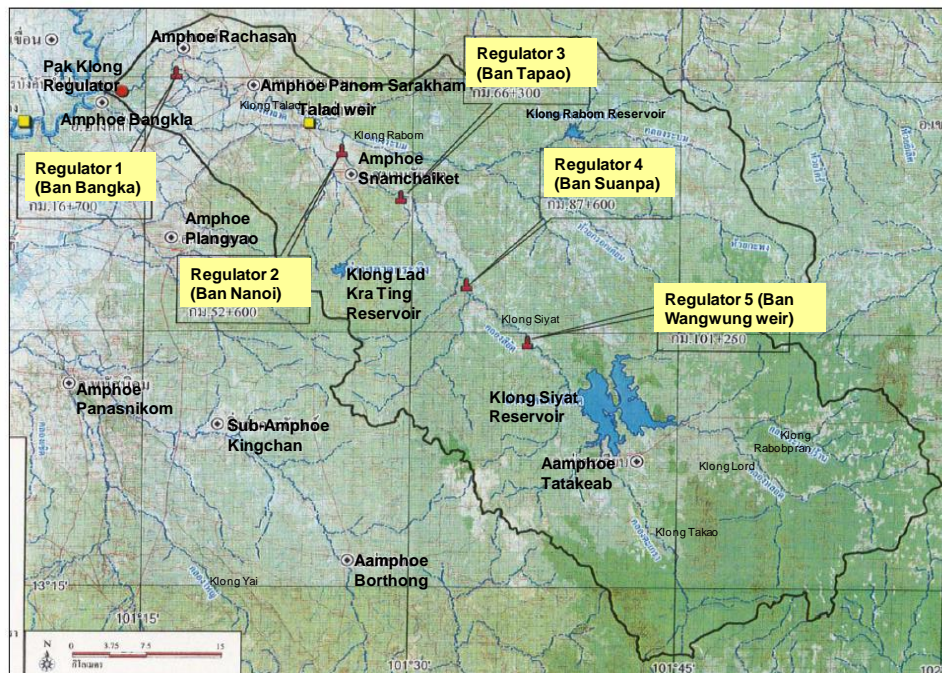
The increasing supply that has come together with the reservoirs recently built in the Bang Pakong river basin has spurred rice intensification (see box 2) and increased water demand in uncontrolled ways.

- As mentioned earlier, in the Nakhon Nayok sub-basin, the existing Nakhon Nayok irrigation project - if improved in order to grow high yield varieties - will have a capacity to use water much greater than the amount of water made available by the dam (which only has a capacity of 250 Mm³). Even if only part of the land is developed and if demand remains in line with supply when the dam is full, in dry years many fields will be waiting for water hopelessly.

⁹ The Huay Samong dam, with a capacity of 295 Mm³, is to be constructed in Prachin Buri province. The dam is likely to become the main regulator of the lower basin in the dry season, at a cost of 1.6 billion baht (+ 1.5 billion for mitigation of impacts and 6 billion for the reservoir itself).

- In the Tha Laat sub-basin, the increase in supply allowed by the Si Yat dam is already committed, even though weirs (see figure 9) and pumping stations planned for the valley located downstream of the dam are still under construction. Additional supply in the dry season is already used in the Tha Laat project and also now in the lower Bang Pluang. The former project alone has a capacity to use water in the dry season that exceeds this additional supply (especially because parts of the scheme can easily grow three crops per year, and already do).

Figure 9. Weirs to be constructed in the Tha Laat subbasin (courtesy of RID)



- The increase in supply coming from the Phra Prong dam is fully absorbed by downstream users, including one irrigated scheme managed by RID which cannot be fully irrigated in the dry season for lack of water. Whatever release is made during the dry season, no part of this flow is able to reach Prachin Buri.
- In the case of the Huay Samong dam, which could be constructed soon, irrigated areas planned downstream of the dam, including the transformation of the Tha Hew project into a double cropping area, are sufficient to commit all of its water (see more on that later).

In other words each time a new dam is constructed, with the prospect that water can be released to solve downstream problems of water quality, water scarcity, or salinity intrusion, this new resource is paralleled by an increase in demand that is even higher than the new potential supply (at least in some of the years). *Scarcity is therefore artificially generated.* It can be argued that, at the same time, more farmers have been able to grow more crops and to increase their income. This is true and forms the positive side of continued water resources development. However, in many countries worldwide this cycle of development has run into environmental, economic, and social contradictions. The cost of developing 1 ha of irrigated land becomes so high that spending public money cannot be justified anymore; dams also become more costly because they are built in less favourable sites, and/or even located in national parks. The problem of compensations to people affected or removed by dams is also

unfortunately not easily solved. More crucially, the overcommitment of additional resources means that there is no slack in the system (some water in reserve in some reservoirs, to deal with shortages). The river system is made increasingly artificial; rivers are hardly flowing anymore in the dry period; and the whole system becomes very sensitive to hydrologic variability.

Increasing access to existing water is seen by RID as a mission but this is often done by only looking at the local scale and basin realities -as well as economic constraints or costs - are not well taken into account. In sum, increased development of water resources in the Bang Pakong basin -and this can be observed also in other river basins- is not seen to improve water problems as scarcity quickly reappears.

4.6 Operation and management

The management of the lower part of the basin, with the Prachin Buri and the Nakhon Nayok rivers joining and forming the Chachoengsao River, is complex because of the tidal regime and the dynamics of salt water.

The Bang Pakong dam, constructed a few kilometres upstream of Chachoengsao, has shown the limited knowledge and control of the natural water regime. Management decisions sometime have unexpected consequences. For example it is believed that the pollution episode of Khlong Saraphee, in the lower Prachin Buri river, would have had a lesser impact if RID had not attempted to flush pollution away by releasing water from the Nakhon Nayok dam (the result was said to have been the opposite, with pollution being carried away downstream instead of being "controlled" by the tidal effect). In another event that was reported (but not checked) the Bang Pakong dam was said to have been closed to control salinity and allow East Water company to pump freshwater upstream: when the dam was later opened the brusque inflow of salt water reached very high in the Prachin Buri river and damaged rice plots.

There is a serious lack of knowledge on the hydrology of the lower basin: the tidal effect meets the river flow that combines the flows from the Nakhon Nayok, Tha Laot and Prachin Buri rivers. Farmers abstract water at high tide by gravity if the salinity of water is not too high. Pumping water is sometimes possible and the salt content of the water usually decreases with water depth (at high tide the water at the surface of the river flows upstream - as can be seen by the movements of water hyacinths - while deep water layers still flow to the sea). Understanding how salinity and water levels evolve, depending on the tidal cycle, the distance from the sea and the respective discharges in the three contributing rivers is not an easy task. The tough difficulties faced by attempts to find a mode of management of the Bang Pakong dam that would reduce salinity intrusion without losing the benefit of the tidal movement (let alone collateral dimension such as landslides) is testimony of the complexity of managing the lower part of the basin.

For lack of strict scheduling in irrigated areas and control of water abstraction in general in the basin, RID tends to manage water "reactively": based on past experience and adjusting dam releases or gate opening whenever required by imbalances observed or complaints received.

4.7 Conflict resolution

Conflict resolution is one of the main tasks of river basin organizations: conflicts generally involve various stakeholders with conflicting interests and actions on the hydrological system. Mediating conflicts requires an intermediate position - between different sectors -, legitimacy, power to access data and information to inform negotiations and dialogues. Traditionally water management is almost exclusively done by RID (and EGAT) and conflicts are frequently mediated by politicians (local MPs or otherwise), who use their connection within the administration or the government to impose solutions that favour their constituencies, but without a more systemic and large-scale understanding of the implication of the decisions made. In general no mechanism is put in place to ensure that the problem will not occur again in the future.

During the last four years the Committee has decided to put emphasis on local conflicts: starting from "real issues" was seen as a way to show people how the Committee could be instrumental in improving water conditions in the basin, but also as a practical entry point into the basin's problems which could help raising the awareness and the capacity of the Committee members. 12 local issues have been identified by the Committee and further studied by a research entrusted to a Professor at Chachoengsao's local University (Rajapat). These local water issues included problems of water quantity and quality in the Bang Nam Priew district, flood and pollution problems in Kabin Buri; water shortages in the lower Phra Satung basin (Sakew area); pollution problems in the Bang Pakong river estuary, etc.

Some of these issues were tackled through the Pilot and Demonstration Activities (PDA) of the Bang Pakong Dialogue Initiative supported by the Asian Development Bank (ADB) in 2004-2006. More than 20 workshops and consultations were convened to understand specific conflicts in the river basin, and finding solutions. For such sessions, the Committee deliberately leaves the agenda open so that the stakeholders can raise the issues that are important to them (INPIM, 2007). The workshops also helped stakeholders understand the Committee's mandate and learn IWRM principles and practices.

The Committee has therefore been involved in several conflict resolution exercises. The conflict around Klong Saraphee appears to be quite exceptional but stands as a perfect illustration of how social learning and multi-stakeholder platforms can bring a solution to a local problem. In short, four years ago, one year after the installation of a paper recycling factory (*United Paper*), the brusque release to the Prachin Buri river of the water retained in the Klong Saraphee area during the rainy season resulted in severe damage to fish cage production in the river. In November 2006, more than 80 million baht worth of dead fish were carted off (INPIM, 2007). Poor quality of the released water was attributed to both decomposition of organic matter in flooded fields and to the waste released by the factory. Collective action resulted in establishing rules for opening the gate in a manner that allows for a gradual mix of the water released with the water in the river, a change in infrastructure (the new gate allows the release of the upper water layer instead of the lower one, whose oxygen content is lower), compensations (by provincial authorities) to fishermen having undergone losses (200 families – 11.000 baht per family), a system of locally controlled and continuous sampling of water quality, and a better recycling of waste by the factory. Provincial authorities and line agencies have worked together with the Pollution Control Department.

Another example is the conflict which occurred in the area of *amphoe* Bang Nam Priew, on the west bank of the lower Nakhon Nayok river. Engaged in the cultivation of two or three rice crops per year, farmers have mobilised against insufficient water supply and water quality

problems (created by wastewater released from Bangkok). The mobilisation started with six *tambon* and then expanded to 9 and later 12. A total of 20 meetings, mediated by the chairman of the river basin Committee, and assisted by ONEP, led to several measures that helped in alleviating the problems.

A further example is the pollution problem in the lower Phra Prong subbasin. Release of waste from factories has several times resulted in fish mortality in the river. Several meetings and dialogues have been organised by the Committee with support from *oboto*. Local villagers have received training in water quality measurement and data recording and have started monitoring 30 spots on a 35 km long river reach. A short time later, in October 2006, a very severe pollution accident occurred, with most fish in the river ending up belly-up. Villagers blamed it on a nearby factory while the factory owner blamed it on the agro-toxics used by farmers. After a visit by the head of the district to witness the causes of the accident, the provincial prosecutor took the factory to court.¹⁰

An interesting aspect of both the Khlong Saraphee and Phra Prong subbasins cases is that they have involved local villagers in monitoring and data collection. This is akin to other initiatives observed in Thailand, including the Thai village research networks (*Vijay Thai Baan*) implemented in the cases of the Pak Mun dam and of the Nam Songkram basin, and the local research (*vijay thongthin*) promoted by the Thai Research Fund.

These cases showed that politicians, officers from line agencies, farmers, fishermen and industrials could meet and discuss in order to solve or mitigate a collective problem. Although the main department of the Ministry of Environment involved was the Pollution Control Department, these kinds of conflict are typical situations where the basin Committee can be instrumental in coordinating collective action. In another case the Royal irrigation Department reports having worked together with the Department of Environmental Quality Promotion in order to discuss with opponents of the Huay Samong dam, that is to be constructed straddling the boundary of the Khao Yai national park. No information was available on how this process unfolded but this provides another example of a contested issue for which multistakeholder meetings and social learning can be conducive to an agreement or a resolution of the conflict.

4.8 Capacity building and awareness raising

Preparation and implementation of information and awareness campaign including small conservation projects implemented by the communities were part of the Pilot and Demonstration Activities (PDA) project. The Committee has also been involved in a number of actions to raise people's awareness on water issues and aquatic ecosystems.

A number of NGOs are also involved in raising awareness of students in schools or of local populations in places where problems occur.

In terms of capacity building, and beyond the actions taken in terms of water, land or forest conservation the Dialogue activities "Created horizontal relationship among people from upper-, middle- and lower-watershed... established linkages between the River Basin

¹⁰ to date the case is still not resolved; one of the complicating issue is that the factory is located in Sakew province, while its treatment ponds, from which originated the pollution, are located in Prachin Buri province (where the impact was concentrated).

Committee and people in the areas... and incentivized the emergence of volunteer groups" and local community leaders (DWR, 2006). This may not be very visible in terms of concrete achievements but is a very important and necessary step for the future of stakeholder deliberation in the basin.

4.9 Coordination with other agencies

The major problem facing the Committee (and DWR) is to establish itself among the set of organisations already involved in water issues. With regard to government organisations the definition and the consistency of their respective mandates should derive from their roles as described by laws and bureaucratic structures. It is apparent that the role of MoNRE in general and DWR in particular, together with that of the river basin committees, is not well established and conflicts with those of existing line agencies. Since the role of the ministry is largely regulatory it stands to reason that it can only fulfil its job if it is given substantial power to have a say in the most important decisions that deal with planning of infrastructure, allocation of water, and the control of pollution (to take just three major issues).

Unfortunately, and this is observed virtually *in all countries* establishing ministries for the environment, this power is sometimes not enshrined in the law and in all cases challenged by existing organizations (see Molle and Hoanh, 2009, for an example from Northern Vietnam). In the present case, for example, the Committee clearly has very little power to intervene in these major water issues. Its role remains mainly consultative.

The Chairman of the Committee acknowledged "that most agencies in the four provinces of the Bang Pakong did not recognize the Committee. The member of the Committee did not clearly understand its mandate. Lack of budget and personnel in the secretariat was a critical problem" (KU, 2006). It was reported that "*there remains some considerable antipathy between the line agencies and the BPRBC regarding the roles and responsibilities of the various parties involved in the BPRBC; and possibly about the potential for the BPRBC to play an active role in the management of the basin*" (KU, 2006).

During the second meeting of the recently formed river basin Committee for the Bang Pakong River (held in July 2009 in Chachoengsao) several members questioned what were the exact role and objective of the Committee. The vice president of the Province considered that a lot of time had been lost with the working groups and that the RBC members needed to know what is their role and tasks ("*we are just talking about working groups, but what about us the Committee, we do nothing?*"; "*the only thing they do is training, nor action!*").

The lack of clarity of the responsibility of the Committee and its working groups is also stressed by other agencies. One problem related to the working groups is that of their exact role and mandate and to what extent they would be responsible for the implication of their decisions, should their decision power be increased. For example, in case of flood, the Committee might be led to take decisions not endorsed by the RID, or in contradiction with its opinion, and this could raise issues on who is eventually responsible in case of damage.

While the Committee should have a role in coordination, supervision, and regulation it is not clear what its technical capacity should be. Should it have a capacity of its own? resort to the private sector and consultants? or merely coordinate the input of existing technical state agencies? It is clear that it's very difficult to build a technical capacity within the Committee, or even the regional office of the DWR, without comprehensive access to hydrological data as well as involvement in daily allocation and distribution decisions. Some interviewee stated

that *"the KU report had not been done in collaboration with line agencies and did not integrate enough their knowledge. As a result it will not be used. Guidelines must be thorough and realistic, not done by building up knowledge at DWR and duplicating existing knowledge"*.

5 Redefining the role and structure of the RBC

From the above observations it is possible to derive a few suggestions and ways forward. It is clear that the effectiveness and role of the river basin committee cannot be understood separately from the position of the DWR/MoNRE at the national policy level. This section, therefore, offers a few reflections on three different levels: the national level, the DWR level, and the RBC level. It has not been possible during the short time of this research to gather and analyse all the technical data which would allow sounder recommendations on water management and allocation. These reflections must therefore be taken as very tentative and as food for thought.

5.1 National policy level

5.1.1 Definition of roles and responsibilities

Just like in Vietnam (Molle and Hoanh, 2009), the institutional position, role and mandate of the river basin organizations are poorly defined: they have been established officially to integrate water use and environmental sustainability, water uses across sectors and across sub-basins, allow people's participation in decisions (notably allocation), steer water planning, help in controlling pollution, but in practice they lack both the capacity and the political power to achieve these goals.

The BPRBC, in theory, should be a river-basin based body that would receive regulation duties from the MoNRE. The main role of a regulator is to screen projects, review options, and set up strategies. As mentioned earlier such duties clearly overlap with or constrain the mandate and the activities of other government agencies; but in some ways this is precisely what a regulator should do, that is regulating: the construction of the Bang Pakong dam, for example, could have been the object of debate and of more in-depth and environmental studies, with local people -using their own knowledge of their environment- allowed to express their views on the future impact of the dam. An interesting further illustration was provided after the dramatic problems created by the dam surfaced (Wangvipula, n. d.): RID typically responded by proposing another costly infrastructural solution: building up concrete embankments along 75 km of the river! With no control, projects become increasingly justified by the mere need to correct and redress the negative impact of earlier projects. The embankments were eventually not constructed (perhaps because of the announced cost) and "soft" answers are being sought (although it is apparent that options to use the dam are not easy to identify).

The water law has been under consideration for almost 10 years and many drafts have been discussed. At the moment there seems to be two competing drafts, one authored by Dr Amnat Wongbandit (Thammasat University, for the DWR) and the second one by the advisory Committee on Natural Resource & Environment of the Senate (*Sapha Tipruksaa*). It was reported that the RID felt that the importance of agriculture was not enough recognised in the draft water law and therefore did not support it. The move towards more open decision-making and to regulation is seen as a threat to business as usual in the old way of planning and constructing.

The overall lack of political will, which reflects in part the opposition of strong constituencies like the Ministry of Agriculture, has long affected possible changes in the water sector in Thailand. This lack of political and institutional support affects the RBOs in the very same way it affected earlier the ONWRC. The odds are high that RBOs will remain organizations with limited power and a consultative role rather than strong participants in arenas of negotiation and decision making. It is also likely that if there is external pressure for issuing the water law its formulation will be watered down. Yet while a new water law would not just empower the MoNRE and the DWR overnight, it is clear that it is a prerequisite to any substantial change.

Current political turmoils are not favourable to advance in the democratisation of decision-making and the participation of civil society. It was declared, lately, that regulation of the water sector was not among the hot issues and priorities of the government. Yet construction of infrastructure is back on the agenda, as a possible driver of economic recovery.

5.1.2 Data collection and integration

Water data collection at the national level should be left to the various technical agencies involved in such collection for many years. Yet collection, process, and accessibility of these data should probably be coordinated by the Department of Water Resources. One of the objectives of the recent donor funded project was to "Prepare data warehouse and establish the National Water Information Center" but this activity seems to have been abandoned.

The "Hydro and Agro Informatics Institute" set under the Ministry of Science is already providing a host of information on climate, rainfall, and daily water levels in the main reservoirs of the country. (Since data can only be visualised and time series cannot be exported in digital form, the benefit of the database is unfortunately very limited). The process to access data and construct the database has been quite long and painful and the efforts already made should be capitalised upon to build this capacity within DWR.

Dissemination of data is often problematic but things have greatly improved during the past 10 years. The Meteorology Department has an exemplary policy of data dissemination that benefits many universities, students, analysts, and other government agencies and could be taken as a model.

At the moment the regional office of DWR is not able to access data from the various sectors. This is true for irrigation data, including the water use by golf courses, for domestic water (as abstracted by East Water and other companies), or for water abstraction by industries (it is also believed, however, that the administration in charge of the industrial sector does not collect these data either; only the amount of water to be used indicated in the feasibility study is available). However, it should adopt an open policy of dissemination of its own data, as proposed in the conclusion.

5.2 DWR and RID level

The distribution of roles between the DWR's regional office in the basin Committee is not clear (Pangare et al., 2006). Ideally the Committee should not appear as being fully under the purview of the DWR but at the same time it relies on the Department which acts as the Secretariat of the Committee, channels all the funds needed for activities, has the legitimacy to deal with other government organizations, and can mobilise some technical expertise.

5.2.1 Masterplan, project screening

Planning is one of the most important activities in water resources development. This is the step where options should be examined, costs calculated, and the priorities and values of stakeholders incorporated and combined with the government's priorities.

Infrastructural development is essential and has many benefits: the construction of the Nakhon Nayok dam has allowed a boom in tourism, with 18 resorts constructed near the dam, together with six or seven golf courses; new factories have established themselves near Sakew because of the new weir on the Phra Satung river that guarantees water supply in the dry season; farmers have been able to intensify cultivation because of additional supply allowed by weirs or reservoirs.

But unrestrained conventional planning insulated from discussion or input coming from the MoNRE or concern people has proved everywhere in the world to result in -at least a few- very damageable projects that could have been avoided; many other projects tend to be constructed because construction departments and private companies are there to... construct; and because investment of public money can be done with limited concern for cost efficiency: some of the planned projects that combine a reservoir and irrigation infrastructures, like the Huay Samong dam (figure 10) and its attendant irrigation infrastructures, forecast costs of \$10,000 per ha: it is clear -and this has been shown in the case of Northeast Thailand- that there are many other possible public investments with much higher returns to society, which challenges the rationale for an endless development of irrigation.

Hydraulic bureaucracies worldwide have also shown limited flexibility to incorporate environmental values and objectives in their planning practices: a dam planned in the Khlong Luang basin has just received the green light for construction; this dam was supposed to flood areas formerly exploited for mining and polluted with heavy metals like cadmium and lead. It is not known why and how the decision for its construction has now been taken and whether this possible negative impact will be avoided with the present project; but, just like the case of the Bang Pakong dam, it is clear that the lack of transparency of planning and design, and the lack of accountability altogether, make bad projects all the more likely to happen. Likewise, six dams are planned in the Kao Yai national park.

Environmental impact assessments have been precisely designed to anticipate negative consequences of projects (over 1 million Baht) on the environment. But it is no secret that such EIA studies are often not done seriously, in particular because consultants implicitly know that the agency funding the studies is supporting the project. This is why most of the EIA studies limit themselves to proposing mitigation measures to identify impacts; and never go as far as challenging the overall rationale of a project.

As abundantly discussed earlier, beyond the economic and environmental questions raised by water projects, we ought to be concerned by their impact on the hydrological cycle and the way they endlessly generate water scarcity while pretending to be an answer to it: the new Huay Samong dam and its attendant distribution infrastructures are targeted at 7 billion baht and must supply water to 20,000 ha of land, half of it in the existing Tha Hew scheme which would be modernised to grow crops in the dry season (figure 10). Apart from its very high per hectare costs, the dam water is likely to be absorbed by both these areas and the Bang Pluang irrigation project. It is likely that in deficit years a shortage will be experienced. More water will have been mobilised at a very high cost and for a limited return, with benefits for the irrigation sector but hardly any for the environment and the overall regulation of the basin.

This is not an isolated story: The Phra Prong dam has a total capacity of 90 Mm³ (somewhat less of active storage) and has an irrigated scheme of 2000 ha downstream of it that has the capacity to absorb a good deal of its water in the dry season (it is interesting to note that 3000 were also planned to be developed on the right bank of the river but have eventually been dropped).

The Si Yat dam, with a capacity now raised to 420 Mm³ (but unlikely to be filled up each year) came with an additional irrigation command area of 30,000 ha (7000 ha on the right bank of the river, five weirs and attendant pumping stations and irrigated areas, and over 20,000 ha in the Tha Laat project): a demand is being created by this new supply, and these demand will end up being larger than supply, most especially in dry years.

The Huay Klay project, constructed 40 years ago, with around 1000 ha of command area is only used in the wet season for lack of storage upstream.

While water agencies in many countries have achieved many water resources development project without which we could not live it must be recognised that by nature there will be a day when few cost effective projects are possible, a day where emphasis is more on maintenance, modernisation, improvement in management, and incorporation of new values like environmental values. Such a transition has been observed very widely; and in all cases water bureaucracies have had a difficult time adjusting to this new reality.

The subsequent question is what could be the role of DWR in regulating and bringing rationality to planning: of course regulation demands power and this power can only exist if granted by politicians with a clear motivation for change. Under present conditions this motivation does not exist; however it seems that the DWR has chosen to compete on project planning with all other agencies traditionally involved in it: rather than discussing option and identifying impacts the DWR, as one interviewee stressed, "*also has construction projects and is behaving like a second RID. Most people in this Department are engineers and they think the same way in terms of construction*".¹¹

In theory the DWR, together with the River Basin Committees on which it is serving as secretary, should rather be screening the projects and the solutions designed by line agencies. In practice, departments and agencies prepare their work plan for the Budget Bureau and the money is directly allocated to them.

The working logic of RID is at the moment still very centred on its historical role: his new motto: "water for all living beings" (*Nam phua tuk sappasing*) aptly echoes the "water for all" catchphrase of ADB and reflects its conception of its mission as bringing water to people at any cost (see section 4.5). Talks of possible changes in logic are answered by "*We must develop; if we did nothing then we would not have any road or canal or anything*".

¹¹ Although in the Bang Pakong river basin the DWR is mainly concerned with small-scale projects, it has -a few years ago- hotly competed with the RID regarding the masterplan of the "water grid" multi-billion-dollar megaproject.

5.2.2 *Inventory of water use*

Identification of uses and users –at least those with a substantial impact on water resources-, is an obvious necessity of any river basin management undertaking. This objective has been well recognized by the Committee and the activities of the Dialogue Project. Yet, the task has proved to be more complex than anticipated (see section 4.2). Difficulties have been both logistic (the scattered and unknown nature of many abstractions) and institutional (uncooperative relationships with other state departments).

User identification should start in the three sub-basins (as was attempted) but should concentrate on significant users (smaller ones can be counted but their use estimated based with monthly averages and not monitored). Intensification of data collection can only be achieved with the different department involved receiving the instructions and means necessary to engage in it. This is again a policy issue, one that adds up to the question discussed above regarding further collection and analysis of data by DWR/RID.

In other words it will remain very difficult for DWR to gather comprehensive data without commitments at a higher level in the ministries concerned.

5.2.3 *Water pollution control*

The control of industrial pollution is a vexing problem. As is the case in many countries worldwide the control of waste released from industrial plants is made difficult by both technical and political issues: documenting and proving the causes and consequences of pollution events requires a network of data acquisition and recording which is costly to maintain (while some parameters are easy to record on a continuous basis, others are very costly to measure); in addition industries are generally owned by investors with significant political connections and power. They often find their ways in the bureaucracy to avoid action against them. Many interviewees reported that authorities in charge of industries as well as provincial authorities are too powerful and that "local people (*chaoban*) can do little" to reduce the problems.

In the past 20 years several famous cases of pollution have been recorded in Thailand but control is overall still limited. Sugar factories in the Mae Klong basin, the Siam Craft factory in Kanchanaburi, the Phoenix pulp factory in Khon Kaen, or diverse types of pollution around Ang Thong and in the Tha Chin River are examples of recurring crises.

People around the industrial parks suffer from the pollution from industries, including some electricity generation plants that use low quality coal and pollute the air. Some people, however, are happy with the factories because they create some economic activity, although most of the labour is said to be coming from Northeast Thailand. Isan workers, often without families, are socially not well integrated.

There is no magic bullet to solve pollution problems: the issue largely lies beyond the basin and has to do with the regulatory and enforcement instruments put in place at the national level. But popular mobilisation can also go a long way in forcing local authorities -and some time authorities in Bangkok- to intervene after particular pollution events: the Klong Saraphee story shows the way forward and the major role that the Committee can play in responding to public outcry and organising multi-stakeholder platforms.

5.2.4 Staffing, Capacity building

Several people have commented the limited adequacy of the current DWR staffing with regard to its mandate in general and to the idea of regulation in particular. It is noted that at the moment DWR has construction projects "*like a second RID*" while it should concentrate on regulation. One interviewee considered that the DWR should focus on "*how to compatibilize desires of people in the basin*" and as a result "*should not be technical, only social*".

Many officers (around half) are coming from RoPhocho (Office of the Accelerated Rural Development Project), a department formerly under the Ministry of Interior, and do not have the culture of environmental protection or social participation. Others are coming from the Ministry of Energy (former DEDP) from the Public Works Department.

Indeed there seems to be a case for the hiring of personal with a background in natural resources management, including both understanding of natural resources management and of ecosystem functions, and the capacity to steer and guide social processes (e.g. organising multistakeholder platforms, helping solve conflicts, etc). In turn, this raises the question of whether and where in Thailand it is possible to find university degrees and curriculum that correspond to this need. There is an obvious need to develop a multidisciplinary curriculum that would be focused on developing such skills.

It is widely regretted that DWR is too weak at the regional level. Both regional offices and River basin Committee secretariats are seen as not having enough budget, and not enough trained staff, to achieve their goals. The DWR has not only suffered from the lack of an official mandate or inadequate staffing but also from political upheavals and instability: it has changed of director general seven times in seven years.

The role of the Secretariat and its relationships with the Committee were several times reported to be unclear. It seems that the Secretariat is too associated with DWR and should involve other agencies. If the chairman of the Committee is not an official, it is also difficult for him to have any authority on the Secretariat. He may be willing to push things in certain directions, or at a certain speed, and not be able to count on the support of the Secretariat, whether it is because of a lack of technical and financial capacity or otherwise. It was also commented that the secretary of the Committee should be a local civil servant and not one coming from Bangkok.

5.3 RBC level

5.3.1 Water allocation

Reaching agreements on how scarce water is to be shared is a prime role of the regulator. This means that the RBC must define allocation rules, based on the guidelines, standards, and priorities defined at the national level. Priorities are *de facto* quite well established: domestic water use and industries are generally given priority while agriculture, invariably the largest user, is expected to adjust to the level of remaining waters. The level of priority given to the environment, however, is much less clear: in the recent past the environment has been considered as the residual user and ecosystems have suffered accordingly. Raising the profile of environmental conservation and flows is a central task of the regulator.

Water allocation seems to be as simple as sharing a cake: many people believe that knowing how much water is available and who wants how much water will be enough to allocate water in an efficient and equitable way. Few realise that both supply and demand are not well known, that rainfall during the next few weeks or months is uncertain, that managers are not even sure of what will happen to the water they release from the dams.

Water allocation scenarios should be discussed at the beginning of the dry season based on the available storage in the different dams. At the moment the management of the whole basin system is not optimised and tends to be merely "reactive" to problems, as they get reported during the season. Water allocation could be improved by establishing precise water balances of each of the three main rivers (Nakhon Nayok, Phra Prong, Tha Laot) during the dry season, based on an enhanced knowledge of the river flows needed to control water quality and respond to water needs. As mentioned earlier, according to KU (2006), an "*Allocation plan for each reservoir was formulated*" by the river basin Committee together with RID; but these plans are indicative and not worked out in details (see table 2 for an estimate of dam releases needed to control salinity at different times of the dry season).

Table 2. Water release strategies to control salinity intrusion (KU, 2006)

Reservoir	Start	Stop	Water requirement from reservoirs		
			cu.m./sec.	MCM/day	MCM
Khlong Si Yat	Dec 1, 07	Jan 10, 08	20.0	1.73	70.85
Khun Dan Prakarnchon	Dec 25, 07	Jan 31, 08	9.0	0.78	29.55
Upper Phra Prong	Jan 15, 08	Feb 28, 08	2.5	0.22	9.94

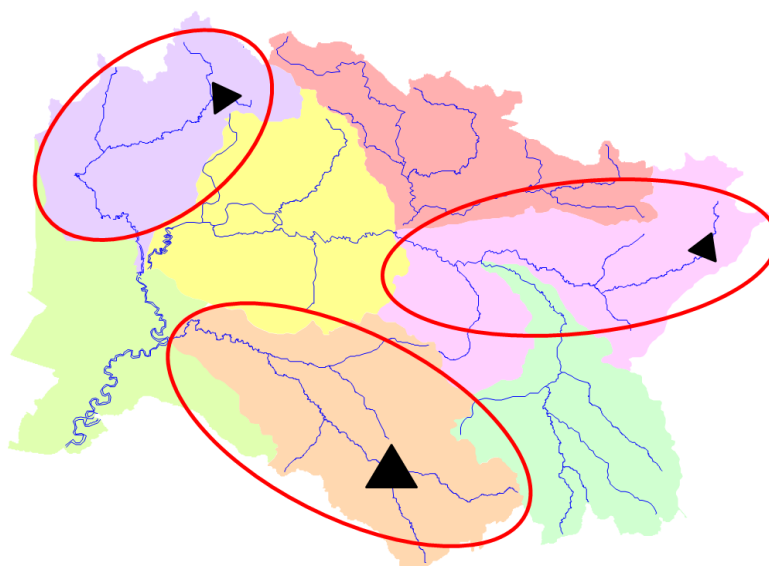
Part of the reason why RID's management is *reactive* is that it does not have a full knowledge and a full control of supply and actual use. While a strict **enforcement** of planned cropping patterns could be envisaged (this will never be easy because of intervention by politicians) in gravity irrigation systems where water supply is largely controlled by RID (Nakhon Nayok, medium/small-scale projects) it will be close to impossible to achieve in areas like the Bang Pluang project, where part of the inflow from the river to the irrigated plots is done through the management of gates handled by the farmers themselves (limitation of cropping areas is the opposite of RID's policy to expand rice cultivation as much as possible). (See box 3 for an implication of that).

The question associated with that is whether DWR or the Committee should be involved in monitoring allocation. This raises both the question of the technical capacity of the DWR/Committee and how in practice it could be involved in monitoring day-to-day location: this could only be possible with a very dense and real-time transfer of data from RID and other agencies, which is not possible or likely in the near future.

The question is therefore how to make RID accountable for a number of allocation decisions such as: priority of user X over Y; the maximum water that a given irrigation scheme should use (this takes us, again, to the issue of scheduling in RID schemes and the necessity to plan water supply at the season level with water user associations); the minimum flow that should be ensured at certain points. It is suggested that this could be operationalised in two ways:

first these macrolevel rules could be monitored by data collection made available to the Committee (even if with some delay, so that it can be checked afterward if rules have been followed); **second**, in cases when RID is not in a position to stick to the predefined rules because something unusual happened in the system (e.g. additional release of water is needed because of some pollution problem; but it can also be that the season is especially wet and that the water allocated to irrigation scheme will be re-discussed and increased) the Comity should be quickly convened to examine the new/specific situation.

Figure 11: The three main subbasins for which allocation plans must be established



Box 3: Water allocation and the control of salinity

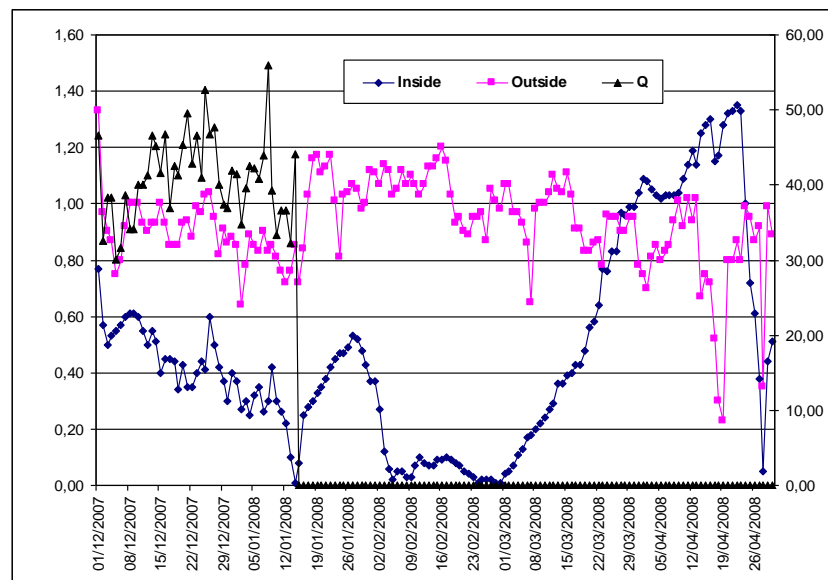
The importance of water control is not trivial: at the moment water uses in the lower half of the basin are shaped by the pattern of salinity increase in the three rivers during the dry season. In the lower part of the Nakhon Nayok basin, along the side of the East bank of the Chao Phraya Delta, watergates controlling the flow of water between the canals inside and the river half closed from mid-January onward because water is too salty (despite the difference in water levels allowing inflow by gravity: see figure 12) (although it seems that canals near Ongkarak have been able to benefit from longer periods with freshwater because of the positive impact of increased water releases from the Tha Dan dam). In the Prachin Buri river, salinity will also gradually creep up almost reaching Prachin Buri city: this creates a constraint for farmers in the Bank Pluang project who abstract water along the river (either by pumping or by opening gates at high tide). These farmers have adjusted their cropping calendars to grow two crops of rice separated by a 'flood period' in September/October and a 'saline period' in February/March. In the Tha Laot basin salinity intrusion is less because the slope of the river quickly increases; yet the lower part of the Bang Pluang project can now divert water from the Tha Laot river thanks to a weir constructed close to the mouth of the river.

Think of what would happen if greater supply coming from new dams constructed in the upper part of these three basins would allow releases in the dry season to control salinity and keep it confined to the lower Bang Pakong reach: more freshwater, pushing salinity downstream, would be available along the lower reach of the three rivers: water gates along these reaches would then be opened during a longer period (typically in January to March), and farmers would take advantage of the availability of this new freshwater: cultivation would increase but salinity would tend to come back because of the amount of diverted water; a new

equilibrium would be reached, with "demand" – or, rather, diversions - having developed according to the new supply.

This is quite positive in the sense that farmers will have been able to use more water, to grow more crops, and to raise their income. Yet the managers would be back to a situation where all stored water is allocated, with little spare water to face special events, and imbalances occurring again in deficit years.

Figure 12. Water levels in the East Bank and Nakhon Nayok river during the dry season



It is worth reiterating that the response capacity of water managers to special events and crises is enhanced when they have **spare water** at their disposal in the dams; in other words managers need to have some **slack** in the system; if it's not the case they can only respond at the cost of greatly increasing risk in the near future (by tapping reserves): this, one more time, militates for **not overbuilding** irrigation facilities and keeping enough water to ensure healthy environment and conditions and be able to respond to special events. It would be highly recommended, in particular, that the irrigation area associated with the forthcoming Huay Samong dam be much **smaller than planned**. Having some security water in that dam will be key to restoring normal water conditions in the lower basin in case of need or shortage.

Allocation also raises the question of **water rights**: the work on water allocation in the upper Phra Prong basin included a discussion on whether farmers could be compensated in dry years for receiving little water or relinquishing their rights to more priority users such as cities and industries. Although the idea is worth considering it has to be reminded that while -in most of the world- agriculture is the residual user, it does very rarely receive any financial compensation for an irregular supply. In the case of Thailand, it is also worth noting that the share of water allocated to irrigation is indeed the leftover in the system: dry season cropping varies widely each year with the amount of water available in the dams. This variability can be seen as precarious but is expected by farmers: establishing a compensation mechanism in one particular basin would raise a multitude of claims elsewhere in the country, which would be difficult to answer. In the short term, it is suggested that such compensation mechanisms are incompatible with the lack of clear-cut water rights and that under present conditions the unreliability of supply is partly compensated by the fact that farmers access water free of charge.

Overall it is clear that the Committee -together with DWR- have at the moment limited access to data and a minimal role in allocation decisions: for example it does not know how much water is diverted by the East Water company to other basins and increases in diversion are planned elsewhere, outside their purview.

A key finding of the dialogue was the confusion of water rights with water charges. It was reported that that people identified questions of measuring water for allocation as the first step of setting up water fees: the two must obviously be dissociated. It is suggested that discussion over allocation should be referred to as water sharing agreements (*kanbeng nam*).

5.3.2 *Financial sustainability*

The RBC is constrained by its limited budget and is likely to remain so in the future. This is a severe constraint to the activities of the RBC. It has impacted, in particular, the formation and the activities of working groups and subbasin Committees.¹² The Committee itself only meets around three times a year. Some Committee members are not comfortable with such limited activity and claim that it is not possible to achieve anything under such conditions. Almost all interviewees have emphasised the constraint of funding and the lack of budgets for transportation for meetings, which affects the willingness of members to participate and what can be achieved altogether. Some Committee members complain that three-hour meetings three times a year is way too little to make any difference; and that the working groups "*have only names, no activity*".

At the moment the DWR can mobilise a budget of 45 million baht/year, for a total of 31 regional offices and 25 RBCs. Around **1 million baht** is available for administration, data management, and public relations for each of the 25 basins each year. It is unclear whether this budget has any chance to be increased as long as political commitment remains as it is, and as the responsibility and prerogatives of the MoNRE/DWR are not substantially reinforced. The budget for RBC in 2010 is 66 million Baht.

One way to make the RBC financially sustainable is to recover fees from water users and polluters in the basin. This application of the user pays and polluter pays principle, as is the case -for example - in the financial water agencies of France, has the potential to constitute a basin fund. At the moment, no charge is recovered from users. For political and practical reasons it is not advisable to charge farmers (even in countries where they are charged, like France, their contribution to the basin fund is only around 5 to 10%). As is generally the case the main contributors to the fund are urban users and industries. A little fee can be added to the water bill of urban dwellers to account for river basin management costs.

The use of the basin fund can primarily support the activities related to conflict solving, capacity building, awareness raising. At the second stage, it could be, as is the case in France, that the money available is distributed back to water users as subsidies to encourage investments in water treatment or efficiency. This could be a major role of the RBC to consider applications for subsidies and to define priorities for the allocation of the fund. A virtuous cycle, involving funds levied within the basin but also re-invested within it, can be started. This independence is very important for water users in the basin to see the benefits

¹² in the new structure of the RBC, there is formally only one subcommittee (*anukamakan*) while the others are called working groups because in the former case per diem and transportation fees must be paid to members, while in the latter no payment is required. The budget is not sufficient to support several subcommittees.

derived from their fees. But the most important point is that this funding mechanism should be insulated from the allocation of budget by the state itself: this means that the collected fees should not go to the state coffers (with little insurance on how much would come back) but should stay and be managed within the basin.

The difficulty to start collecting fees from water user (even if farmers are not requested to pay) is that this must be decided at the level of the country and will face opposition from lobbies and organisations such as the Federation of Thai Industries. Again political determination at the government level is needed.

5.3.3 Structure, sub groups, selection of members

Interviewees have widely commented issues related to the membership of the Committee and to the ways it is established and members are selected.

In the initial days of the early eight pilot RBOs¹³ there was a bias towards administrative representation and farmers were grossly underrepresented but the ONWRC (now the Department of Water Resource) has worked to correct this imbalance (see changes in the appendix).

It seems that the provincial government's role in the river basin Committee has been strengthened. This has led to the formation of province-based subcommittees; although these subcommittees are not consistent with the idea of managing resources according to hydrologic boundaries, they are justified by the centralisation at the provincial level of budgeting and planning.

It is widely stated that the Bang Pakong River community is the only one in Thailand to have a Chairman coming from the private¹⁴ sector. It is not explained, however, that this is the result of a particular configuration during the first meeting of the Committee, during which the Chairman has to be selected by the members. Because of the absence of two officials and the unanimous choice of non-governmental members, Chamroon Suaydee was elected as Chairman of the Bang Pakong river basin Committee.

Although this is presented as a mark of independence of the community from the government the question of whether a chairman from the private sector is desirable or not is widely debated in the basin. The overwhelming opinion of the people interviewed is that having the provincial Governor as the chairman is preferable because of its power to take decisions followed by budget decisions and actions. On the other hand, people emphasised that - whether one likes it or not- Thai political culture is such that government officials do not accept to be placed under the presidency of a non-official individual. As a result the actions of the Committee were undermined by a lack of support from official bodies and having a

¹³ The RBOs of the upper and lower Ping rivers, for example, had only two farmer representatives each, compared with 20 officials. The 1997 (unofficial) draft Water Law stipulates that the RBO should include "no more than 21 persons in total. They may be the government officials or the official of the government enterprises or the qualified persons who have achievements, experience pertaining to the state water resources. The appointment should have selected a certain number of officials in the field of water resources."

¹⁴ See for example INPIM: "Bang Pakong is the only one among 29 basin committees in Thailand with a chair from the private sector". Although Chamroon Suaydee is an entrepreneur, former president of the Prachunburi Province Tourist Club, and the owner of several restaurants he is more interested in strengthening civil society groups rather than a representative of commercial groups.

chairman from the private sector ended up being counterproductive for the Committee. It is reported that many times representatives from government agencies would not participate in the meetings, would keep changing, and would sometimes have little knowledge about the issues debated.

On the other hand, it was also stated that having the *puwaa* as chairman was not efficient if he happened to be little interested in the Committee. Meetings would then only be set up "*if and when puwaa has time*". Some of the interviewees also emphasise that the *puwaa* is too busy, often send someone else in his place, and that water is not his direct responsibility.

All the River basin committees recently elected have the governor of the main province of each basin as their chairman. The rule has not been changed and the chairman is still elected by the Committee members. Yet it was reported that the selection is, in some cases, done through a vote by show of hands. This does not seem to be appropriate in view of the prevailing political culture, as many members are likely to feel uncomfortable to display public preference for another candidate. The selection should be done with 'secret' written votes.

Some of the problems mentioned regarding the selection of Committee members include the lack of candidates; the case of one member of the selection committee who also was candidate and was elected (this seems to be allowed by the current regulation); the presence of an 'advisor' of the selection committee in the final meeting of particular groups in which the final member is selected; and the implication of some committee members in party politics.

The constraints with the selection of members of the community (and their implications) have been widely commented by many interviewees. Some representatives of local governments do not come because they have been selected during the first meeting, although they did not attend it. Some representatives of the civil society were considered not to be adequate; some were reported to have limited knowledge while others hardly show up at the meetings ("*why did they propose themselves? could we have sanctions against them?*"). In other instances "*people who really have knowledge did not come*". According to one of the most respected and experienced Committee members "*less than half of the members are real representatives*". In several instances it seems that these representatives had been asked by the DWR or another department to candidate themselves and in many cases there was a limited number of candidates.

Another frequent comment from interviewees was about the relationships between government officials and the civil society. Many stated that they did not support confrontation and aggressive actions because, according to them, it did not fit Thai culture, or because it would end up being counter-productive. There was some discomfort with some actions of the civil society perceived as hostile and persons who excited people ("*pluk mob*"). At the same time, and somehow in contradiction, there was a recognition that if people did not move or protest little would happen.

6 Building constructive collaboration in the Bang Pakong river basin

It is well understood that the lack of official support to the theoretical mandate of the RBC, and more generally MoNRE, is at the root of its weakness in achieving its objectives and in dealing with other government agencies and ministries. It is therefore hoped my many people that the elusive Water Law, once passed, will solve these problems. It can be argued, however, that waiting for the Water Law to solve all problems might not be an appropriate

strategy: too much is expected from the Law and "support from the policy level", and it is not unrealistic to think that it might take another lengthy period before it is passed; it is also not unlikely that even if it is passed its content might be watered down and not meet DWR expectations. In other words, even getting increased power and recognition from the law might not be sufficient for DWR to work as a regulator.

It has to be understood that very few countries have successfully established a powerful regulator. This is because the power it is expected to receive threatens too much of the existing interests of well established powerful line agencies (one interviewee stated: "*the water law means empowerment of stakeholders, line agencies don't like it too*"). It is probably illusory to expect a sweeping change in responsibility in the short to medium term.

It is therefore suggested – irrespective of future decisions and when they will occur - to build a more positive relationship with other agencies and stakeholders, by instilling trust and positive incentives to collaborate. Endowed with limited power the DWR has so far chosen to develop a number of activities, some of which are perceived by RID as an encroachment on its own mandate. This is particularly the case for the recording of hydrological data and for the planning of small-scale water related projects. Although it is understandable that the DWR tries to expand its activities and compensate for the lack of collaboration from other departments, this may also, however, undermine and jeopardize both its current relevance and its future role as a regulator.

At the national level it is suggested that DWR makes available the hydrological data collected to both RID and the public at large: this goes beyond showing daily values of water levels on a website. Historical series of data should also be accessible. There is nothing especially secret or threatening about such data and by making it fully accessible the DWR would show that it departs from a culture of secrecy that is common in many public agencies but which is quite in contradiction with both the concept of IWRM and the role of the regulator.

Requesting budget for small-scale water related projects could also be reconsidered. Many agencies are already mediating local demand for such projects and provincial RID offices (let alone DOLA and other ones) have long been involved in such projects. It is doubtful that the DWR should be involved in the funding and technical screening of such projects, especially because it does not have the technical staff to respond to the demand. Although it is understandable that the DWR tries to raise its profile and budget, and attempts to show water users in the basin that it is having beneficial activities, this competition creates great and unnecessary attrition with other agencies. This makes it all the more difficult to establish any kind of positive loop and partnership. However, the involvement of DWR in such project planning is a decision that comes from the highest level; while the situation is as it is, RID's technical advice should be mobilized so that competition is lessened and duplication of projects avoided.

Major issues such as funding of the Committee, inter-agency centralised water data management, and regulatory power (concerning for example control of pollution or decision over the construction of dams) strongly depend on political decisions at the higher level: such decisions go against established vested interests and amounts to a redistribution of bureaucratic power. Whether this is going to happen lies, of course, much beyond the issue of River basin management in general and the Bang Pakong in particular.

At the river basin level, it is suggested that the Secretariat should include local staff from relevant agencies, notably the Royal Irrigation Department; the regional office of DWR and

the Committee are unlikely to acquire and build a technical capacity of their own and this capacity should rather be built by coordinating existing technical bodies. This does not mean, however, that people in the Committee should not be able to understand basic technical issues and capacity building on water sharing, the consequences of the planning of new dams and new irrigation areas, the implication of changes in rice cultivation, etc should be strengthened. DWR should in particular also increase its capacity in conflict management, negotiation, establishment of multi-stakeholder platforms, etc by recruiting staff with an adequate profile.

As discussed in this report the question of planning of new dams and irrigation areas is crucial: current procedures unfortunately mostly aim at increasing demand (irrigation areas that may grow crops in the dry season), often much beyond the availability of water (especially in years with supply below the overage), which lets other environmental problems unsolved, and generate further calls for developing new resources. RID's policy is still largely based on the perception that it has a mission to endlessly develop water resources, largely independently of their social, economic and environmental consequences. Checking this logic is only possible with the Committee (or DWR) having enough power in the decision-making process which, at the moment, is unlikely to happen; yet RID's decisions might be, perhaps, influenced by organising meetings to discuss openly these issues and raise the understanding of provincial authorities. At the moment decisions on dams, in particular, remain little open to scrutiny or discussion: the recent decision to build a dam located near former sites of mining activities (in the Khlong Luang basin) - unless design options have been changed in order to avoid the risk of contamination - is worrying and a perfect example of why the Committee (and the Ministry of Environment) should be involved in the decision.

The planning of dry-season dam releases in the three main sub-basins (Nakhon Nayok, Phra Prong, Tha Laot) must be done together with RID staff, with DWR merely coordinating the discussion with, and participation of, other stakeholders. The RID could be made accountable to a "joint dry-season analysis group" which could meet at the beginning of the season to establish targets and at the end, to examine how water has been allocated and managed, and whether and how main objectives (such as the establishment of a minimum flow at some point in the basin) has been respected. In case a special event arises during the season, the Committee could be convened to take special decisions accordingly.

The key question is: what are the reasons and the incentives why RID would shift from a mode of management that is mostly "reactive" and based on experience to a stricter scheduling and to enforcing allocation plans? and if it were to do so, why would it do it in collaboration with or under the control of DWR or of the Committee? There is no easy response to these questions but 1) more harmonious relationships between agencies, avoiding encroachment on respective duties, 2) capacity building and additional financial means and incentives are fundamental steps.¹⁵

It has also been noted that technical studies should be carried out to increase knowledge on the relationships between water levels, discharge, tide and salinity. These studies should be (at least partly) entrusted to the RID (which has a boat and other adequate equipment) instead of being contracted out, as a way to show they are full partners. The evolution of cropping patterns in the Bang Pluang project and West Bank of the Nakhon Nayok river in relation

¹⁵ RID's staff at the provincial level (Prachin Buri) and regional level include officers with a keen interest in management, which is a chance for the future development of basinwide collaborations and management improvements.

with changes in salinity must be better understood in order to anticipate what could happen in case more freshwater is stored and released upstream in the dry season.

With regard to irrigation management proper, there is a need for RID to better plan allocation within the Tha Laot and Nakhon Nayok irrigation schemes, where more water is being made available during the dry season (KU, 2008): questions of efficiency and equity between head-end farmers (some of them growing three crops per year) and tail-end farmers have to be addressed.

With all the existing constraints - in terms of interagency relationships, limited political support, scarce funding, access to data, staffing - the strategy of both the DWR and the Committee should be focused on what is achievable. Activities carried out as part of the Bang Pakong Dialogue project have shown the relevance of having a government agency, together with a stakeholder Committee, being able to intervene in situations of conflicts, or more generally in issues where coordination of several sectors and agencies is needed.

It should probably, and this was an earlier realisation of the past Committee, continue to focus on particular hot issues, trying to bring together stakeholders concerned, and the data and the expertise needed. Further very important issues such as control of allocation and use, and screening of large-scale projects should of course also be addressed: but this is hard to achieve if the political and bureaucratic situation at upper levels is not changed accordingly.

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8 Annex

Annex 1. Sub-Committee of Bang Pakong-Prachinburi and Tonlesap River Basin (KU, 2006)

- Components

- | | | |
|-----|--|---------------|
| 1. | Governor, Chachoengsao Province | Sub-committee |
| 2. | Governor, Prachinburi Province | Sub-committee |
| 3. | Governor, Nakhon Nayok Province | Sub-committee |
| 4. | Governor, Sakaeo Province | Sub-committee |
| 5. | Representative from Office of the Permanent Secretary to the Ministry of Interior | Sub-committee |
| 6. | Representative from Department of Groundwater Resources | Sub-committee |
| 7. | Representative from National Park, Wildlife and Plant Conservation Department | Sub-committee |
| 8. | Representative from Royal Irrigation Department | Sub-committee |
| 9. | Representative from Forestry Department | Sub-committee |
| 10. | Representative from Department of Disaster Prevention and Mitigation | Sub-committee |
| 11. | Representative from Community Development Department | Sub-committee |
| 12. | Representative from Department of Public Works and City Planning | Sub-committee |
| 13. | Representative from Marine Department | Sub-committee |
| 14. | Representative from Provincial Waterworks Authority | Sub-committee |
| 15. | Representative from Local Administration Organization, Chachoengsao Province | Sub-committee |
| 16. | Representative from Local Administration Organization, Prachinburi Province | Sub-committee |
| 17. | Representative from Local Administration Organization, Nakhon Nayok Province | Sub-committee |
| 18. | Representative from Local Administration Organization, Sakaeo Province | Sub-committee |
| 19. | Representative from Water User Organizations or Groups from Agricultural Sector, Chachoengsao Province | Sub-committee |
| 20. | Representative from Water User Organizations or Groups from Agricultural Sector, Prachinburi Province | Sub-committee |
| 21. | Representative from Water User Organizations or Groups from Agricultural Sector, Nakhon Nayok Province | Sub-committee |
| 22. | Representative from Water User Organizations or Groups from Agricultural Sector, Sakaeo Province | Sub-committee |
| 23. | Representative from Water User Organizations or Groups from Business or Industrial Sector, Chachoengsao Province | Sub-committee |
| 24. | Representative from Water User Organizations or Groups from Business or Industrial Sector, Prachinburi Province | Sub-committee |
| 25. | Representative from Water User Organizations or Groups from Business or Industrial Sector, Nakhon Nayok Province | Sub-committee |
| 26. | Representative from Water User Organizations or Groups from Business or Industrial Sector, Sakaeo Province | Sub-committee |
| 27. | Representative from Civil or Private Sector for Natural Resources and Environment, Chachoengsao Province | Sub-committee |
| 28. | Representative from Civil or Private Sector for Natural Resources and | Sub-committee |

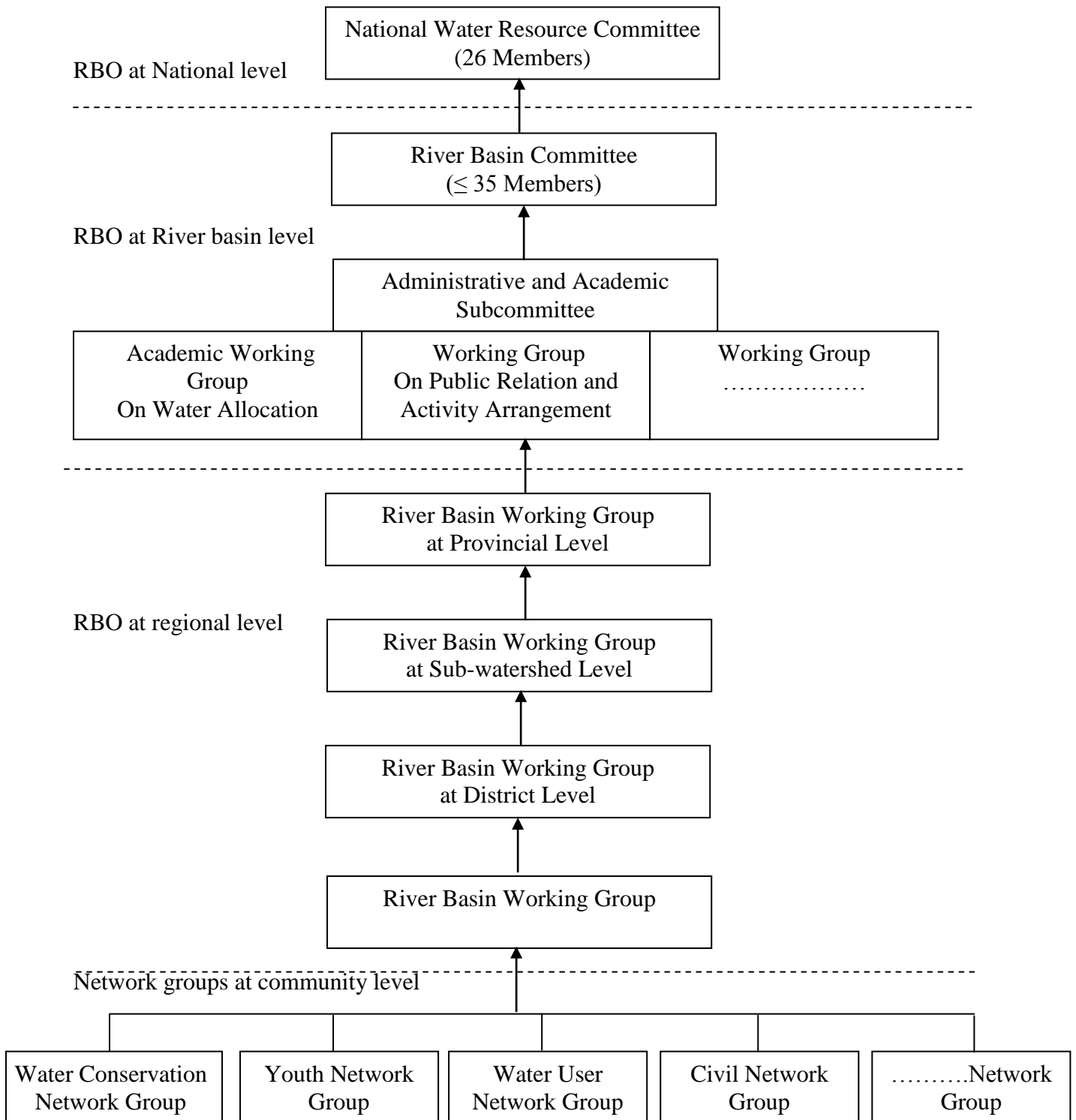
- Environment, Prachinburi Province
29. Representative from Civil or Private Sector for Natural Resources and Environment, Nakon Nayok Province Sub-committee
 30. Representative from Civil or Private Sector for Natural Resources and Environment, Sakaeo Province Sub-committee
 31. Representative from Academe or Intellectuals for Natural Resources and Environment, Chachoengsao Province Sub-committee
 32. Representative from Academe or Intellectuals for Natural Resources and Environment, Prachinburi Province Sub-committee
 33. Representative from Academe or Intellectuals for Natural Resources and Environment, Nakon Nayok Province Sub-committee
 34. Representative from Academe or Intellectuals for Natural Resources and Environment, Sakaeo Province Sub-committee
 35. Director, Water Resources Regional Office 6, Department of Water Resources Sub-committee
 36. Director, River Basin Coordination and Management Division, Water Resources Regional Office 6, Department of Water Resources Sub-committee

Annex 2. Authority and Duties of the sub-committee (KU, 2006)

1. Propose to the National Water Resources Committee the policies, plans, projects, and guidelines for solving problems and obstacles in development, usage, conservation, and any implementation necessary for water resources management, including any implementation of agencies within the jurisdiction area of the river basin.
2. Formulate Water Resources Management Plan within the jurisdiction area of the river basin.
3. Coordinate operation plans from agencies within the jurisdiction area of the river basin to comply with the plan in 2.
4. Consider the prioritization and quantification of water usage and measures for appropriate, equitable, and efficient water allocation.
5. Monitor and evaluate the operation of agencies concerning with water resources within the jurisdiction area of the river basin.
6. Request for documents, information, and facts and figures related to water resources to collate statistic, information, opinions and recommendations concerning with water resources management, water sources development and conservation, prevention and solution to water shortage, flood, and quality of water within the jurisdiction area of the river basin.
7. Negotiate conflicts and solve problems related to the implementation of water resources management within the jurisdiction area of the river basin.
8. Coordinate operations on water resources with Sub-committees of other related river basins.
9. Disseminate and generate understanding to the public about the results or the implementation of the Sub-committee.
10. Appoint Working Groups to implement operations that may be assigned by the Sub-committee.
11. Operate other tasks that may be assigned by the National Water Resources Committee.

Annex 3. Structures of RBOs

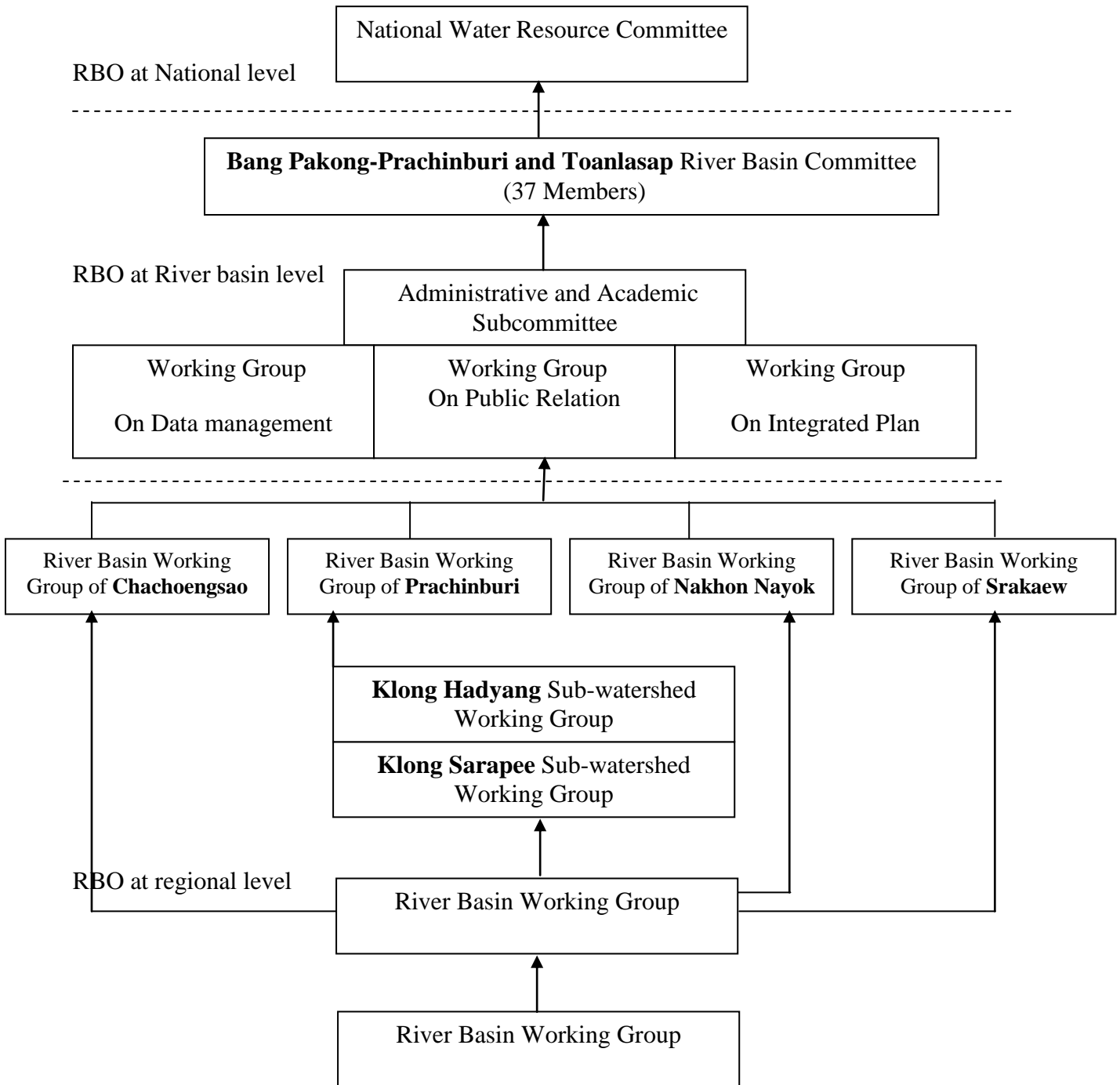
RBO Structure (General)



Note:

1. Committee & Sub-committee: can get meeting allowance (~1,000 THB per diem + travelling cost – 4 THB/km.)
2. Working groups: do not have meeting allowance

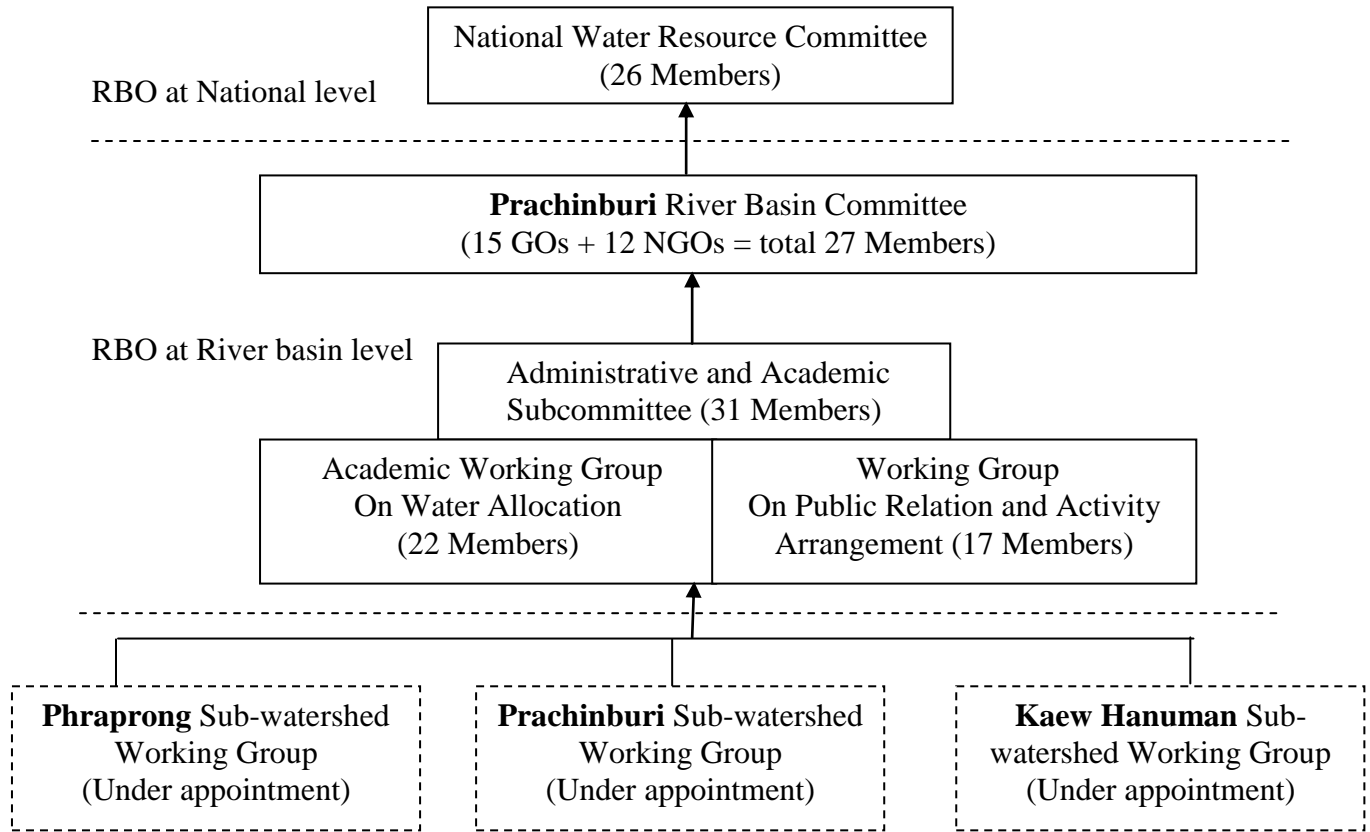
RBO-1 & 2
(21 August 2003-July 2008)
(Bang Pakong-Prachinburi and Toanlasap River Basin
Committee)



- Sources:** 1. interview
 2. Minute no.1/2548 (Bang Pakong-Prachinburi and Toanlasap River Basin Committee)
 3. Minute no.1/2552 (Prachinburi River Basin Committee)

RBO-3: Prachinburi River Basin Committee

(1 August 2008-Present)



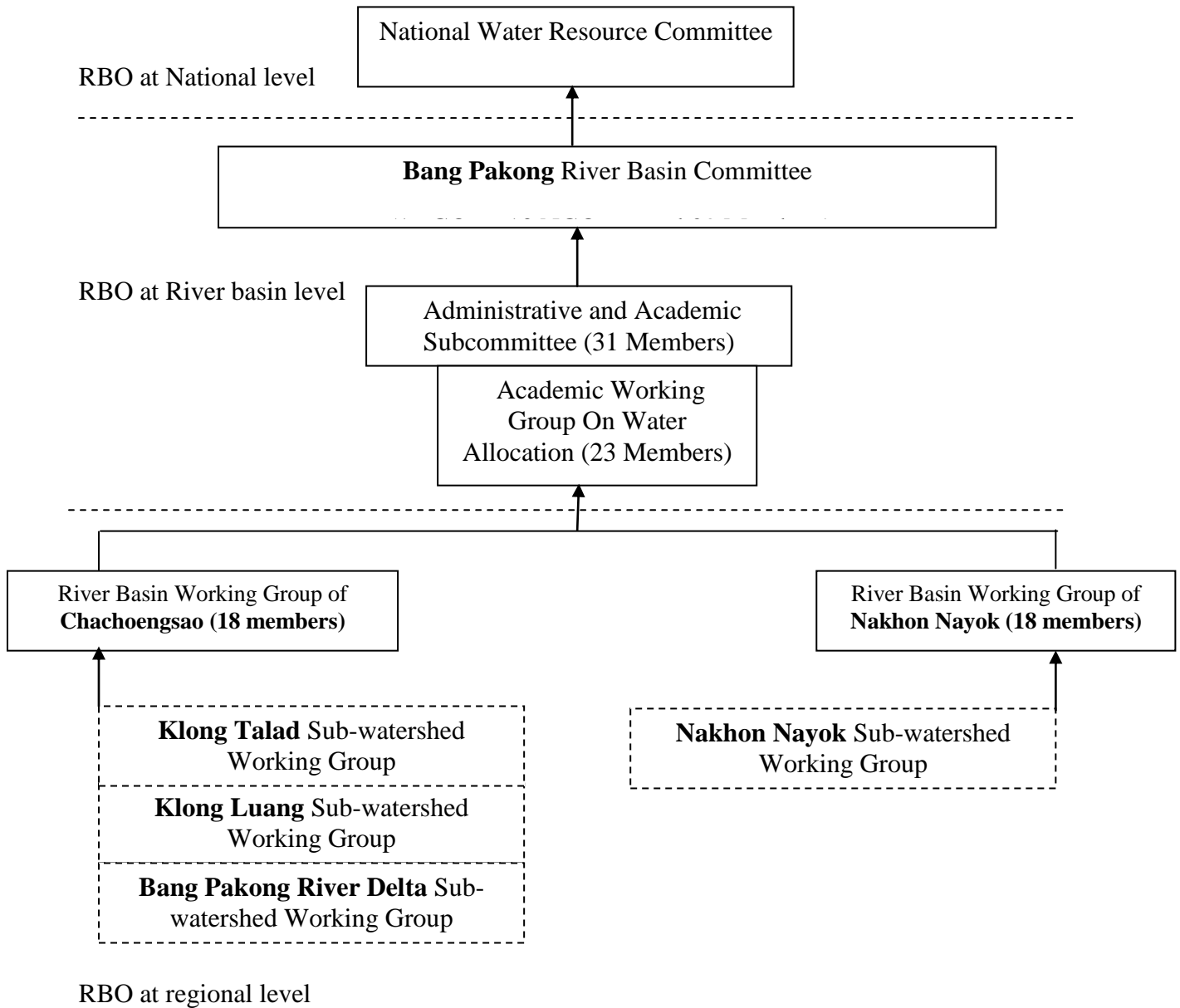
RBO at regional level

Sources: 1. interview

2. Minute no.1/2552 (Prachinburi River Basin Committee)

RBO-3: Bang Pakong River Basin Committee

(1 August 2008 - present)



Sources: 1. interview

2. Minute no21/2552 (Bang Pakong River Basin Committee)

Annex 4. Changes in the structure of the RBOs

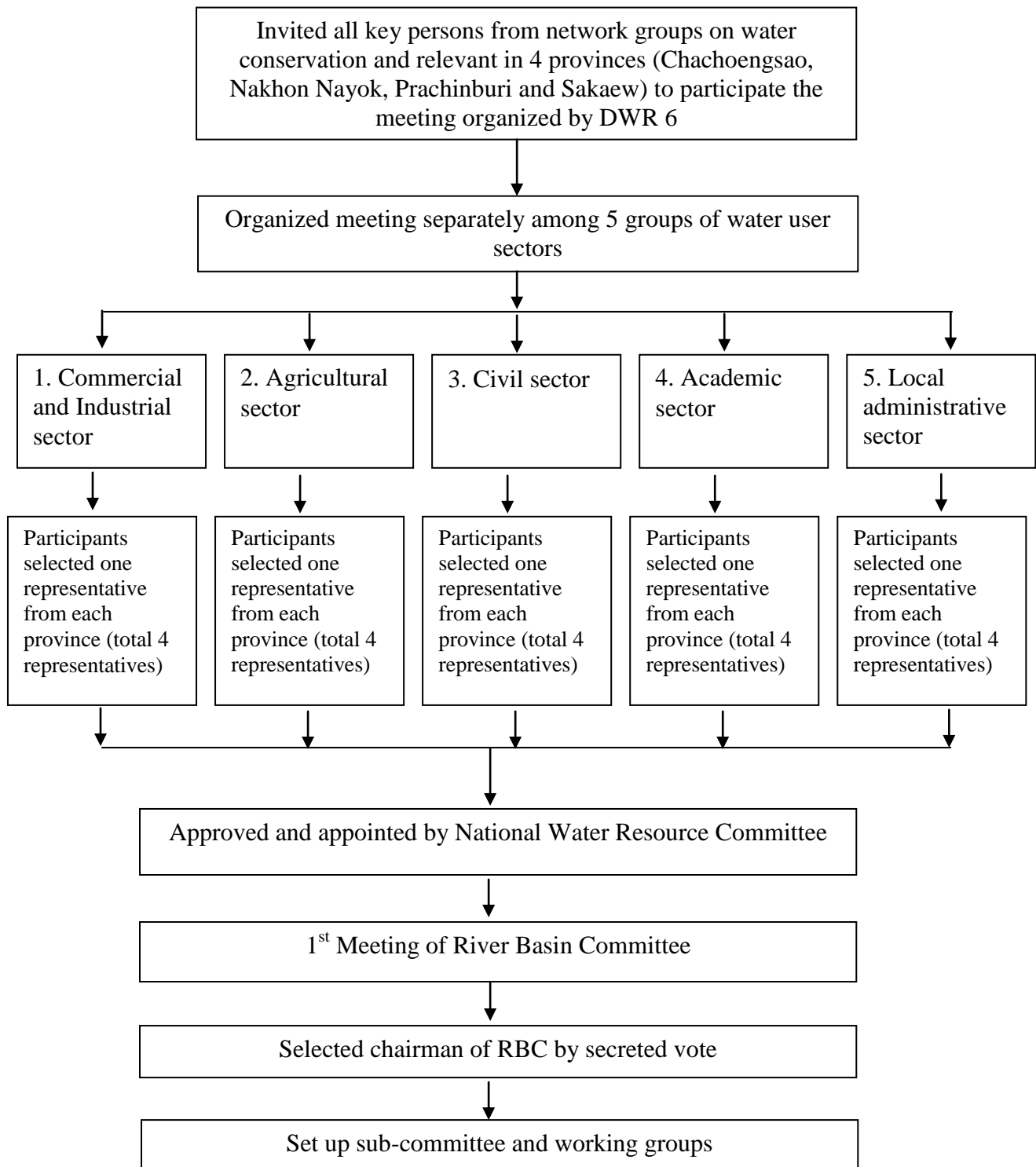
I. Components of the River Basin Committee

RBO 1& 2 (August 2003- September 2008)	RBO 3 (August 2008 – present)
<p>- 1 committee 4 Provinces (Nakhon Nayok, Chachoengsao, Prachinburi and Srakaew): “Bang Prakong- Prachinburi and Toanlasap River Basin Committee”</p>	<p>- 3 Committees</p> <ol style="list-style-type: none"> 1) Bang Prakong River Basin Committee (Chachoengsao & Nakhon Nayok) 2) Prachinburi River Basin Committee (Prachinburi) 3) Toanlasap River Basin Committee (Srakaew)
<p>- Chairman: from non-government sector</p>	<p>- Chairman: Governor</p>
<p>- Ratio between GO & NGO: GO members = 17 (46%) NGO members = 20 (54%)</p> <p>Local administration 4 (20%) Commercial service or industries 4 (20%) Agriculture 4 (20%) Civil sector/or NGOs organizations 4 (20%) Academic sector/honorable committee 4 (20%)</p>	<p>- Ratio between GO & NGO: (Prachinburi/Bang Pakong)</p> <p>GO members = 15 (56%) / 16 (55%) NGO members = 12 (44%) / 13 (45%)</p> <p>Local administration (25%)/3(23%) 3 Commercial service & tourism 2 (17%)/2(15%) Industries (17%)/3(23%) 2 Agriculture (17%)/2(15%) 2 Academic sector/honorable (25%)/3(23%) 3 Committee/expert in NR & Env.</p>
<p>- Different selection process: No selecting committee</p>	<p>- Different selection process: Called for application and pre-selected by selecting committee</p>
<p>- Under the Regulation of the Prime Minister’s Office on National Water Resource Management B.C. 2545 (2002)</p>	<p>- Under the Regulation of the Prime Minister’s Office on National Water Resource Management B.C. 2550 (2007)</p>

Annex 5. Changes in the Selection Process of the RBOs

RBO 1

Bang Pakong- Prachinburi and Toanlasab River Basin Committee



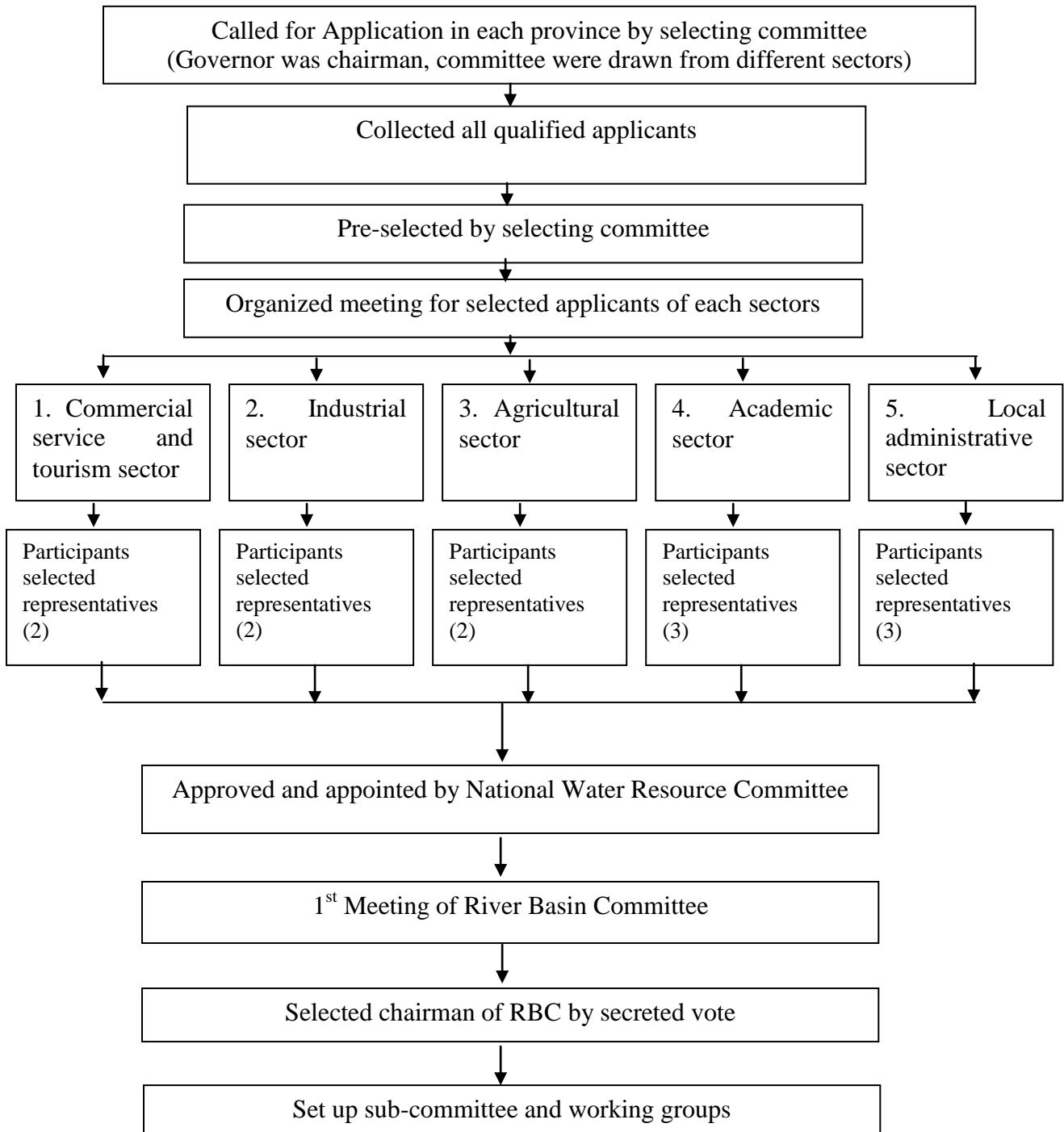
RBO 2 (Acting Committee)

Bang Pakong- Prachinburi and Toanlasab River Basin Committee

No selection for RBO 2 (The same persons of RBO 1)

RBO 3

Bang Prakong River Basin Committee Prachinburi River Basin Committee Toanlasab River Basin Committee



Annex 6. Bang Pakong River Basin Committee (2008-present)

1. Component

1. Representatives of government sector	16
2. Representatives of non-government sector	13
2.1 Representatives of local administration sector	3
2.2 Representatives of agricultural sector	2
2.3 Representatives of industrial sector	3
2.4 Representatives of commercial, service, and tourism sector	2
2.5 Representatives of academic sector, honorable committee, and expert in natural resources and environment	3
Total	29 members

2. Lists

1. Mr. Weerawit Wiwatanawanich
Governor of Chachoengsao Province Chairman
2. Mr. Preecha Kamolbutr
Governor of Nakhon Nayok Province Vice-chairman
3. SM.1 Sakda Thongprasit
Vice-president, Office of Chachoengsao Provincial Natural Resource and Environment (Honorable committee) Vice-chairman
4. Director, Office of Regional Irrigation 9
(Representative of Royal Irrigation Department)
5. Mrs. Parichart Sriwiphatana
Director, Office of Regional Agricultural Extension and Development 3
(Representative of Department of Agricultural Extension)
6. Mr. Nantapol Nonghanpitak
Head, Land Use Planning Group (Representative of Department of Agricultural Extension)
7. Mr. Anuphan Ittirat
Director, Water Quality Management Division
(Representative of Pollution Control Department)
8. Director, Coastal Fishery Research and Development Center
(Representative of Department of Fisheries)
9. Director, Office of Chonburi Natural Resources and Environments
(Representative of the Under-secretary Office of the Ministry of Natural Resources and Environments)
10. Director General, Department of Water Resources
(Representative of Department of Water Resources)
11. Mr. Surasak Tongasukdee
Research and Development Center of Upper Thai Gulf Marine and Coastal Resources
(Representative of Department of Marine and Coastal Resources)
12. Director, Office of Conservation Area Management 1
(Representative of Department of National Parks Wildlife and Plant Conservation)
13. Director, Center of Regional Disaster Prevention and Mitigation 1
(Representative of Department of Disaster Prevention and Mitigation)
14. Director, Bureau of Water Technology and Industrial Pollution Management
(Representative of Industrial Works)
15. Chachoengsao Local Administration Office
(Representative of Department of Local Administration)
16. Mr. Narong Rochanapiyawong
Vice-Chief of Nakhon Nayok Provincial Administrative Organization
(Representative of Local Administration Sector)
17. Mr. Aphichart Thepwutistaporn

- Mayor, Muang Nakhon Nayok Municipality
(Representative of Local Administration Sector)
18. Mr.Lhim Sathuchart
Chief of Tatakeab Sub-district Administrative Organization
(Representative of Local Administration Sector)
16. Mr. Chagrapong Biathong
(Representative of Agricultural Sector)
17. Mr.Chalee Chitprasong
Head, Klong Chugkachoe Pawn Culture Group(Representative of Agricultural Sector)
18. Mr. Phaitoon Trakarnsakdikul
President, The Federation of Thai Industries-Provincial Chapter, Chachoengsao
(Representative of Industrial Sector)
19. Mr. Sanchai Hemyakorn
Manager, Paiboonsiri Rice Mill
(Representative of Industrial Sector)
20. Manager, The Federation of Thai Industries-Provincial Chapter, Chachoengsao
(Representative of Industrial Sector)
21. Mr.Wirat Intrakun
President, Chamber of Commerce-Nakhon Nayok
(Representative of Commercial Service and Tourism)
22. Mr.Sirichai Paobanchong
President, Healthy and Smart Acts Company Limited
(Representative of Commercial Service and Tourism)
23. Mrs. BoonYang Kangjai
President, Natural Resource Protection Volunteer (Honorable Committee)
- 24 Mr. Anek Wantippa.
President, Chachoengsao Reporter Association (Honorable Committee)
25. Mr.Wiwat Sojuiya
General Director, Water Resources Regional Office 6
26. Major Komdech Chaichana
Director, Prachinburi River Basin Management and Coordination Section

Committee
Secretariat
Assistant to
Committee
Secretariat

Annex 6. National Water Resource Committee

- | | |
|---|------------------------------------|
| 1. Major General Snan Khachornprasart
Vice Prime Minister | Chairman |
| 2. Mr. Suwit Khunkitti
Minister, Ministry of Natural Resources and Environment | Vice-chairman |
| 3. Mr. Theera Wongsamut
Minister, Ministry of Agriculture and Cooperatives | Vice-chairman |
| 4. Mr Woottipong Chaiseang
Minister, Ministry of Science and Technology | Vice-chairman |
| 5. Under-secretary of the Ministry of Agriculture and Cooperatives | |
| 6. Under-secretary of the Ministry of Transport | |
| 7. Under-secretary of the Ministry of Natural Resources and Environment | |
| 8. Under-secretary of the Ministry of Science and Technology | |
| 9. Under-secretary of the Ministry of Energy | |
| 10. Under-secretary of the Ministry of Interior | |
| 11. Under-secretary of the Ministry of Industries | |
| 12. Director general of Bureau of the Budget | |
| 13. The Secretariat of Office of the National Economic and Social Development Board | |
| 14. Director general of Royal Irrigation Department | |
| 15. Director general of Department of Groundwater Resources | |
| 16. Mr. Jetsada Kaewkallaya | |
| 17. Mr. Chaichana Rungsaeng | |
| 18. Mr. Nipon Tangthum | |
| 19. Mr. Mingsan Kaosa-ard | |
| 20. Mr. Santi Bang-or | |
| 21. Mr. Suphat Wongwisetsomjai | |
| 22. Mr. Aphichart Anukulamphai | |
| 23. Mr. Siripong Hangsapuk
Director general, Department of Water Resource | Committee Secretariat |
| 24. Vice-director, Royal Irrigation Department | Assistant to Committee secretariat |
| 25. Mr. Surapol Pattani
Vice-Director, Department of Water Resource | Assistant to Committee secretariat |
| 26. Director, Bureau of Water Resource Planning and Policy | Assistant to Committee secretariat |

Lists of all key informants were met during 13-17 July 2009

Thursday 9 and Friday 10

* Sukontha Aekaraj; Surapol Patanee - Department of Water Resources

* Staff hydrology division

* Dr Apichart Anukularmphai

* Staff at Pollution Control Department

* Dr Somkiat (RID)

15-7-09 (Wednesday)	09.00-12.00	1. Mr.Sanya Seangpoompong	Project director, Prachinburi Royal Irrigation Project Rob Muang, A. Muang, Prachinburi	081-8319682
Date	Time	Name	Position/Organization	Tel.
13-7-09 (Monday)	09.00-12.00	1. Mr. Kasidesh Surajirachart	Director, Division of Irrigation Engineer Office of Regional Irrigation 9, Bangpra, A. Sriracha, Chon Buri	081-8752823 038-341252-4
		2. Mr. Kriangsak Poomnak	Director, Division of Water Use Extension Office of Regional Irrigation 9, Bangpra, A. Sriracha, Chon Buri	089-9392353
		3. Mr.Sanya Seangpoompong	Project director, Prachinburi Royal Irrigation Project Rob Muang, A. Muang, Prachinburi	081-8319682 037-212178
	13.00-16.30	Bang Pakong River Basin Committee		
14-7-09 (Tuesday)	09.00-12.00	1. Mr. Ammarin Chakasik	Project director, Bang Pluang Water Distribution and Maintenance Project Rob Muang, A. Muang, Prachinburi	037-211486
		2. Mr. Rithee Phrompichit	Bang Pluang Water Distribution and Maintenance Project	037-211486
		3. Mrs. Wanida Pongnak	Bang Pluang Water Distribution and Maintenance Project	037-211486
	13.00-16.30	1. Mr. Chamroon Suaydee	Former President of the Bang Pakong-Prachinburi and Toanlasap River Basin Committee, Representative from Commercial Service and Tourism Sector President of Prachinburi Tourist Club	086-3262868
		2. Mr. Anusorn Charoenpol	Senior Irrigation Engineer (Water Allocation Section) Prachinburi Royal Irrigation Project, Rob Muang, A. Muang, Prachinburi	084-6572888
		3. Mr. Narin Laksomboon	Senior Irrigation Engineer (Water Pump Section)	089-5211511

			Prachinburi Royal Irrigation Project, Rob Muang, A. Muang, Prachinburi	
		4. Mr. Chalao Arun	Head, Klong Sarapee Water Distribution Station Prachinburi Royal Irrigation Project, Rob Muang, A. Muang, Prachinburi	086-0500696
		5. Mr. Sala Kongtowa	Officer, Water Distribution Station Prachinburi Royal Irrigation Project, Rob Muang, A. Muang, Prachinburi	083-1103191
		6. Mr. Thawal Pewklam	Irrigation Water User Group of Bang Pluang	081-4429688
		7. Mr. Somchai Tadderm	Irrigation Water User Group of Bang Pluang	080-5612249
		8. Mr. Sman Singjhon	Irrigation Water User Group of Bang Pluang	081-6631575
		9. Mr. Praditchai Chaiy wattana	Irrigation Water User Group of Klong Sarapee	081-9854057
		10. Mr. Somporn Puangtong	Irrigation Water User Group of Klong Sarapee	086-0500696
	13.00-14.30	1. Mr. Pornthip Somnam	Water User Group-Agricultural Sector, Prachinburi Head, Aquaculture group (“Majchaphasook”) 1 Moo 6, T. Bansang, A. Bansang, Prachinburi 25150	086-7632435
	15.00-16.30	1. Captain Chaliew Bussabong	Water User group-Agricultural Sector, Prachinburi Advisory board, Ban Pra Orchard Farmers’ Cooperative	081-9404714
		2. Mr. Boonvech Srikasikij	Ban Pra Orchard Farmers’ Cooperative	081-9213548
		3. Mr. Surapol Srihom	Ban Pra Orchard Farmers’ Cooperative	081-2520349
		4. MSGT. Wiroaj Srisuwan	Ban Pra Orchard Farmers’ Cooperative	089-0855048
		5. Mr. Prasert Narinrawongs	Ban Pra Orchard Farmers’ Cooperative & Head of Village	087-8337991
		6. Mr. Pongpatana Luengaram	Ban Pra Orchard Farmers’ Cooperative	089-0955921
Date	Time	Name	Position/Organization	Tel.
16-7-09 (Thursday)	09.00-12.00	1. Sergeant Major Sukda Thongprasit	Honorable Committee, Bang Pakong River Basin Committee	081-5767207
	13.00-15.30	1. Mr. Phaitoon Tharakarnsukdhikul	Water User Group-Industrial Sector President, The Federation of Thai Industries, Provincial Chapter-Prachinburi	038-840805
	16.30-18.30	1. Sergeant Major Sukda Thongprasit	Honorable Committee, Bang Pakong River Basin Committee	081-5767207
17-7-09 (Friday)	08.30-12.00	1. Mrs. Bussabong Chaokhanha	Honorable Committee, Bang Pakong River Basin Committee Manager, Center of Prachinburi Civil Development	081-4114630
	13.00-14.30	1. Mr. Wirat Intrakul	Committee member, Bang Pakong River Basin Committee (Representative from commercial and tourism sector)	037-311401

			President, Chamber of Commerce-Nakhon Nayok	
	15.00-16.30	1. Mr. Chakrapong Biathong	Water User Group-Agricultural Sector, Nakhon Nayok Committee member, Bang Prakong River Basin Committee (Representative from Agricultural sector)	089-6064553
		2. Commander Wichien Sukdee	Water User Group-Agricultural Sector, Nakhon Nayok	086-3199502
		3. Mr. Somjuan Konthong	Water User Group-Agricultural Sector, Nakhon Nayok	
		4. Mr. Laksana Chantrkao	Water User Group-Agricultural Sector, Nakhon Nayok	
		5. Mr. Arrom Thaboonmee	Water User Group-Agricultural Sector, Nakhon Nayok	
		6. Mr. Panom Klinhom	Water User Group-Agricultural Sector, Nakhon Nayok	
		7. Mr. Sittichai Mankong	Water User Group-Agricultural Sector, Nakhon Nayok	
		8. Mrs. Boonchu Deeang	Water User Group-Agricultural Sector, Nakhon Nayok	

Lists of all key informants were met during 20-24 July 2009

Date	Time	Name	Position/Work office	Appointment place	Tel.	Stay overnight at
20-07-09 (Monday)	10:00-13:00	Mr. Komol Chantawong	President, Institute of Strengthening the Learning Process and Community Way "Chantawong" Amphoe Muang, Sa Kaew	District Office Muang, Sa Khaew	089-9397856	<i>Aiyara Hotel</i> 279/49 Dong Phra Ram A. Muang, Prachinburi 037-212615, 083-1165552
	14:00-17:00	Mr. Smith Yensabyi	Head, Center of Sa Kaew Natural Agriculture Takasem, A. Muang, Sa Kaew	Center of Sa Kaew Natural Agriculture	089-9354400	
21-07-09 (Tuesday)	09:00-16:30	Mr. Sanya Seangpoompong	Project director, Prachinburi Royal Irrigation Project Rob Muang, A. Muang, Prachinburi	Prachinburi Royal Irrigation Project	081-8319682 037-212178	<i>Aiyara Hotel</i> Prachinburi
22-07-09 (Wednesday)	09:00-12:00					<i>Aiyara Hotel</i> Prachinburi
	13:00-16:30	Mr. Wiwat Sojuiya	General Director, Water Resources Regional Office 6 Prachinanusorn Road, Namuang, A. Muang, Prachinburi	Water Resource Regional Office 6	037-213638-9	
		Mr. Phathai Panturothai	Director, Prachinburi River Basin Management and Coordination Section Water Resource Regional Office 6	Water Resource Regional Office 6	089-2058264	
23-07-09 (Thursday)	09:00-12:00					<i>Aiyara Hotel</i> Prachinburi
	14:00-16:30	Mr. Rueangsinthu	Former committee member, Bang Prakong-Prachinburi and	Nakhorn Nayok	081-4049541	

		Ratanalam	Toanlasap River Basin Committee Teacher , Nakhorn Nayok Wittayakom School Suwannasorn Rord, A. Muang, Nakhorn Nayok	Wittayakom School	037-311255	
24-07-09 (Friday)	10:00-12:00	Mr. Kasidesh Surajirachart	Director, Division of Irrigation Engineer Office of Regional Irrigation 9 Bangpra, A. Sriracha, Chon Buri	Office of Regional Irrigation 9	081-8752823 038-341252-4	-
	13:30	Departure to Bangkok				