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Climate Change and Institutional Challenges for Developing Countries: The Case of Water Resource Management in Thailand

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1. Introduction

Changing weather pattern imposes major institutional challenges for water management in many countries, in particular developing countries ones where administrative capacity and resources are limited. In case of Thailand, a study on observed extreme weather events by Limsakul et al. (2011) revealed that during the last 5 decades (1951-2005), the annual occurrence frequencies in severe droughts in Thailand has more than doubled with a large jump in the mid 1970s due to surface warming. At the same time, the frequency in wet spells declined 2.5 per cent per year during the particular period. The sum of the annual occurrence frequencies in severe droughts and wet spells increased by 2 per cent per year relative to the long term mean. With more frequent extreme weather condition, Thailand urgently needs to overhaul the current water resource management institution that is highly centralized but fragmented.

While academics confirm increasingly frequent extreme weather conditions in Thailand, the changing weather pattern has been gradual and hence has not set off an "alarm" for policy makers to make a move. However, in 2011 Thailand suffered one of the most devastating floods in her history. The cost of the damage estimated by the World Bank (2012) was 1.4 trillion baht (roughly 47 billion USD), or 13 per cent of the country's GDP. While the unusual heavy rainfall, judged by experts to occur on average only once every 100 years, no doubt triggered the disaster, the extent of the damage was exacerbated by inappropriate land use, dilapidated infrastructure for drainage such as water gates and water pumps and last but not least, the lack of proper administration and management of floods due to both bureaucratic inept and flawed institutional design.

The flood was an unpleasant "wake-up call" for the Thai government. Unfortunately, governments are often too eager to adopt "simple (but expensive) solutions" such as building large-scale structures the likes of massive flood ways and water reservoirs to prevent the recurrence of such inundation. On the contrary, much less attention and effort was devoted to the development of proper institutions that would facilitate an efficient and effective management of floods. This is because construction projects are better "vote catchers" as they help stimulate economic growth and employment and the output are visible to the public. Institution building, on the contrary, is extremely complex to design and implement and, at the same time, unappreciated by to the average voter and hence is often ignored by policy makers. Thus, academics are at task to examine, propose and advocate an optimum water management institution.

2. Objective

This paper aims to propose a desirable and feasible water management institutional design, taking into consideration of country-specific environment and constraints that will allow Thailand to handle extreme weather condition that gives rise to more frequent and more severe droughts and floods.

The current literature on water management is expansive but most focuses on the optimal institutional design either at both the macro (national) level or at the micro (community) level. Water resource management at the national level seems to be converging on the concept of an "Integrated Water Resource Management (IWRM)," which advocates that water management should be area-based rather than function-based and that water management decision making should be decentralized on a basin-wide context, under the principles of good governance and public participation.

Although the proposed principles no doubt hold merit, but subsequent work on the topic concerning practical implementation, especially in the context of complex water management scenarios in the developing countries, is lacking.

At the same time, there is rich literature on "self-organized collective water management" that builds upon the work of Ostrom (1990) "institutional design principles" for local common pool resource systems. The ground-breaking and Nobel prize-winning work posits that an efficient management of common pool resources can be attained without state rules and regulations if the institutional design of such management meets eight key principles. These principles are based on numerous real-world experiments that have proved to be robust over time and across different geographic locations.

The integrated water resource management and the collective common pool resource management represent two different approaches to water management during normal times. The first takes a "top down" approach while the second, a "bottom up" approach. However, they are two pieces of the same puzzle. Current literature suggests that water management institutions at the macro level is best organized by hydrological boundaries such as river basins and that at the community level organized by collective initiations. However, there is little literature on how the institutions at the national and those at the community level fit together in the entire water management landscape in practice. This study aims to provide a holistic picture of water management institutional landscape from the very top to the very bottom level.

3. Research design

The research is divided into 2 parts. The first part concerns the design of water management institutions at the macro level which involves mainly desk work, reviewing the conceptual framework of an optimal water management institution from existing literature and documenting different institutional designs that prevail in countries with advanced water management administration namely, Japan, the Netherlands and France. The exercise serves as a benchmark against which the existing over-arching water management institutional design in Thailand can be assessed so that "institutional gaps" can be identified for the purpose of policy recommendation.

The second part concerns water management at the micro or community level. The research in this part involve both primary and secondary data collection in order to develop a sound knowledge of the *facts* involved as well as the *perception* and *behavior* of stakeholders. Firstly, the research team reviewed the laws and regulations as well as different institutions governing water management at the local level. Secondly, it conducts in depth interviews with academic, relevant state officials and community leaders in order to develop a solid understanding of the formation and management of water user groups in different parts of the country. Thirdly, several workshops with members of different water user groups were organized with professional facilitators in order to collect detailed practical information about the organization and challenges of community water management groups. Fourthly, several surveys have been conducted and are on-going in order to gauge the perception and experience of local residents, farmers and local administrations about water management in the particular community. And, finally, a water allocation game was carried out in which community members participate by assuming different roles as upstream, midstream and downstream. Different teams were provided with real financial incentives to manage limited water resources most efficiently. This exercise allowed researchers to understand the behavior and strategy of water users along a river basin.

It is important to note that this research project is a work-in-progress. This paper describes the conceptual framework governing an optimum water management institutional design. It also identifies the shortcomings of the current structure in Thailand as well as the factors responsible for those shortcomings. The paper awaits empirical evidence to support the preliminary analysis based on extensive qualitative data and information collected thus far.

4. Results

4.1 The over-arching water management institutions

An extensive review of literature reveals that water management during normal times and during a state of emergency such as a severe drought or flood is diametrically different. During normal circumstance, the management of water should be "integrated" but "decentralized" and that during the emergency state it should instead be centralized. Efficient water management during a normal circumstance needs to be able to integrate multiple water-related policies such as irrigation, land use, urban development, road network construction, etc. , which calls for an area-based management. At the same time, it should be decentralized based on the "principles of subsidiarity", which suggests that water management should take place at the lowest appropriate governance level in order to ensure that it (1) is tailored to the specific local environmental characteristics (2) is consistent with local needs and demands (3) minimizes administrative cost associated with large centralized bureaucracy and (4) promotes better accountability given that stakeholders are directly involved in the management. Integrated but decentralized water management amounts to area-based water management at the regional level.

On the other hand, the management of water under the state of emergency such as a large scale inundation requires a centralized decision making process in order to ensure the interest of the public rather than of a particular constituency. The efficient execution of flood management during a crisis requires the division of clear roles and responsibilities of relevant bodies at different levels of the government from the national level to the regional, provincial, municipal to local levels. Hence, an optimal proper water management institutional design must be able to accommodate a smooth transition from a decentralized to a centralized management structure, which is particularly challenging as the management of water resources during normal time and that of a flood often involves different state organizations. Overseas experience in water management under normal circumstances and under an emergency situation is summarized below.

Water management during normal state

A thorough examination of water management regimes in three countries with advanced water resource management institutions namely, Japan, France and the Netherlands, reveals that water management during normal time is managed by area and is decentralized. However, the three countries exhibit 3 different decentralization models. Japan decentralizes her water management authority according to the administrative borders. River basins are classified into class A B and C basins depending on their size and length. Class A river basins are under the purview of the national government, while class B and C rivers are under the supervision of provincial and municipal administrations.

The management of water resources in France is decentralized along the country's hydrological features, the main river basins. T has eight different "River basin Committees" whose members are made of representatives from the central government, local administrations and water users consisting of farmers, industrialists, land developers, electricity generators and environmental activists. The Committee works jointly with the central government "water agencies" to develop a Master Plan for Water Development and Management" for each river. Although the Committee does not have finance resources to fund flood prevention projects nor the authority to approve such projects implemented by other bodies, local authorities need to comply with the Master Plan in their management of water and floods.

The Netherlands' water management regime is most interesting as it represents a mix of the administrative and hydrological model known as the "co-ordinated model". Under such a model, local

authorities voluntarily form themselves into "water boards". The water boards have the power of the law to access pooled financial resources from member local administrations and to impose "water tax" if need be. Member of the boards are not officials from member local administrations, however. Rather, they are representative of water users consisting of property developers, commercial property owners, residential property owners, open land users, i.e., farmers and property renters, selected by local residents.

Interestingly, the Netherlands model is based on the "bottom up approach" whereby local communities form collective water management bodies themselves based on the local hydrological features. The number of water boards in the Netherlands has been constantly as a result of mergers between different boards. Currently, there are 22 water boards.

Each of the decentralization models has its pros and cons that countries considering one of the options need to ponder. Japan's "administrative model" is simple to set up as it relies on existing administrative borders but since administrative borders are smaller than a river basin, efficient management of water resources requires an efficient platform and system for coordination and cooperation across local authorities that are stakeholders within the same river basin.

The French "hydrological model" although is theoretically sound, the fact that the "River Basin Committees" are drawn by law rather than by natural formation of different local administrations deprives local administrations the experience in collective resource management. Moreover, such management may also prove difficult to implement in countries with long history of highly decentralized administration such as Germany.

The Dutch model is most interesting as it represents the management of water resource from the "bottom-up approach". But this is certain unique to the Netherlands that has had history of community-based flood management organization since the 12th century in building dikes in certain cities. At one time, there were as many as 2,500 self-organized water management groups. However, but since the 1970 the central and regional flood management began to consolidate in order to achieve scale efficiency as certain power and authority of the central government were devolved to the water groups. Today, the numbers of "water boards" have declined to just 22 in a country with 12 provinces and 490 local administrations.

It is important to note that although water management in these countries appear to be decentralized, the central government still play an important regulatory role in approving regional or river basins master plans (as in the case of the Netherlands) and approving the construction of infrastructures that have an effect on the level and flow of water such as the national agency known as the "Water Police" in France. That is, decentralization of water resource management still requires centralized regulation in order to ensure public interest. Hence, designing an optimal water institutional design requires not only the design of the devolvement of water resource management, but also the design of the role and authority of the central versus the regional organs.

Water management during emergency state

The management of water during emergency state in these three countries is almost identical in that each water board, river basin committee or local authority is responsible for the management of floods within their own territory. The central government takes over only when the flood affects multiple constituencies. In Japan, floods within a provincial or municipal boundary are handled by the Provincial or Municipal Disaster Management Council. However, to ensure that there is co-ordination and cooperation across local administrations within the same river basins, a Flood-fighting Liaison Committee was established for each river. For large-scale inundation that crosses provincial borders, the single authority responsible for handling emergency situation is the Central Disaster Management Council (CDMC) chaired by the Prime Minister takes over. Japan's Flood Fighting Act prescribes the line of command and designated roles and responsibilities of the CDMC and other organizations.

In France, once an emergency state has been announced, the water management authority shifts from the individual river basin committee to the "Basin Coordinator Prefect", which is the body of the central government. However, the shift in the authority requires approval of the local water users. Also, to ensure consistency and coordination of water management during the normal and emergency state, certain members of the Basic Coordinator Prefect are also members of the river basin committees.

In the Netherlands, during a major flood, a committee headed by the government leader takes over the commanding authority. However, the Flood Management Plan prescribes clear division of roles and responsibilities of the central government, the water boards and local authorities so that execution is swift and most effective.

Overseas experience confirms that water resource and flood management, though requiring different institutional design, needs to be properly "integrated" in order to facilitate a smooth transition of the decision making process.

4.2 Water management at the community level

While the overarching water management institutional design provides the macro-level landscape of how water resource is to be managed, it does not address water management at the local level. For example, it does not prescribe how small water reservoirs or sub-branches of irrigation canals or rivers are to be managed, and how these small "water-users groups" fit into the scheme of things at the macro level.

As mentioned earlier, the institutional design of a self-organized management of a common resource, such as water, is best described by Ostrom's work which concludes that there is no prescriptive institutional design for collective common pool resource management and that one needs to pay greater attention to the "process" involved in building the institution. Huntjens et al. (2012) provides a description of an evidence-based water management institution in three countries namely, the Netherlands, Australia and South Africa. The authors found that Ostrom's eight institutional design principles do hold for community flood management, with slight changes on some of the principles as shown in details below.

Design Principle	Explanation
1. Clearly defined boundaries	Clarity about who is affected by the water resource and who has the responsibility, capacities, access to resources and information to deal with the problem.
2. Fair distribution of benefits and costs	Effective participation of groups or individuals highly vulnerable to or highly affected by water resource/flood. Credible information on flood risks burden provided by scenario-based approaches is essential.
3. Collective choice arrangements	Decisions are made based on sufficient consultations with local stakeholders from all administrative levels.
4. Monitoring and evaluation	Effective monitoring of water resource/flood management schemes is available.
5. Conflict prevention & resolution	Early and transparent information sharing and communication of uncertainties. Forums supported community awareness and transfer of knowledge.
6. Nested enterprise/polycentric governance	Decision making authority is devolved to authorities at various administrative levels which are well connected to ensure policy coordination and consistency.
7. A robust and flexible process	Facilitation of "bottom-up" initiatives in water resource/flood management that is consistent with local environment.
8. Policy learning	Since water resource/flood management is complex, adaptive, there needs to be a systematic feedback mechanism in order to refine policies.

How do these water user groups fit into the bigger picture described in section 4.1?

The optimum water management institutional design prescribed decentralized of water management either by the administrative or hydrological borders, or both. Overseas case studies reveal that water resource is best managed by "river basin committees", whose members consist of representatives of "water users". Indeed, these self-organized small local water user groups, especially those organized along the smaller river branches, can form larger formal water groups that have a formal representation on the river basin committee. Therefore, the success of the river basin committee ultimately depends on the extent to which water users can effectively organize themselves into a "nested enterprise" as proposed by Ostrom.

5. Thailand's current water institutional design

Thailand's current water management institutional design is far from optimum. Water management under normal circumstances is highly fragmented with more than 32 laws involving 40 state departments and 8 committees at the national level. Different state authorities oversee own narrow mandate be it allocation of irrigated water, dredging of canals, regulation of land use, supervision of the use of underground water, construction of transport infrastructure, operation of dams, etc. In the absence of due coordination among these authorities, water management in Thailand is far from being "integrated".

At the same time, water management is Thailand is highly centralized. Thailand's Decentralization Act 1999 stipulates that central authority should be devolved "gradually", depending on the "capacity" of the local administration. So far, only waste water management and the ownership of smallish structures such as irrigation sub-canals, aquifers and dikes have been transferred from the Royal Irrigation Department to the local administrations. Unfortunately, only the financing of the maintenance and the operation of these structures have been transferred, not the technical knowledge and experience. This is because RID staff is unwilling to give up the more stable and prestige civil servant status to become an employee of a local administration.

There are two main pitfalls with the current design. First, most local administrations known as "*tambon*s" are extremely small, almost half has a population of less than 5000. While such small units may be optimum for management of local public service such as garbage collection and waste water management, they are suboptimal for more complex management of water resources.

Second, in the absence of a Land and Property Tax Law, these local administrations have little capacity to raise income in order to finance essential activities to effectively manage own water resources. They have had to rely on transfers from the central government and financial assistance from the RID. To add salt to injury, the Decentralization Act prescribes that all formal financial and technical assistance to local administrations must be channeled through the Department of Local Administration Promotion, the Ministry of Interior only. This is because the law places local administration under the supervision of the Department.

According to a questionnaire survey of 51 local administrations in 6 provinces that experienced frequent floods or droughts, 35 per cent indicated that they do not have a specific budget allocated to water management and that when the disaster strikes, they rely on emergency slush funds or assistance from the central government.

Information provided by the Royal Irrigation Department confirmed continued financial and technical dependence of local administrations. Roughly 80 per cent of structures whose ownership has been transferred to local authorities, most of which are small-scale dikes, still require financial support for maintenance from the Department. The remaining 20 per cent are mainly structures that are too small to qualify for financial support – i.e., structures with coverage area of less than 2500 rai (988 acres). Without financial assistance, many of these structures lay idle while gradually depreciate.

In the past, Thailand attempted to create an area-based water management based on hydrological borders. In 2001, 25 river basin committees, whose members were mainly provincial governors, were created. However, these committees do not have the required legal power as they are simply subcommittees under the National Water Resource Policy Committee, which itself, is set up by a cabinet decision and hence, has no legislative authority. According to the statistics, the 25 river basins met in total 51 times in 2012, 34 times in 2013 and only 31 times in 2014. This averaged to 2.1, 1.36 and 1.24 meetings per year per river basin. The continuous decline of the number of meetings reflects the failure of these committees.

Water management during an emergency situation such as floods is determined by the Disaster Prevention and Mitigation Act 2007. The Act prescribes that local administrations are responsible for emergencies occurring within their own territories. In case of "severe floods" the Prime Minister will take over the command. The assignment of responsibilities in managing floods to different levels of administrative bodies depending on the scale of the flood is modeled after that of Japan.

Although the centralized flood management is in line with international institutional designs, but in practice the management is decentralized due to the limited capability of the central government to handle floods. For example, during the peak of the devastating 2011 flood, the Prime Minister chose to delegate the task of controlling floods to provincial governors due to the lack of a better strategy. As a result, each province constructed its own barriers, obstructing the natural flows of water, resulting in unusually prolonged (2-3 months) and severe inundation in certain areas. The same problem occurs at the lower levels of administration. The questionnaire survey of 51 *tambon* administrations reveals that 27.5 per cent of the administrations indicated that they experienced disputes with adjacent administrations regarding the construction of dams and operation of water pumps that pushed water into adjacent areas.

Another serious short fall of Thailand's flood management is that there is no specific central agency that is responsible for overall flood risk assessment and management, only for mitigation when the disaster strikes. The task then falls solely on the local administration that has little control over the management of flood at the macro level. When asked to specify the most important task related to flood management 21.5 per cent of the surveyed local administrations indicated the *ex post* evacuation and relief activities. Another 18 per cent indicated the maintenance of irrigation and natural water canals and 12.3 per cent the digging of water ditches or reservoirs within their administrative boundaries.

Legally, the Royal Irrigation Department (RID) is provided with the mandate not only to provide irrigated water, but also to prevent floods. But, as the name dictates, it has always been preoccupied with the management of the former mandate. Moreover, the RID's jurisdiction is limited to irrigated areas only, which do not include cities and most of the regions other than the central plain. As a result, the highly vital tasks of assessing the risk and the severity of floods, identifying vulnerable areas, developing proper flood warning system, designing proper land use, etc., are sorely missing.

The highly centralized water management without the participation of stakeholders has given rise to frequent conflicts between upstream and downstream water users of river basins and irrigation canals as well as between adjacent local authorities during floods. As a result, various structures of joint water management schemes have evolved among water users and local administrations.

There is currently no registration of water user groups as they do not have a legal status except those residing within the irrigated that are supported by the RID. The RID classifies water user organizations into 3 different types (1) the basic water user groups with area coverage not exceeding 1000 rai (395 acres); (2) the water use management groups with area coverage not exceeding 20,000 rais (7907 acres) and (3) the Joint Water Management Commission (JMC) which consist of farmers as water users, representatives of the local administration, regional government, private sector and the RID. According to The Report on the Statistics of Irrigated Water User Groups as of September 2014 (Royal Irrigation Department 2014) , there were 45,515 basic water user groups, 2301 water use management groups and roughly 100 JMCs. The total area coverage of these water groups is 16.2 million rais, roughly 62 per cent

of the irrigated area. However, since the irrigated area covers only 20% of cultivated land and 10% of the country's land area, these water groups are unique rather than common.

There are a few water user groups outside the irrigated area without the assistance of the RID. One that stands out are water user groups in the mountainous Northern region that have organized themselves around the construction "irrigation ditches" capturing water resources from the mountains. Such groups were formed as early as the 13th century out of sheer necessity: the need to manage spring water for farming activities.

Empirical evidence from water user groups within and outside the irrigated area suggests that the success in the organization of joint water management schemes in Thailand depends on 5 major factors:

(1) *The severity and the frequency of the problem*. Successful water groups are often found in areas that are subject to recurrent drought or flood, providing the incentive to devise a systematic solution. This observation is consistent with Ostrom's "equal and fair distribution of risks, benefits and costs" principle that requires engagement with representation of groups most affected by the flood/drought. Most effective water user groups are concentrated in the North and Northeastern regions of Thailand which are mostly unirrigated.

(2) *The particular personal characteristics of and relationships between local leaders*. As there is no formal platform or scheme for local administrations to coordinate and cooperate with one another, personal trust becomes the single most important elements that help drive cooperation. Trust facilitates conflict resolution and minimizes the need to monitor and enforce sanctions. Hence, the transaction cost associated with the particular institution is relatively low when there is trust.

(3) *The composition of stakeholders*. It is observed that communities that form successful water users or flood prevention groups are usually made up of local residents whose livelihood or well-being depends on the effectiveness of the local flood management scheme. Villages or municipalities where there are many "outsiders" such as business franchise whose owners are from Bangkok would find it difficult to achieve a well-accepted collective flood management regime as outsiders often have different interests and have the option of "exiting" and so need not be involved in local problems. Again, this observation is consistent with Ostrom's principle of equal and fair distribution as mentioned earlier.

(4) *The support of the regional irrigation agency*. As most local authorities and communities lack technical knowledge and expertise in water management as a result of financial constraints, the success of the joint management scheme is dependent on the willingness of the regional officer of the Department of Royal Irrigation to help provide technical know- how and information to facilitate the cooperation. Only with such assistance, can a user water group monitor and evaluate the joint management scheme as well as acquire policy learning there from as proposed by Ostrom. It should be noted that local capacity building is not part of the Department's mandate and hence, the assistance of the central government officer is purely voluntary. This illustrates the failure in Thailand's decentralization scheme as it does not prescribed the critical role of the central government in supporting local administrations.

(5) The availability of vital information required for a joint decision making regarding the availability of limited water resource or severity of a flood. The "equal and fair distribution of risks, benefits and costs" principle requires credible data and information on the basis of which joint decisions can be made. In irrigated areas, the information on the availability of irrigated water of the volume of flood water is provided by the Department of Irrigation. Beyond the area, however, the lack of information can pose a serious drawback to a potential cooperation across local administrations (questionnaire data support). When the exact or approximate volume of water is unknown, it is difficult to establish an acceptable water allocation scheme. Likewise, in the absence of accurate information about the severity and the timing of the threat of a flood, it will be difficult to decide on the appropriate response.

On this note, certain local authorities have been develop own information based on references from past experience. For example, community A may form educated expectations about the timing and the

severity of a flood based on the situation occurring in community B upstream. Likewise, a community may calculate the volume of available irrigated water based on information about the speed and volume of water released from dams.

(6) *The availability of finance in order to undertake joint management projects*. Funding is an integral part of community-based flood management groups which carry the task of constructing flood prevention infrastructure such as water reservoirs or dikes. Often, the smallest administrative unit, lacks sufficient funds and so has to team up with larger administrative units such as the municipal or provincial government.

It is important to note that the current water management regime in Thailand does not facilitate the attainment of requirements (3)-(5). First, facilitating coordination and cooperation among local administrations is not within the mandate of an RID officer. In Thailand, once a task is devolved, the central agency ceases to be involved. The concept of the central agencies as a "facilitator" to local administrations is not well understood. For example, the central government does not have a comprehensive data based on water demand and supply that is required for an effective management of water resource and flood. Second, vital information about water is mainly in the hands of the RID. Local administrations lack the capacity to collect such data. In the absence of a reliable and accurate data about water supply and demand, cooperation can be difficult as different water users group with different interests may not be able to agree on the optimal allocation or strategy. Finally, current budget rules impose a restriction that a local administration can only use its budget for the interest of residents in its constituency only. Hence, joint projects with adjacent administrations, such as the building of a dike, are not allowed. This prohibitive regulation undermined any potential joint water management schemes.

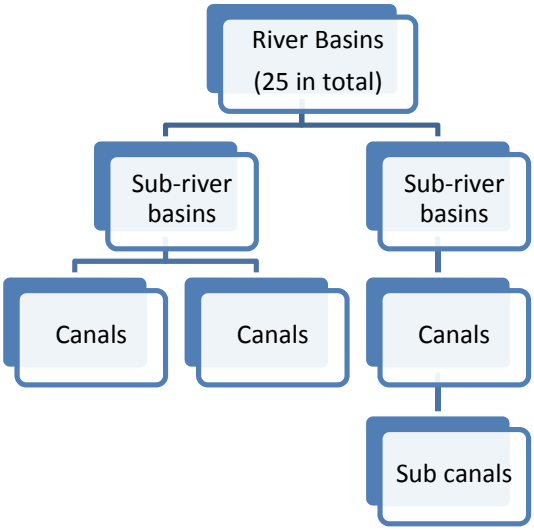
Given the unfavorable condition, successful cases of joint water management are unsurprisingly extremely rare. All are very small scale water management. For example, the Krasiew Joint Water Management Committee (JMC), the single largest of such a committee today which was awarded the Best Public Service Innovation Award in 2010, covers a land area of only 120,000 rai (47.4 thousand acres) compared with the total irrigated area of roughly 26 million rai (10.3 million acres). The committee is made up of 11 local administrations, water users, private sector and government officers, manages the allocation of water supply from a smallish Krasiew reservoir in Suphanburi – a western province. In this particular case, the both the Provincial Governor and the regional Royal Irrigation Department officer are particularly active in promoting cooperation among water users across small local administrations. Most importantly, the organization was able to overcome the budget rule restriction and mobilized funds to finance joint projects by collection of fees levied on water users.

But success in setting up a joint water management scheme does not guarantee subsequent success in the actual management of water. The research team has witnessed failures in a JMC by the name of "Krokphra" due to "free rider problems". In this case, a municipality has advanced the expenses incurred from activities involved with "joint flood prevention planning" but certain tambon administration refused to "chip in". As the joint agreement is only a Memorandum of Understanding without legal power (no graduated sanctions according to Ostrom), there is no penalty for those who shirk.

To sum up, the centralization of water management and the fragmentation of local administration in very small units have prompted local administrations to form more productive institutions at the micro-level. While there are many examples of joint water management schemes in many corners of the country, the absence of guidance and facilitation in terms of rules and regulations from the central government makes a successful case extremely rare. Nevertheless, by identifying the key features of successful schemes, lessons learned can contribute to policy recommendations in building an effective local water management institution.

That being said, there remains a huge gap between institutions at the macro level, i.e., the river basins, and those at the micro level, water user groups that are organized at mostly at the sub-canal level and most groups operate independently; they do not form a larger nested organization.

Diagram 1: Holistic Water Resource Management Institutional Structure



The most developed water user group which is in the Northern part of Thailand along the Ping River (see diagram 2 below) spans several local administrations. But even then, the current organization exists only in 2 of the 14 sub-river basins of the Ping River. Experts from RID opined that to create similar water user groups for all 14 Mae Ping River sub-basin will take at least 7 years. Undoubtedly, the bottom-up approach is not an option for Thailand in the medium term.

Diagram 2: Main river basins in Thailand

6. Way forward

Climate change call for water resource management institutions that are capable of dealing with frequent extreme weather conditions, in particularly droughts in Thailand. In view of the current fragmented and centralized management of water resources, it is clear that the building of an effective flood management

requires, at the very first step, a water law that lay out the institutional landscape of the country's water management. .

The appropriate institutional design for water resource and flood management needs to take into account of the fact that water resource management in Thailand has always been highly centralized. Local administrations have very limited financial and human resource, experience and technical capacity. Thus, devolvement of water resource management has to be gradual. That is, the institutional design for water management will not be static, but evolve with the growing capability of local authorities. Given the limited experience in community self-organization in the management of own resources, the devolvement of water resource management in Thailand will likely be based on administrative rather than hydrological borders. Therefore, the building of local administration's capability to effectively manage own resources will be the foremost challenge facing Thailand in building water resource management institutions.

It is proposed that during the initial period, the government may establish a few main river basin committees (perhaps 9 rather than the current 25) with the mandate to draw up the basin's water management and flood prevention plan and to oversee the allocation of water resources as well as approve the construction of structures that affect the level and the flow of water, be it roads, dams or buildings. The committee will still be chaired by a high level central government authority, but members will include not only central and regional government officials and authorities, but also representatives of different groups of stakeholders such as farmers, residents, real estate business, manufacturing business, water user groups etc. , in order to avoid political intervention. The secretariat of the committees would likely be the regional offices of the department of irrigation which possesses the technical knowledge in the short run.

The draft Water Act that is being deliberated in the National Legislative Council contains provisions that support a broader stakeholder-based River Basin Committees that include water user groups and local water users. However, to empower local stakeholders several laws have to be amended. For example, the Royal Irrigation Department Act needs to be amended in order to prescribe the Department's role in supporting local water user groups such that local or community capacity building will be formally and systematically provided rather *ad hoc* and voluntary. At the same time, the Decentralization Act requires an amendment to abolish the current administrative design that places all local administrations under the supervision of the Department of Local Administration Promotion, the Ministry of Interior. Local authorities need to be truly independent of the central government. Such as amendment will allow line Ministries to have own projects and funding for local support.

At the same time, the government needs to remove obstacles to the establishment of self-organized water resource management groups such as amending the current budgetary rules to facilitate pooling of funds by different local authorities, or even co-fund flood prevention projects initiated by these self-organized groups that have already received approval from the particular river basin committees. In order to ensure accountability of these committees to stakeholders, the latter should finance a non-trivial portion of the committee's expenses through "water tax".

In the medium term when local authorities have developed some technical expertise in flood and flood risk management, the central government may further devolve the authority to the river basin committees by reducing the number of committee members that represent the central government offices. In order to ensure that the central government does not "hog" the water resource management authority, the law should stipulate that local authorities within a river basin that is qualified to manage own water resources should be able to do so. However, independence comes with accountability. That is, river basins that would like to become independent will need to rely more on own financial and human resources. This means that local authorities should be given broader authority to impose local tax, in particular the land and property tax.

These propositions for water management reform cover a broad range of rules and regulation that may not be directly related to water management, in particular the administrative decentralization which involves the devolution of power in taxation, land use laws, budgeting etc. This goes to show that designing an optimum water management institution is an extremely complex issue that is specific to the particular case. An overhaul of the water management institutional design requires many enabling factors in the absence of which the reform can hardly materialize. Simply put, *a good water management regime requires a good administrative regime as a prerequisite*.

Fortunately, Thailand is undergoing a major reform in the design of her political and administrative system whose new design will be crafted into the new Constitution. With the administrative environment still fluid, however, the road map towards building an optimum water management scheme cannot yet be drawn. Nevertheless, stop-gap measures that may help improve water management system in Thailand given existing institutions include (1) the establishment of a comprehensive water management Master plan that includes "risk assessment" of floods and droughts and prevention plan (2) the development of water resource database including the current and forecast of the demand and supply of surface and underground water and (3) the translation of the implication of the Water Resource Management Plan and the Water Resource data into information that is digestible by local administration and communities and (4) the expansion of the role of the Royal Irrigation Department as the main supporter of local administration and water user groups outside the irrigation area .

Finally, it is important to note that a water resource management reform agenda is not exclusive to climate change. With growing population and increased urbanization, the demand for water is forever increasing while supply ever dwindling. However, the presence of climate change helps create an urgency of such a reform by imposing higher costs for delaying implementation.

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