TOWARDS SUSTAINABLE WATER MANAGEMENT IN NORTH WEST THAILAND: A GOVERNANCE AND SOCIOSPATIAL RELATIONS APPROACH

by

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ABSTRACT

This thesis tackles the challenges confronting irrigated agricultural practice at the local scale in developing country, focusing on water institutional arrangements under water scarcity that shapes contestation of day-to-day water use among stakeholders. To address this, new approaches must be developed and sensitive to the uncertainty and complexity of water resources if they are to meet the needs for sustainable agricultural water management. Thus, the thesis's analytical framework employs particular strands of the voluminous literature on governance alongside insights from the literature on sociospatial relations as its main explanatory concepts to provide complimentary analytical functions, in terms of clarifying local political priorities for water (sociospatial relations), and in identifying the decisionmaking and decisiontaking activities at other levels and scales that intimately affect these localised politics (governance approaches). A case study in north west Thailand was selected to develop practical recommendations for achieving more equitable and effective water management practice that is sensitive to local socio-economic and environmental change, and addresses the needs of multiple stakeholders. Data collection methods comprised: (i) 192 face-to-face in-depth semi-structured interviews with key actors; (ii) 20 questionnaires distributed to actors from Joint Management Committee for Irrigation (JMC); (iii) four group discussions with actors from a state-led irrigation project; and (iv) 20 remote interviews with four administrator groups. The result reveals that in the context of developing country where the continuing hegemony of a command and control approach to water policy, such as Thailand, space and scale shapes politics and interactions among actors over water use. Therefore, the thesis concludes that 'middle ground' organization is very much important to facilitate collaboration of actors across scales and levels, and also a strategic policy goal to encourage more sustainable agricultural water management, set against the pragmatic reality of escalating future demand for water from multiple users at different levels and scales.

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I dedicate this thesis to my family and all the teachers who have taught me since my childhood.

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TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

Page

TABLE OF CONTENTS

TABLE OF CONTENTS

Page

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

FAO	Food and Agriculture Organization
GWP	Global Water Partnership
KMTW	Kor Mai Tun Weir
IPTRID	International Programme for Technology and Research in Irrigation and Drainage
IWRM	Integrated Water Resources Management
IWUG	Integrated Water User Group
JMC	Joint Management Committee for Irrigation
MRRW	Mai Rai Row Weir
MTIP	Mae Tang Irrigation Project
OECD	Organisation for Economic Co-operation and Development
RFRCHM	Royal Floral Ratchapruek Chiang Mai
SAO	Subdistrict Administrative Organization
SE	South East
TAC	Technical Advisory Committee
TDRI	Thailand Development Research Institute
UN	United Nations
UNDP	United Nations Development Programme
UNEP	*United Nations Environment Programme*
UNESCO	*United Nations Educational, Scientific and Cultural Organization*
WUA	Water User Association
WUG	Water User Group
WUO	Water User Organization

CHAPTER 1: INTRODUCTION

1.1 Study context

Water constitutes a vitally important biological resource and is a critical component of any human development strategy. Consequently, sustainable water management is increasingly regarded as a necessity (Loucks, 2000; Richter *et al*., 2003; Mollinga, 2008; Schelwald-van der Kley and Reijerkerk, 2009; Flint, 2010; Grigg, 2011). Although ‘sustainability’ and ‘sustainable management’ are both vague and often politicized terms (Lant, 2004), particularly with regard to water, the basic concept – of guaranteeing sufficient water to support socio-economic and cultural activities from generation to generation – is undeniably important. Thus, organizations from global through national to sub-national scales have adopted the same normative goal of managing water resources to achieve sustainability (Koudstaal, *et al*., 1992; Rahaman and Varis, 2005; Molden *et al*., 2007; Allabadi, 2012). Accordingly, my intention in this thesis is to examine the conditions under which a transition to more sustainable water management practice can be achieved across multiple scales, focusing on the developing country context of Thailand. In this introduction, I begin by considering the prevailing models and approaches used to achieve sustainable water management. In order to contextualize my case study, particular attention is paid to agricultural water management under irrigation systems in the developing world.

This Chapter proceeds as follows. The first section describes the current context of global water scarcity and its effects on agriculture. In it, I consider the role of irrigation as a management approach that seeks to address the impacts of seasonal and interannual hydrological variability. I then examine one of the principal approaches for encouraging more sustainable management of water resources, Integrated Water Resource Management (IWRM), its evolution and the recent elaboration of more specific water governance concepts which are largely complimentary to IWRM. These governance concepts are considered in detail in Chapter 2. The contextual debates on IWRM and governance approaches provide the background for establishing the thesis aim and objectives, which are discussed in the second section. The thesis structure is then outlined, with the chapter-by-chapter elaboration of my argument.

1.2 Water management dilemmas in developing countries

Water plays a pivotal role in sustainable development, poverty reduction and maintaining healthy ecosystems (Flint, 2010; UN-Water, 2010). The use, abuse, and competition for increasingly scarce water resources has intensified dramatically over the past decade, reaching a point where water shortages are seriously affecting prospects for economic and social development, as well as political stability (UNDP, 2008; FAO, 2012). With water management now playing such an influential role in social development, domestic stability and international security, there have been increasing demands placed on governments to assume responsibility for, *inter alia*, determining appropriate forms of water management, intervening in water abstraction disputes among water users, ensuring year-round access to water reducing conflict over 'water politics', and preserving ecosystem balance (Johnson and Handmer, 2002; Rogers and Hall, 2003; Petersen *et al.*, 2009). Governments' assumption of these responsibilities is arguably most pressing in the developing world, where agriculture has a direct impact on socio-economic growth prospects (The World Bank, 2006; Namara *et al*., 2010, OECD, 2010).

1.2.1 Global water scarcity and agriculture

Global water demand has been increasing at more than twice the rate of population growth over the last century, and a growing number of regions are now reaching the limit at which water services can be sustainably delivered (Rockström *et al*., 2009; UNESCO, 2012; UNEP, 2012). This has led to increasing pressure on water resources and greater political tensions and conflicts among users, as well as often excessive demands on associated natural resources (Flint, 2010; FAO, 2012).

The major driver of these political tensions is water scarcity. Water scarcity has several dimensions (Molden *et al*., 2007; UN-Water, 2006). The first is lack of availability of fresh water of acceptable quality with respect to aggregate demand, that is, a simple case of physical water shortage (FAO, 2012). It occurs when water availability is less than 1,000 cubic metres per capita per year (Rijsberman, 2006; Pereira *et al*., 2009). UN-Water (2006) and FAO (2012) estimates that by 2025, 1.8 billion people are likely to be living in countries or regions with 'absolute' water scarcity (less than 500 cubic metres per capita per year), and two-thirds of the world population could be under 'stress' conditions (between 500 and 1,000 cubic metres per capita per year). The second dimension of water scarcity is lack of access to water services as a result of the failure of relevant public and private institutions in countries to ensure reliable water supplies (FAO, 2007; Namara *et al*, 2010). Third, water scarcity also arises due to inadequate infrastructure, irrespective of the abundance of water resources, because of insufficient investment or other financial constraints (FAO, 2007; Molle and Floch, 2008; FAO, 2012).

The first instance of water scarcity arises chiefly because of climate change-related impacts which are affecting the global hydrological cycle in many ways, including change in the volume, intensity, and variability of precipitation **(**Fischer *et al*., 2007; Arnell *et al*., 2011; Nan *et al*., 2011). Change in the frequency and distribution of rainfall is associated with more frequent, severe flooding and drought in many regions (Zhou *et al*., 2012; Vrochidou *et al*., 2013). These adverse climate change-related impacts on freshwater systems have already resulted in 2.4 billion people living in "highly water–stressed areas" (Oki and Kanae, 2006, p.1069). In the other two instances of water scarcity, countries may have relatively high levels of water resource endowment, but are unable to capture and distribute this water because of limited financial resources for infrastructure development or lack of institutional capacity to maintain or manage them appropriately; a situation confronting many of the world's developing countries (FAO, 2007; Molle and Floch, 2008; FAO, 2012).

In developing countries particularly, water scarcity has serious implications for agricultural activities, the main objective of which is to establish domestic food security. Globally, agriculture accounts for about 75 percent of the world's annual freshwater consumption (Figure 1.1) or about 3.5 million cubic metres (The World Bank, 2004; UNDP 2008; The Water Project, 2011), with this sector's success crucial in achieving global poverty reduction targets (Byerlee *et al*., 2009; Christiaensen, 2011). Hence, water for agriculture is by far the largest category of human use of available water resources (Harrington, 2009; UNESCO, 2012). Particularly in the developing world, withdrawals of locally available fresh water flows for agriculture can reach 90 percent of total water flow (Postel and Vickers 2004; UNDP 2008; UNEP, 2012).

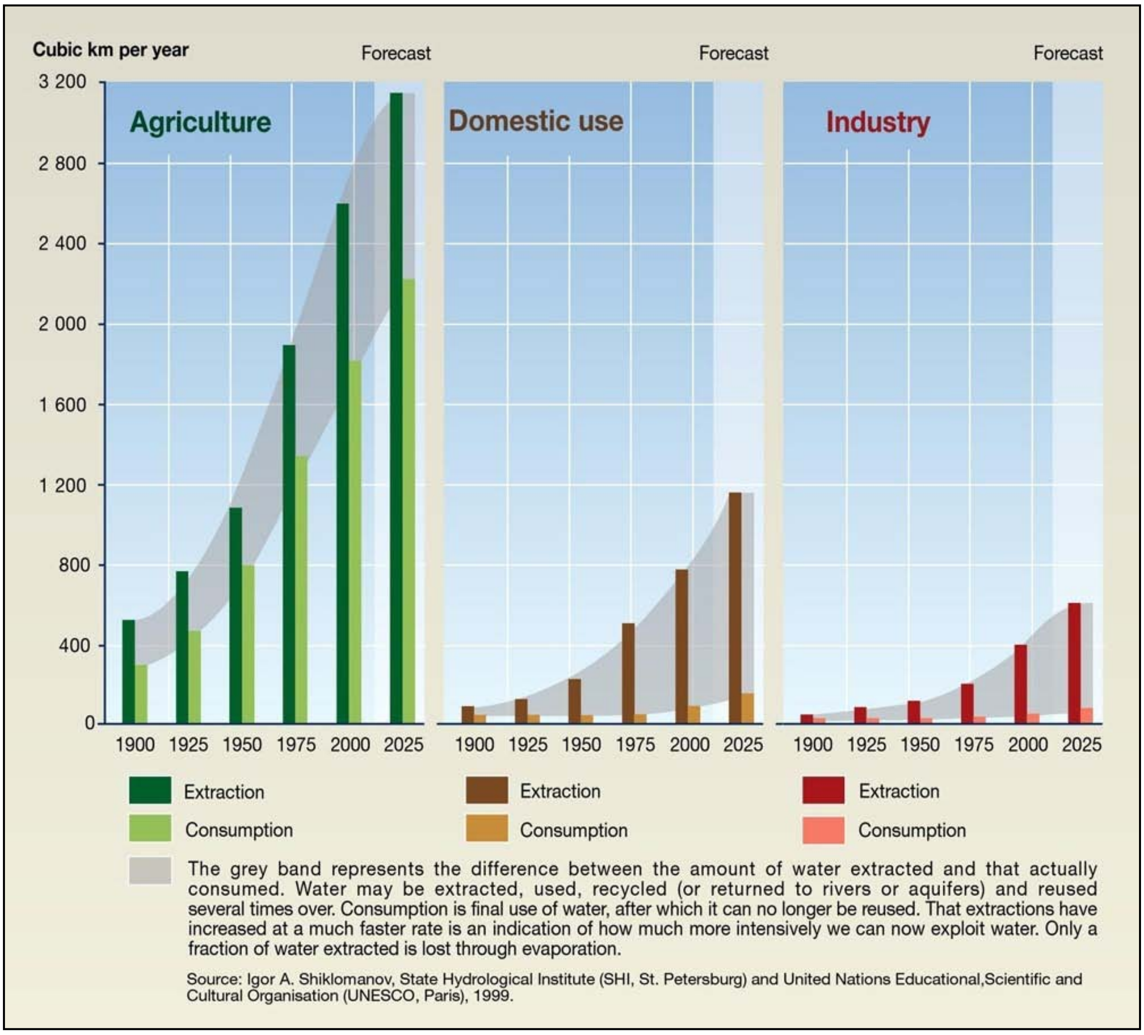

Figure 1.1: Trends in global water use by sector

Source: Shiklomanov (1999) (Cited in UNEP, 2008)

In the developing world especially, water scarcity has serious implications for national economic and social development, as well as for political stability (UNDP, 2008). At the local scale in these countries, day-to-day activities are predicated on water scarcity

(Rockström *et al*., 2007). Small farmers and the rural poor are often significantly disadvantaged by lack of access to water for production purposes, entrenching poverty and promoting 'water insecurity' situations (Qadir *et al.*, 2003; Forouzani and Karami, 2010). In other words, rural populations frequently do not have access to water to satisfy their needs for either food security or sustainable livelihoods, a situation exacerbated increasingly by their having to compete for water with urban residents and industries (Rosegrant *et al*., 2002; Molden *et al*., 2007).

Moreover, rising global population and changing dietary habits among the affluent middle classes in the BRICS[1] is also affecting water consumption by global agriculture, as confirmed in recent reports from international organizations (World Water Council, 2012). Thus by 2050, the global population is expected to have increased to 8.9 billion, 86 percent of whom will live in developing countries and 70 percent in rapidly growing urban areas (Population Division, 2004; Rosegrant *et al*., 2009; Bendorf, 2010). Yet water demand already exceeds supply in nearly 80 countries around the world, with water scarcity affecting more than 40 percent of the world's population (Qadir *et al*., 2003). It is thus inevitable that the more global population increases, the more demand there will be for agricultural water to supply food production needs (de Fraiture *et al*., 2007; Harrington, 2009). Agricultural water directly addresses domestic food security and also offers quality of life development (Molden *et al*., 2007).

[1] An association of five major emerging national economies: Brazil, Russia, India, China and South Africa

However, one does not have to look to future demand projections to identify water scarcity. Current demand from agriculture is already causing water shortages across the developing world, with a variety of studies confirming that this sector typically uses more water than that consumed for domestic purposes (around 20 percent) or industrial use (around five percent) (see for example Shiklomanov, 1999; The World Bank, 2004; UNDP, 2008). There is thus a pressing need for agricultural water use to be much better integrated with current and projected future water demand from municipal and industrial sectors (UNEP, 2012). Agricultural water scarcity has the potential to become a pivotal, indeed the key, limiting factor in food production and livelihood generation among the rural poor across Africa, south-east Asia and central and south America, where national governments are increasingly confronted with growing and unsustainable water demand from users of all kinds (Rijsberman, 2006; FAO, 2012). Consequently, agricultural water scarcity is heavily implicated in global poverty (Namara *et al*., 2010).

Inevitably, the tensions and pressures between rural and urban water users and between rural stakeholders (agriculture, tourism, industry) promote water conflict (Flint, 2010). To address this, new approaches to water allocation and delivery must be developed, utilizing natural and technological mechanisms along with social mechanisms in decision making for water resource arrangements (Poff *et al*., 2003; Qadir *et al*., 2003). In turn, these new approaches must be sensitive to the uncertainty and complexity of water resources if they are to meet the needs for sustainable agricultural water management that is economically viable, ecologically sound and socially responsible (Forouzani and Karami, 2011).

The following section considers the role of agricultural water management technology, focusing on irrigation systems and their limitations. I then focus on social science approaches which have been used to conceptualize water resource management issues at different geographic scales and levels, since a main cause of water scarcity arises from the problem of multiple organizational involvement in the struggle to distribute resources equitably (FAO, 2012). The approaches considered here are integrated water resources management (IWRM) and water governance, which examines how institutional functions and how water allocation and supply decisions affect farmers' livelihoods. It is also relevant to choices on infrastructure development for water and the way these structures are managed.

1.3 The role of irrigation systems in agricultural water management

Although it is certainly possible to enhance rain-fed production in 'normal' seasons, if there is no rain, then there is no agriculture, bringing us back to the importance of irrigation (Turral *et al*., 2010). Indeed, irrigation continues to be the main water use globally (Lopez-Gunn and Llamas, 2008). Irrigation is an adaptation to rainfall variability on a seasonal and annual basis as it allows the impacts of seasonal and interannual hydrological variability on agriculture to be smoothed out (Turral *et al*., 2010; Schneekloth *et al*., 2009). Typically this is done by making connections between sub-systems in agricultural water use, including storage, conveyance, and distribution-off and on-farm (Pereira *et al*., 2002).

Apart from the central role played by irrigation in boosting agricultural productivity under conditions of climate change, irrigated systems are instrumental in providing food security; approximately 40 percent of the world's food is derived from less than 20 percent of its utilized agricultural area (Siebert *et al*., 2005; Fereres and Soriano, 2007; Hanjra and Qureshi, 2010). Moreover, irrigated agriculture benefits farmers and the rural poor by improving living standards, particularly in rural areas affected by water scarcity (Rijsberman, 2006; Faurès *et al*., 2007). In effect, irrigation provides the backbone of rural economies in the developing world as it is a potent mechanism for increasing household income and generating employment (IPTRID, 1999; Smith, 2004; Chen and Facon, 2005; Turral *et al*., 2010).

Consequently investing in irrigation infrastructure and extension activities is particularly important in developing countries and in Asia especially, where it accounts for over 70 percent of the world's irrigated area, and is home to some of the oldest and largest irrigation schemes (Mukherji *et al*., 2010). Turral *et al*. (2010) reveal that Asian governments have been the key investors in large-scale irrigation development since the late 19th century, including irrigation and drainage development, modernization, institutional reform, capacity building, creation of farmer organizations, and regulatory oversight. Across south-east Asia, farmers in irrigated areas often play important roles in participating in the investment in joint facilities, wells, and on-farm water storage and irrigation equipment. In small-scale irrigation, communities throughout Asia have collectively invested over many years and traditional management arrangements, evolved over centuries, continue in use today (Coward, 1980; Chambers, 1989; Barker and Molle, 2004; Mukherji *et al*., 2009). Equally important, there has been widespread emergence of private groundwater exploitation since the early 1980s, which has become the dominant form of irrigation in many south-east Asian countries as it is either the sole means of providing year-round water supplies, or provides greater flexibility in conjunctive use with use of surface irrigation systems (Barker and Molle, 2002).

The development of irrigation systems in Asia continues to grow. The construction of major irrigation infrastructures (Gleick, 2002) demonstrates the importance of physical solutions, such as building dams and reservoirs to capture, store, and move ever-larger fractions of freshwater run-off (Gleick, 2000). These allow irrigation management to be pursued as has been practiced in many regions in the world, though invariably at the expense of considering basic principles of resource conservation and sustainability (Fereres and Soriano, 2007). This is partly due to the inability of engineers, planners and managers to adequately quantify the effects of irrigation and drainage projects on water resources, and to use these effects as guidelines for improving technology, design and management (Schultz and De Wrachien, 2002). At the same time, increasing levels of irrigation increases water costs and, ultimately may exacerbate problems of water scarcity in some regions (Sauer *et al*., 2010). They can be attributed essentially to poor planning, design, system management and development.

Wilson (2002) criticizes such physical solutions and demonstrates that they are facing increasing opposition, chiefly because of their failure to consider wider environmental, economic, and social impacts or to adequately address the uncertainties inherent in complex natural systems. Additionally, Smith (2004) comments that there are also significant risks that badly designed and managed irrigation can negatively impact on poverty. Chambers's study (2013, p.156) confirms these by pointing out that farmers, particularly in South Asia, often suffer from ignorance and blind spots of the main system management of canal irrigation systems (oversupply of water in head reaches and little and unreliable supply or none at all in lower reaches). The result is that such 'solutions' often create more difficult water resource problems than were encountered in the first place. Furthermore, traditional 'top-down' or hierarchical systems of water management rely on techno-scientific fields of knowledge that have been 'hard-wired' into governing institutions to have as much control as possible over natural processes, with the incentives not aligned with broader goals of sustainability (Smith, 2008; Reed and Bruyneel, 2010; Lawhon and Murphy, 2011). Employing 'technological fixes' might appear very efficient in the short run in solving water management problems, but long-term consequences are not taken into consideration (Gleick, 2003).

While examination of *formal* water management institutions (ie. organizations, legal provisions) continues to develop, our understanding of the *informal* institutions that help shape the capacities of individuals and social groups to respond is still lacking, because water knowledge has been overwhelmingly dominated by applied and natural sciences to control or regulate water regimes for economic development (Molle *et al*., 2008; Lankford and Hepworth, 2010; Pahl-Wostl *et al*., 2011). Thus, water norms and beliefs crafted to fit one set of socio-cultural conditions can erode as social, economic, and technological developments increase the potential for negative human impacts on water resources, as well as ways of evading formal rules (Dietz *et al*., 2003). This can cause problems between different stakeholders, particularly farmers and policy makers and practitioners, and between farmers and non-agricultural water users (Molle *et al*., 2008). As Barker and Molle (2002, p.22) reflect: "The theme of conflict runs through – conflict in the goals of equity and productivity, conflict among professionals as to how systems should be designed, and conflict between irrigation bureaucracies and local administrations in the management of systems”. Water scarcity is thus a social as much as a technological problem and could be viewed as a chronic ‘wicked problem’ that is hard to solve (Pereira *et al*., 2009; Rosegrant *et al*., 2009; Cominelli and Tonelli, 2010). Thus Molle and Floch (2008, p.112) reveal that “water scarcity is constructed and reflects the disconnection between politically motivated projects and hydrologic reality”. They also state that farmers tend to be those most affected as they reflect, “Throughout the entire period…farmers have had very little say in the design and management of public irrigation systems”.

Mollinga (2008, p.11-12) considers these problems in his study of social behaviour and interaction, which examines how humans have intervened in the water cycle over time and/ or spatial characteristics of water availability and/or its quantities. For Mollinga, water management is a form of politically contested natural resource management, comprising technical/physical controls, organizational/managerial controls and socio-economic and regulatory controls. Each of these requires careful scrutiny and monitoring to ensure effective water management and successful implementation of water use regulation. Thus allocation of irrigation water quotas and rights constitutes an important part of “the everyday politics of water resource management”, as it shapes contestation of day-to-day water use among stakeholders. From Mollinga’s perspective, the social relations of power that are part of irrigation need to be explicitly addressed.

Therefore in tackling the challenges now confronting irrigated agricultural practice in developing countries, there needs to be much greater emphasis on human needs, conditions and institutional arrangements (Ostrom and Gardner, 1993; Lopez-Gunn and Llamas, 2008; Turral *et al.*, 2010; Pahl-Wostl *et al.*, 2011). One such approach is integrated water resources management (IWRM), now widely accepted internationally as the way forward for efficient, equitable and sustainable development and management of the world's limited water resources (Rahaman and Varis, 2005; Hooper, 2006; UN-Water, 2007; Leidel *et al*., 2012).

1.4 Integrated Water Resources Management (IWRM) and water governance in developing countries

IWRM is an approach with a long history (according to some, originating in the experiences of implementing the US's Tennessee Valley Authority some eighty years ago), but has only come to prominence in the developing country context over the last couple of decades. Specifically two conferences held in 1992 on water and environmental issues in Dublin and Rio de Janeiro emphasized how 'water problems' in the developing world were increasing interconnected with other development-related issues and also with social, economic, environmental, legal, and political factors at local and national levels, and regional and international scales (A1 Radif, 1999; TAC, 2000; Biswas, 2004; Engle *et al*., 2011). Thus IWRM attempts to grapple with multi-sectoral and multi-regional interests and multiple causes and variables affecting water quality and quantity, which can be resolved only through proper multi-institutional and multi-stakeholder coordination (Biswas, 2008; Petit and Baron, 2009; Kalbus *et al*., 2012).

At international scale, since 2000 the Global Water Partnership (GWP) has become involved in water policy and has provided its own definition of IWRM as follows:

"IWRM is a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (TAC, 2000, p.22). This definition emphasizes the reality of water as an integral part of ecosystem viability and integrity, a natural resource and a social and economic good, whose quantity and quality determine the nature of its utilization (A1 Radif, 1999; Bandaradoga, 2006; Herrfahrdt-Pähle, 2012). It also acknowledges the importance of policy options that recognize these elements, develop national water policies and base the demand for and allocation of water resources on grounds of equity and efficient use, as well as to achieve the desired balance between equity, environment and economics – in effect, the 'three pillars' of IWRM (Sadoff and Muller, 2009) (see Figure 1.2).

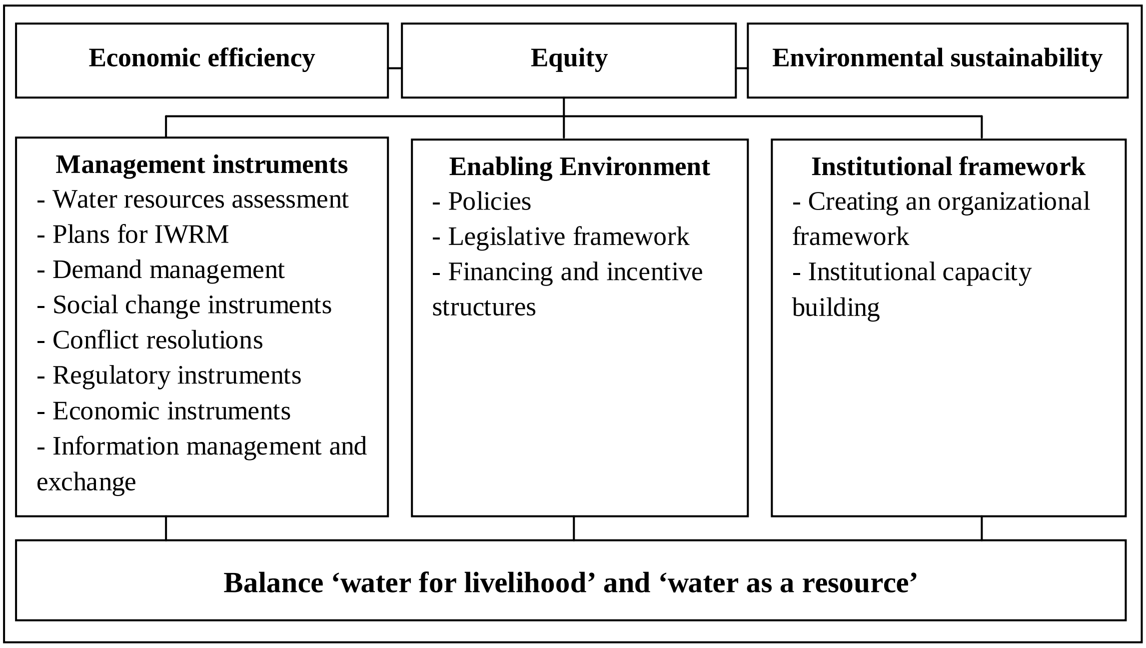

Figure 1.2: The 'three pillars' of Integrated Water Resources Management

Source: Adapted from Global Water Partnership (GWP) (2004) and Jønch-Clausen (2004)

According to proponents of this approach, the benefits to policymakers of adopting IWRM in planning irrigation water management are fourfold (Savenije and Van der Zaag, 2008). First is that IWRM obliges policy makers to take the entire hydrological cycle into account, including stock and flows, as well as water quantity and water quality; distinguishing, for example, rainfall, soil moisture, water in rivers, lakes, and aquifers in wetlands and estuaries, and considering also return flows. Secondly it emphasises the diverse needs of all water users, not simply economic interests and stakeholders. Third is that this approach recognises the importance of spatial scale, including the spatial distribution of water resources and uses (e.g. well-watered upstream watersheds and arid plains downstream), and the various geographic scales at which water is managed, i.e. individual user, user groups (e.g. user boards), watershed, catchment, (international) basin; and the institutional arrangements that exist at these various scales. Lastly, IWRM implicitly acknowledges the temporal scale; taking into account the temporal variation in availability of and demand for water resources, but also the physical structures that have been built to even out fluctuations, and to better match water supply with demand. Therefore, the importance of institutional issues and governance structures is emphasized (McDonnell, 2008).

The major challenge of IWRM is to set up a structure of cooperative management that goes beyond the usual focus of government committees, regulatory agencies and special interest groups, to take into account all actors and the potential ‘winners’ and ‘losers’ in water management (Hering and Ingold, 2012). IWRM has already proved influential in irrigation practice in developing countries (Turral *et al*., 2010), leading, for example, to the development of Participatory Irrigation Management (PIM). This governance approach is now recognized as an important component of reforms in the irrigation sector, and has been adopted both in developed and developing countries as it refers to the involvement of irrigation users in all aspects of irrigation management, and at all levels; from the field channel to the entire system (Peter, 2004; Kono *et al*., 2012). For example, farmers can be involved in various management functions, including planning, design, operations, maintenance, rehabilitation, resource mobilization, and conflict resolution (Svendsen *et al*., 1997; Dung and Shivagoti, 2008; Mohan and Reddy, 2012).

Most developing countries, particularly in Asia, have adopted PIM to encourage greater involvement of farmers on irrigation, focusing on operation and maintenance (O&M) (Ayranci and Temizel, 2011; Kumnerdpet and Sinclair, 2011). For example, in Pakistan Latif and Tariq (2009)'s study reveal that the government in the North West Frontier Province (NWFP) established an autonomous body, the Frontier Irrigation and Drainage Authority (FIDA), in 1997 to effectively cope with the emerging participatory challenges in irrigation management. Six water basins were recently transferred to farmers' organizations under the irrigation management transfer (IMT) for their operation and management. Newly formed institutions have been organized in three tiers, including Punjab Irrigation and Drainage Authority (PIDA), Area Water Boards (AWB), and Farmers' Organizations (FOs) and Khal Punchyat (KP), to link irrigation management at the provincial level with the national canal network and with national farmers' organizations in order to address the requirements of PIM in the country (Ayranci and Temizel, 2011). Latif and Tariq (2009) conclude that after adopting PIM, irrigation supplies are now adequate to meet the farmers and crop water requirements.

In China, Huang *et al*. (2009) reveal that almost half of the Water User Associations (WUAs) manage irrigation systems in a more transparent way as they encourage board members to share management information with water users. This is because China has realized fairly quickly the need for institutional reforms towards IWRM (Bandaragoda, 2006). One of the main reforms is the Self-Financing Irrigation and Drainage Districts (SIDD), supporting farmer participation in local irrigation management, focusing on creating and maintaining a 'virtuous circle' of water delivery in irrigation districts to achieve sustainable use of water resources for agricultural development (Ayranci and Temizel, 2011). SIDD is structured mainly in two integrated parts: a water supply corporation (WSC) or organization (WSO) serving as water supplier from the main headwork, and the water user associations (WUAs) operating as the farmers' own water use organization taking care of the lower distribution network on the ground (Huang *et al*., 2009). Most WUAs have proven to be successful in terms of enhanced efficiency of local system operation and maintenance and increased benefits to farmers, and have been satisfied with the benefits of applying the Participatory approach (Ayranci and Temizel, 2011).

Similarly, most of the major states in India emphasize decentralization of water management and empowerment of water users, by encouraging the farmers to form WUAs to take over the responsibility of operation and maintenance of downstream parts of the irrigation system, distribute water among water users, and collect water rates (Swain and Das, 2008). Irrigation management transfer is being practiced under the broader framework of participatory irrigation management through the implementation of the Water Resources Management and Training Project of the

Government of India, supported by the United States Agency for International Development, and most of the state governments in India have now made policy decisions and enacted exclusive legislation to implement PIM (Ayranci and Temizel, 2011). Hence, thousands of WUAs were formed and took responsibility for operation and maintenance, including the allocation of water among farmers and collection of water charges from water users.

PIM in Turkey has sought to promote farmers' participation in the construction and management of the irrigation systems since 1960s. With the management transfer to WUA, changes occurred in a positive direction in terms of utility, productivity and sustainability criteria (Uysal and Atiş, 2010). The state organization (State Hydraulic Works – DSI) has transferred most of the irrigation schemes to different types of organizations and also encouraged a participatory approach through establishing Irrigation Groups (IGs) or Water User Groups (WUGs) with responsibility for operation and maintenance (Kuşçu *et al*., 2008).

In Sri Lanka, some positive results have been achieved nationally where PIM allows secondary or tertiary segments of irrigation schemes to be managed by farmer organizations, and small rural water supply schemes to be administered by community based organizations (Bandaragoda, 2006). Consequently, farmers' active involvement in irrigation management, especially operation and maintenance decision-making has been identified as a key requirement to attain productivity goals and the sustainability of irrigation systems. Jinapala *et al*. (2010)'s study also concluded that participatory management in the country has clear benefits and should be continued and supported.

These examples demonstrate common characteristics of PIM, namely that hydrological management responsibility is shifted from a centralized government irrigation agency to a financially autonomous local-level non-profit organization which is either controlled by the water users of the irrigation system or in which water users have a substantial voice in the control process (Garces-Restrepo *et al*., 2007; Hodgson, 2009). IWRM, then, helps balance stakeholder viewpoints (Grigg, 2008) and offers a number of entry points for increased adaptability in irrigation management (Herfahrdt-Pähle, 2012).

Nonetheless, a more sceptical stance has been adopted recently to IWRM (Biswas, 2004; Snellen and Schrevel, 2004; Pahl-Wostl and Sendzimir, 2005; Galaz, 2007; van der Keur *et al*., 2008; Biswas, 2008; Petit and Baron, 2009; Butterworth *et al*., 2010; Hering and Ingold, 2012). These criticisms focus on difficulty of implementation of IWRM, with claims that the approach is internally inconsistent, based only on neologisms and vague management concepts; that it offers no guidance for practitioners using the concept in their planning and decision-making; that it is based on normative claims rather than sound science and that there are few, if any, examples of successful implementation. In addition in developing countries, implementing PIM is made complex by having to integrate often extremely diverse knowledge sets and practices for water resource management, and having to grapple with varied institutional and organizational arrangements (Jacobs *et al*., 2010). Furthermore in these countries there is often a strong separation of roles between ‘experts’ and managers with authority, and ‘the people’, whereas increasingly researchers recognise that all participants are stakeholders within a broad arena of shared responsibility (Pahl-Wostl, 2007; Molle *et al*., 2008). Lebel *et al*. (2011, p.45-48) call this problematic portrayal of water management responsibilities "institutional traps", which ultimately may compromise these countries' capacities to respond to current and future climate risks. They argue that "institutional traps" are the result of (i) bureaucratic fragmentation and competition leading to poor coordination, institutionalized incapacities and gaps in service provision (c.f. Bandaragoda, 2006; Allabadi, 2012); (ii) overemphasis on control, stability and elimination of uncertainties in management functions maintained by, and reinforcing, highly inter-connected and inflexible institutions; (iii) overly narrow concentration of resource capacities to a single level, ignoring benefits and management challenges of cross-scale interactions; (iv) elites deploying experts and technical tools in ways that serve their interests, not those of marginalized and vulnerable groups; and (v) a focus on reacting to emergencies and crises because of political pressures and opportunities' made possible by absence of effective, strategic, longer-term planning. These could seriously compromise the functioning of many large-scale public irrigation schemes and weaken their water governance (Fishhendler, 2008).

To be implementable, then, the IWRM approach requires closer attention to be paid to existing governance arrangements and how these need to change (Horlemann and Dombrosky, 2012; Hering and Inglold, 2012). In effect, IWRM relies upon governance as an essential means, a tool, and a goal with which to recast existing institutional arrangements for water in such a way as to create the conditions for sustainable irrigation management (Castro, 2007; Tropp, 2007; Uhlendahl *et al*., 2011). Allan and Rieu-Clarke (2010) mention that IWRM and 'good governance' is connected in three ways. Firstly, equity is seen as a uniting factor between IWRM and governance (Butterworth *et al*., 2010). Secondly, effective IWRM requires appropriate policy tools for guaranteeing full participation, transparency and accountability in water management. Lastly, governance regimes help promote the core element of IWRM, that is for water stakeholders to work more closely with water management authorities. Certainly researchers have argued that the multi-dimensional and dynamic concept of governance is particularly appropriate for understanding the institutional requirements of sustainable forms of water management, as it embraces the relationship between societies and their governments (see for example Rogers and Hall, 2003; Kemp and Loorbach, 2003; Voß *et al*., 2006; Rist *et al*., 2007; Huitema *et al*., 2009; Pahl-Wostl *et al*., 2010; Lebel, 2010). In particular, water governance can be seen as both the structure and a set of interrelated processes by which societies share power, balance interests, and shape individual and collective actions and practices for water allocation and distribution (Lebel *et al*., 2006; Salanes and Jouravlev, 2006; Franks and Cleaver, 2007; Godden *et al*., 2011). Governance thus comprises formal and informal rules, rule-making systems and actor networks across all political-administrative levels (from local to global) that have the potential to shape decisions taken to mitigate and/or adapt to global and local environmental change, within the context of sustainable development (UNDP, 1997; Moench *et al*., 2003; UNDP, 2008; Sehring, 2009; Biermann *et al*., 2010; Grigg, 2011).

Even though a number of countries are now engaged in reforming their water institutions and policies, progress in nearly all cases has been somewhat slow and limited, and often unpredictable (Tortajada, 2010). Particularly in developing countries, such as Thailand, greater impetus for the adaptation of water institutions is needed (Rogers and Hall, 2003). The rise of water governance has brought examination of politics into the mainstream of water resources management and development discourses. As a result, the lack of existing work that applies water governance to IWRM as a means of achieving sustainability in water management has been identified by many researchers (see for example Lebel *et al*., 2005; Molle *et al*., 2008; Ekstrom and Young, 2009; Lockwood, 2010; Tortajada, 2010). These researchers have specified areas where water governance may be pivotal in explaining the seeming difficulty in implementing IWRM. These include, *inter alia*, (i) the emergence of polycentric governance, which might limit IWRM goals by creating pockets of fragmented, unrepresentative and undemocratic institutions and process; (ii) the practice of water networks (including co-management, and public-private-partnerships as typical examples of so-called 'hybridized' forms of governance) could be clarified through studies of routine successes and failures, enabling identification of best practice; (iii) illustration of contestation among stakeholders over the most appropriate scale of water management in study regions; (iv) the politics among stakeholders at different scales, positions and places, and its effect on transitioning to IWRM; and (v) identification of the role of institutional mechanisms in linking public water use with water uptake and circulation in ecosystems (Folke *et al*., 2005; Olsson *et al*., 2006; Pahl-Wostl and Kranz, 2010).

Further research is undoubtedly needed on all these issues, as current understandings of water governance are not by any means strong enough to bring about transitions to more sustainable water management (Biermann *et al*., 2012). In this context, one promising approach recently identified is adaptive governance (Folke *et al*., 2005; UNESCO, 2006; Gunderson and Light, 2006; Brunner, 2010; Méndez *et al*., 2012). Adaptive governance priorities collaborative learning and co-management between individuals, organizations, and natural and social institutions, as a means of instilling behavioral adaptation among them (Young, 2006; Armitage *et al.*, 2007). This approach pays particular attention to actors' involvement in 'cross-level' and 'cross-scale' interactions, which allegedly furnish the managerial and learning frameworks to catalyse sustainable development (Folke *et al*., 2005; Cash *et al*., 2006; Young, 2006).

My consideration here of the overall research context for water management in agriculture in developing countries reveals the paucity of empirical work conducted at the local scale, and the importance of the micro-level of water management (c.f. Mol and Van Den Burg, 2004). Consequently this thesis focuses on local water institutions and practical management arrangements through the lens of governance in order to begin to establish how the transition to more sustainable water management might be undertaken (Shiroyama *et al*., 2012).

1.5 Thesis aim and objectives

This thesis examines how sustainable water management in north west Thailand might be achieved by deploying insights from the governance and sociospatial relations literatures. The aim is to develop practical recommendations for achieving more equitable and effective water management practice that is sensitive to local socio-economic and environmental change, and addresses the needs of multiple stakeholders. This aim is addressed through the following three research objectives:

1. To study current interactions in the study area between water user groups and communities at the local scale with relevant actors (state and private organizations) at other scales.

2. To identify mechanisms to facilitate collaboration, resolve coordination problems and reinforce trust among local actors that are sensitive to their socio-economic needs, and responsive to land use projections.

3. On this basis, to make recommendations that encourage the transition to more sustainable water management in the study area.

1.6 Thesis outline

This chapter has outlined the thesis's research context, namely how global water scarcity and agricultural productivity concerns have triggered increasing emphasis on effective irrigation water allocation and delivery in developing countries. The theoretical foundation for this research is to explore the potential of governance and related sociospatial relations approaches to encourage the transition to more sustainable water management at local scale.

The theoretical approach of the study is set out in Chapter 2, which explores in detail the literature on governance and sociospatial relations and their applications to water resources management. The notion of transitioning to more sustainable water management is discussed and, on this basis, research propositions are derived for empirical validation on facilitating collaboration, resolving coordination problems and reinforcing trust among local actors that are sensitive to their socio-economic needs.

In Chapter 3, the methodology is presented and the rationale provided for use of qualitative techniques to collect and analyze primary data. In-depth interviews, semi-structured questionnaires, remote interviews and group discussions with agricultural communities and water policy practitioners were undertaken to collect primary data on the interaction and relationship among actors, as well as to establish their incipient social capacities and willingness to develop a more flexible locally appropriate water governance regime in future.

Chapter 4 presents the research context for the empirical work: Nam Bo Luang Sub district in Chiang Mai Province, north west Thailand. Contemporary patterns of water governance are described in detail, with full consideration given to the historical and the current water management nationally and regionally. The chapter dissects the critically important influence of the national state apparatus on local water management practices. This Chapter provides the context for the empirical analysis that follows.

Chapter 5, entitled ‘Sociospatial relations and water management in Chiang Mai province, north west Thailand’, examines the recent development of state-sponsored water governance in Chiang Mai and compares this irrigation system with the *muang fai* (traditional irrigation) approach. By selecting as case studies water user groups in Nam Bo Luang Sub District, the analysis focuses explicitly on the hydrological politics between state-led and traditional irrigation management and the resulting decisionmaking challenges faced in transitioning to more sustainable water management, as a precursor to identifying water governance mechanisms that might encourage more sustainable water management.

Recently introduced mechanisms established in the study area to encourage cross-scale and cross-level interactions, the Joint Management Committee for Irrigation and the Water User Association, are then examined in Chapter 6. The role of these 'middle ground' organizations is examined in detail with the aim of establishing whether and how they facilitate cross-scale and cross-level interactions in water management. Can JMC and WUA become new 'intermediary institutions' for enhancing cross-scale and cross-level interactions that, from an adaptive governance perspective, underpin sustainable water practice and management?

Building upon the empirical findings of Chapters 5 and 6, in Chapter 7, I consider the conditions under which the transition to more sustainable water management in Chiang Mai might be emerged. The Chapter reflects on empirical findings of the study, and its contribution to adaptive governance and sociospatial relations theories. The chapter then presents a critical evaluation of JMC and WUA as mechanisms of adaptive governance, and reflects at length on their strengths and weaknesses as viable 'middle ground' organizations in water management. An evaluation of the first couple of years' operation of JMC/WUA is concluded at the end of the chapter.

Chapter 8 concludes the thesis. Water governance in north west Thailand has been shaped over time according to prevailing paradigms of national water management and the determining influence of state policy on local practices. In turn, this has configured the identification of water management 'problems' and 'solutions', and is thus highly likely to determine the success of putative adaptive governance approaches to water management in the study area. On this basis, policy recommendations are made to encourage the transition to more sustainable water management in north west Thailand.

1.7 Conclusions

This Chapter has provided the thesis background, focused on the increasing pressure upon global water distribution and management and its effects on agriculture, and the growing importance of water governance as a process that might address the decision-making of multiple actors, taking place through institutions ranging from the global to the local scale of water management. The Chapter revealed a wide variety of problems and difficulties to achieving integrated water resources management in developing countries, in particular the transition to more sustainable patterns of water management particularly at the local scale. There is, therefore, a need to focus on alternative "governance spaces" (Gregory *et al.*, 2011, p.182) for water in order to establish appropriate institutions and practical management arrangement in these countries, for which the concept of adaptive governance allegedly might act as a promising approach to furnish the managerial and learning frameworks to catalyse sustainable water management.

The Chapter then set out the thesis aims. On this basis, in Chapter 2 I examine the relevant academic literatures on governance (including adaptive governance), sociospatial relations, and transition management which form the theoretical basis for this study.

CHAPTER 2: CONCEPTUALISING GOVERNANCE AND SOCIOSPATIAL RELATIONS IN WATER MANAGEMENT

2.1 Introduction

This Chapter sets out the theoretical context of the study, elaborating on the debates and concepts introduced earlier. The thesis's analytical framework employs particular strands of the voluminous literature on governance alongside insights from the literature on sociospatial relations as its main explanatory concepts, which in turn inform the overall research design (see Chapter 3). Governance concepts are used here both as foundations to analyze and understand how actors participate in water management at different scales (local-regional-national); *and* to furnish guidance on how water governance mechanisms need to change in order to transit to more sustainable water management. In particular, I seek to use the governance literature to examine and to unlock the *social organization* of water practice and procedure, focusing on networked interactions between actors and the effects of organization culture, including the influence of values, beliefs and norms in order to better understand decision-making and implementation (Mancini *et al.,* 2005). The second strand of theoretical literature, on sociospatial relations, compliments my use of governance concepts by providing insight into the *territorial organization* of water supply and delivery within the study area, specifically the all-important role of space and sociospatial relations on day-to-day water management. The conclusions at the end of the Chapter summarise my theoretical approach.

2.2 Governance and water management

It is now recognized that the governance of water is a pressing policy issue in many developing countries, given the growing problem of supply-demand challenges posed by population increase, climate change projections, and rapid urbanization (Rogers and Halls, 2003; Neef, 2009). Agricultural areas particularly are under increasing pressure to raise food production to supply burgeoning urban populations, without recourse to greater water supply. Future water governance arrangements thus need to take account of competing water use demands and conflicting ideas on water use provision, that is water as a consumption good versus notions of it as a common-pool resource (Ostrom and Gardner, 1993; Ostrom, 2002; Ostrom, 2008; Delmas and Young, 2009; Dukhovny and Ziganshina, 2011). The concept of governance (broadly, the rules, procedures and formal and informal relations shaping decisionmaking in particular realms of public policy) has been extensively used to examine the challenges and creative opportunities available to policymakers charged with overseeing water allocation and supply issues in developed and developing country contexts (see, for example, Lautze *et al.*, 2011; Evans, 2012). It is the literature on water governance in developing countries that I focus upon here.

An array of organizations is now involved in water management in developing countries, particularly in the provision, allocation and supply of irrigation water. As Wittfogel (1957) famously observed, political practice and power within developing country contexts is intimately bound up with the workings of the state and, by inference and more contemporaneously, with the evolution of water governance in these countries. Thus, organizing effective water governance is inevitably an evolutionary process, based around bringing together different stakeholders in order to orchestrate greater equality of water access, more collaborative approaches to water management and more effective dispute resolution over time (Royal Irrigation Department, 2001; Movik, 2012). According to Coward (1980), there are five main features of 'good governance' in irrigation systems: (i) water usage should be determined by clear rules and the establishment of common water rights; (ii) water allocation requires clear priorities and transparent procedures for different users including urban, agricultural and industrial stakeholders, to ensure efficient and effective water distribution; (iii) irrigation system maintenance requires attention to be paid to both 'soft' (collaboration, trust, reciprocity) and 'hard' dimensions (maintaining and repairing physical structures); (iv) labour and resource mobilization requires collaboration across water systems and between different stakeholders; and (v) conflict management must focus on effective rules for dispute resolution. In effect, 'good' water governance in irrigation depends on the full spectrum of water users participating actively in the whole range of water management activities. Governance provides rules that empower relevant actors to participate in this way.

Another consequence, following from Wittfogel (1957), is that current patterns of water governance serve to demonstrate *deeper relations about how society orders its affairs* in relation to this key resource, and between its citizens more generally (c.f. Franks and Cleaver, 2007; Pahl-Wostl *et al*., 2010). A governance approach thus obliges us to recognise that while state actors remain influential decision-makers, increasingly it is non-state actors such as private sectors and civil society that often play pivotal roles in decisiontaking on water management (Bulkeley, 2005). Consequently 'good' water governance needs durable links to be made between and within organizations and social groups involved in decision-making; both ‘horizontally’, that is across sectors and between urban and rural areas, and ‘vertically’, that is from local to global scales (Tropp, 2007). It is these horizontal and vertical linkages that structure the processes by which societies share power, balance interests, and shape individual and collective actions on water supply and distribution (Lebel *et al*., 2006; Toonen, 2011). Thus many developing countries now seek to build institutions that bring greater transparency and fairness to water management through closer involvement of stakeholders according to international principles (UNDP, 1997; UNDP, 2008; UNESCO, 2006) (see Figure 2.1).

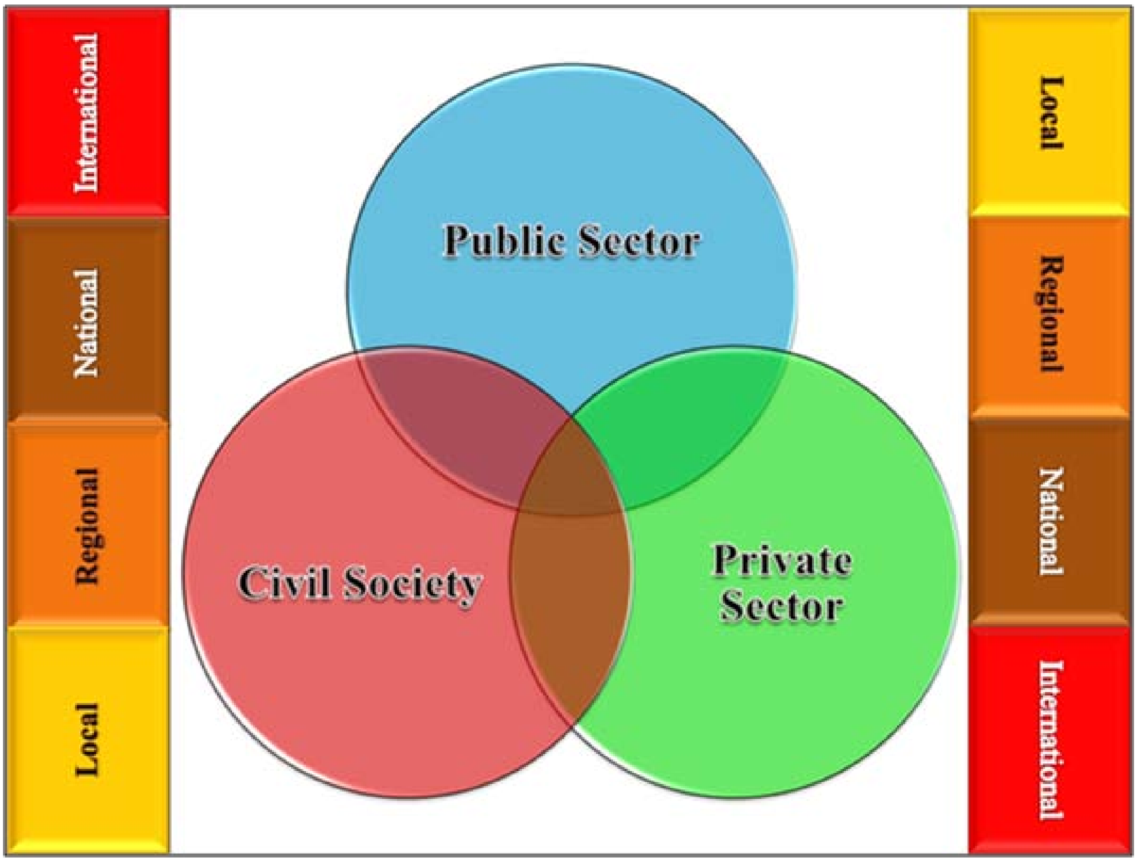

Figure 2.1: Actors’ co-management at multiple scales and levels

Source: Adapted from UNDP (1997)

To provide a better understanding of how water governance works in practice, Griggs (2011) examines generic hydrological management as a chain of institutional arrangements, involving formal organizations and legal and public policy procedures and processes, as well as societal norms and beliefs (see Figure 2.2). Figure 2.2 demonstrates essential governance characteristics including (i) the rule of law and organized policy procedures are critical for 'good' water governance; (ii) basic institutional mechanisms to facilitate water governance include government authority, contracts and agreements, enabling legislation, and regulatory capacity; (iii) water management, regulatory, and empowering organizations are required to implement the roles and processes of water management; (iv) water policy and strategy are derived from government actions and public participation; and (v) water management is influenced by informal networks and patterns of behaviour (Griggs, 2011).

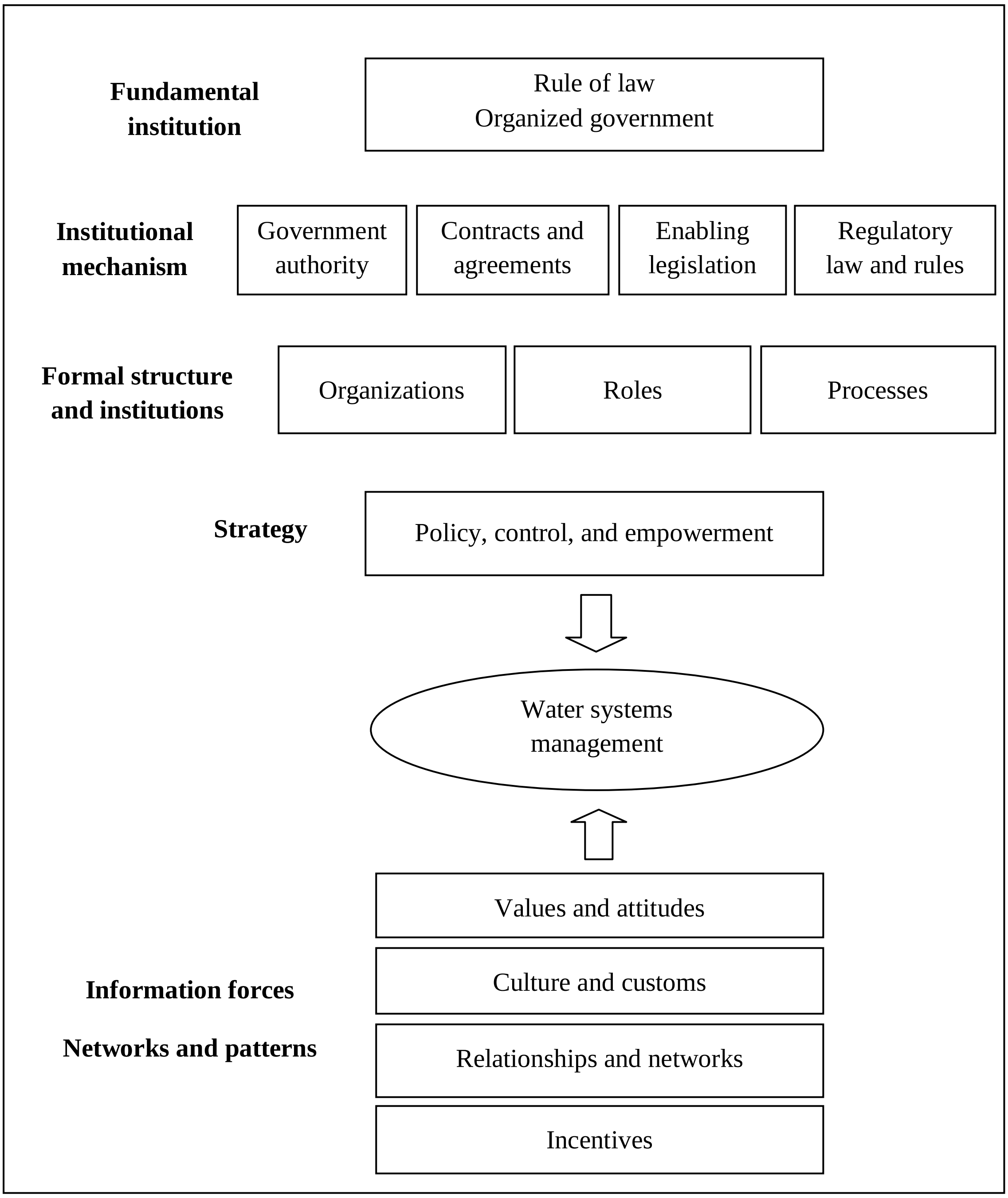

Figure 2.2: Institutional arrangements for water governance

Source: Griggs (2011)

Importantly Griggs's analysis stresses the importance of informal, as well as formal institutional attributes to achieving 'good' water governance. These informal norms and beliefs play a number of significant roles. In essence, where norms and beliefs are shared in common among policy stakeholders, a range of positive collaborative and coordinative functions are likely (Lubell, 2004; Valkering *et al*., 2009; Lebel *et al*., 2010). For example, it is probable that there will be greater public confidence in water management institutions, and greater perceived transparency in policy decisions so that both policy 'insiders' and 'outsiders' can easily follow policy formulation. Moreover, policy decisions are likely to be more inclusive and relevant to stakeholders, while levels of communication among actors is facilitated, aiding the development of an active civil society. Shared norms and beliefs are alleged also to improve coherence between policies and the action required by political leadership, and to enhance 'joined-up' decisionmaking by institutions at different levels within often complex public administrative systems. Lastly, equity between and among the various interest groups and stakeholders is more easily monitored throughout the process of policy development and implementation (Rogers and Hall, 2003).

Contrasting with Griggs's prescription, however, is the reality in many developing countries of deteriorating water allocation, delivery and supply issues (Zimmerman *et al*., 2008; Kuylenstierna, *et al*., 2008). Often this results in these countries from a legacy of 'top-down' government control of water resources, and the continued prosecution of national water resource regimes (Ratner, 2000; Thomas, 2006). These monolithic structures are likely to reduce the adaptability and flexibility of water management patterns nationally, while simultaneously escalating vulnerability to various types of water stress such as climate change related issues (Young, 2010). Young (2010, p.379) notes how the "governance systems we create to steer human-environment relations can be, and often are, just as complex and dynamic as the socio-ecological systems they are created to steer". Where 'misfit' arises between political-administrative and hydrological systems, the outcome is sometimes characterized as 'governance failure', increasing the occurrence of water crises (Bakker *et al*., 2008). Such failures make it far less probable that sustainable management of hydrological resources can be achieved, as Biermann *et al*. (2012, p.51) reflect that often "the current institutional framework for sustainable development is deeply inadequate to bring about the swift transformatic progress that is needed" on water management.

In short, mainstream governance approaches highlight the need for collaboration and coordination between the state and diverse stakeholder groups to achieve equitable and effective management of water resources. Clearly to fulfil this goal greater stakeholder involvement is vitally important, though the governance literature also asserts the significance of shared norms, beliefs and other informalities. In developing countries, however, governance contexts are still largely state-based and relatively rigid and resistant to change. Such institutional failures and rigidity in the capacity to cope with water allocation issues can lead to major management difficulties and problems. Consideration of how to resolve the resulting difficulties is the province of the relatively recent literature on adaptive governance, which I now examine.

2.2.1 Adaptive governance

The emergence of adaptive governance as a separate sub-field of the governance literature has come about in response to widespread transformation of ecosystems and growing awareness of the very close connection between natural resources and the social systems that depend upon them (Folke *et al*., 2005; Brunner *et al*., 2005; Olsson *et al*., 2006; Gunderson and Light, 2006; Pahl-Wostl *et al*., 2007; Folke, 2007; Huitema *et al*., 2009). Thus ecological crises and change in interrelated social systems, for example through political and economic change, need to be considered together rather than separately (Huitema *et al*., 2009). Adaptive governance seeks to address this analytical challenge, and in particular has been applied with great success to conceptualizing water management as a reform strategy by seeking to understand how the resilience of social-hydrological systems might be improved (Brunner, 2010; Akamani and Wilson, 2011; Evans, 2012; Bark *et al*., 2012). In adaptive governance, therefore, institutions and political frameworks are designed to adapt to changing relationships between society and ecosystems in ways that encourage more sustainable patterns of water management (Dietz *et al*., 2003; Folke *et al*., 2005; Carpenter and Folke, 2006). As a result, proponents of adaptive governance advocate so-called ‘co-management’ of diverse sets of stakeholders, operating at different levels and cooperating by sharing rights, responsibilities, and power between multiple levels and sectors of government and civil society, as essential for effective water management (Fabricius *et al*., 2007; Armitage *et al*., 2008; Smith, 2008; Berkes, 2009; sometimes also referred to as ‘hybrid systems’: see Figure 2.3).

In examining water management challenges, governance scholars have employed notions of collaborative experimentation and learning, and ‘self-organizing’ systems of individuals, organizations, natural and social institutions as a means for instilling behavioral adaptation to create the appropriate conditions for greater cooperation and collaboration. Thus, for Folke *et al.* (2005), an adaptive governance approach emphasizes three inter-linked elements: (i) knowledge construction and understanding the dynamics of resources and ecosystems; (ii) translating ecological knowledge into specific management practices; and (iii) support for flexible institutions and cross-level and cross-scale interactions, as a means of dealing with external perturbations, uncertainty and surprise. An adaptive approach thus has an explicit policy aim of meeting the increased demand for governance posed by sustainable management and development (Delma and Young, 2009; see figure 2.3). Haufler (2009, p.121) classifies this approach an “actor-centered perspective”, as it focuses on the types of actors, their character, and their strategies. However, Lemos and Agrawal (2009) note that these systems are not a panacea and require considerable effort to forge the necessary partnerships under conditions which may not be favourable to the success of such endeavours (Delma and Young, 2009).

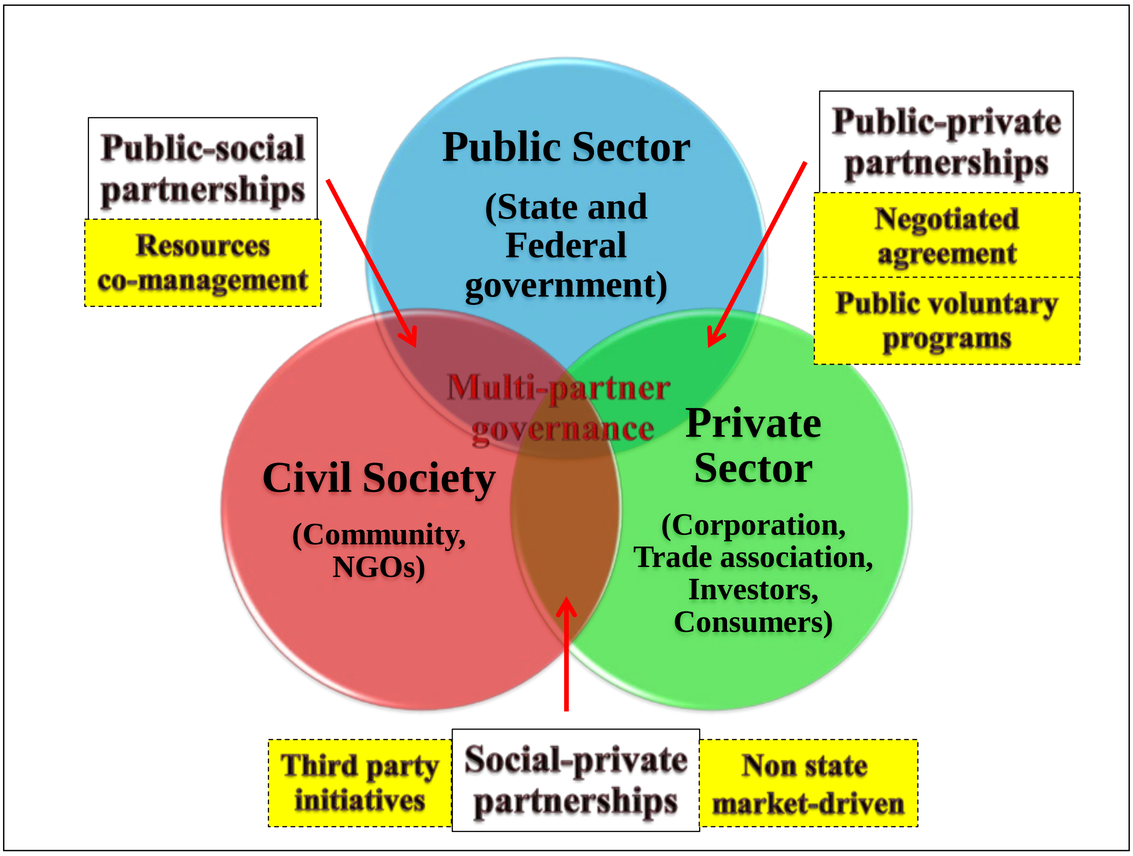

Figure 2.3: Hybrid governance systems

Source: Adapted from Delma and Young (2009)

2.2.2 Cross-scale and cross-level interactions

As noted by Folke *et al*. (2005), a critical feature of the adaptive governance perspective is the importance attached to effective cross-level (ie. organization-organization) and cross-scale (local-regional-national) interactions in delivering successful policy outcomes (see also Cash *et al*., 2006; Young, 2006). In many cases, *cross-level* interactions involve interplay between management systems located at the same scale, such as interaction between state-level regimes' administration, or between traditional water management and state water management practices (Cash *et al*., 2006). By contrast, *cross-scale* interactions refer to transactions between actors, located at different spatial or temporal scales (Berkes, 2002; Cash *et al*., 2006; Moore, 2008). These interactions may also change established pattern-process relationships across scales. As such, cross-scale interactions are increasing recognized as having important influences on ecosystem processes and posing formidable challenges for understanding and forecasting ecosystem dynamics (Peters *et al*., 2007).

In water management, these cross-scale and cross-level interactions are often a joint product of social and hydrological processes. Thus watersheds, drainage basins and irrigable areas all have cross-level and often cross-scale components (Cash *et al*., 2006). Inevitably, actors contest these different scales and levels of water use, overtly through debate, lobbying and sometimes protest, or more subtly, through use and control of technologies, indicators and measurements (Lebel *et al*., 2005; Lebel and Garden, 2007). These interventions give actors opportunities to compare the merits of alternative governance arrangements and to challenge and/or support other stakeholders' interests, causes, and effects (Young, 2002). For water management institutions dealing across levels, timeframes, or scale boundaries, it is vitally important to gain knowledge that is prominent, credible and legitimate across these domains (Cash *et al*., 2006). These cross-scale institutions are in a powerful position to provide legitimization for particular local-level procedures, to broker cross-scale interactions, and to facilitate state legitimization of local practices, thereby enabling cultural and political revitalization, capacity building and institutional building. Cross-scale institutions can thus provide a forum for exchanging knowledge and technologies applying to water management across large areas (see figure 2.4) (Berkes, 2002).

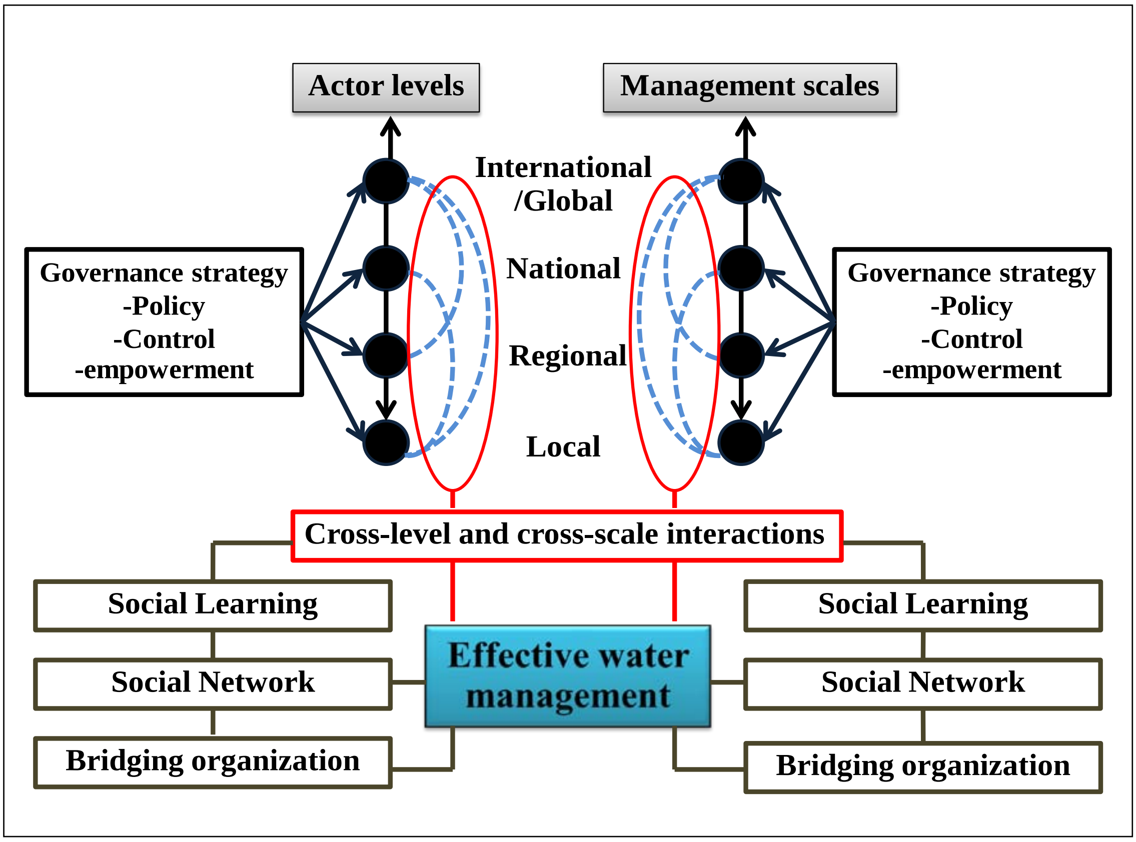

Figure 2.4: Roles of cross-scale and cross-level interactions in water management

Source: Author

It is, thus, important to see cross-scale and cross-level interactions as dynamically embedded in the contexts where they take place (Ransome, 2010). In water management, understanding the relationship of actors across scale and level can be approached in a variety of ways, with Hinde (1981) (cited in Giddens, 1992, p.23-25) identifying eight means of assessment. Firstly, the content of interactions is important as it reveals relationships derive from what actors do, or do not do, together. The second means is the diversity of interactions, which can be used to classify and differentiate relationships so that the more diverse the interactions, the deeper the relationship. Thirdly is the quality of interaction, which is assessed by examining the intensity and style of interaction, the immediacy of the language the actors use, and the non-verbal signals exchanged. A fourth means is to focus on the relative frequency and patterning of interactions that could lead to an increasingly deepening voluntary relationship. Fifthly reciprocity and complementarity of interaction is important, indicating how far actors take into account each other's needs. The sixth dimension is intimacy, that Hinde recognises in two forms: physical and psychological. The seventh dimension is interpersonal perception, and lastly the degree of commitment can be used as a barometer or measure of the strength of actors' relations.

Cross-scale and cross-level interactions grant and empower actors opportunities to exchange their knowledge for adaptation as well as sometimes providing the fora for collective decision-making. By doing so, these interactions can create new social learning possibilities, allowing different stakeholders to connect with other networks of actors and so build new, or deepen existing formal and informal relationships (ie. from formal legal agreements or contracts to informal, voluntary agreements, Pahl-Wostl *et al*., 2007). Certainly, group-centered and multi-level social learning is increasingly seen as central to decision-making on water issues in environmental management (Berkes, 2009). Furthermore, social learning that has been promoted by cross-scale and cross-level interaction may result in increase effectiveness, sustainability and integration. In essence, social learning refers to analyzing and reflecting on existing processes and institutions to ensure (representative) stakeholder interaction at multiple levels (Bouwen and Taillieu, 2004).

For water practitioners and stakeholders, initiatives of this sort crossing scales and levels can also be the prelude to establishing new networks to support formal and informal participatory process in water management (Pahl-Wostl *et al*., 2007). These networked relationships may help articulate a much more profound sense of scaled relationships, within which people and places are bound, a sense in which specific places are seen as simultaneously global and local without being wholly one or the other (Herod and Wright, 2003; Herod, 2011). Networked relations of this sort can foster new livelihood opportunities, as well as form the basis for environmental movements that cut across different hierarchies (Lebel *et al*., 2008), permitting multiple voices to be heard and different kinds of knowledge to be mobilised. These elements underpin key stakeholder activities that can yield new solutions to water management problems and dilemmas (Folke *et al*., 2005; Hahn *et al*., 2006). Also, it can promote the creation of so-called 'bridging organizations' that help address cross-level and cross-scale water management disputes by building trust, accessing much needed resources for improving physical infrastructures such as weirs and dams, and promoting common 'vision' and shared management goals (Berkes, 2009). Yet, even though these cross-scale and cross-level interactions foreseen by adaptive governance may foster new relationships among actors involved in water management, as important might be to reinvigorate existing negotiating arenas with which individuals and relevant organizations are already familiar, thus enabling citizens for example further opportunities to contribute to decisions that affecting their everyday water use (Pahl-Wostl *et al*., 2007; Evans, 2012).

Consequently in this thesis I use governance and adaptive governance concepts to examine key research questions including: how do individuals and organizations view current water governance arrangements; how do they regard and respond to local and national styles of water management; and how might new approaches to water allocation and delivery be provided through new actor interactions locally and regionally. I also use governance to clarify actor interactions across scales and levels of water management, as well as to illuminate how actors combine these to affect opportunities and circumstances and choices for collaboration that might realize more sustainable water management. This is a key step in establishing whether and how a more appropriate water governance regime can be set up. As shown in Chapter 1, to date effective water governance has been prevented by over-reliance on 'top-down' water management or state-led management 'solutions' to water scarcity issues. In some Thai regions, there has been evidence of gradual improvement from state-controlled decision-making to encouraging stakeholders to participate in water management (see Chapter 4). As more stakeholders take up this opportunity at different levels of administration and different scales, so it is hoped they can facilitate the efficacy of cross-scale and cross-level interaction to achieve sustainable water governance. This raises the prospect of gradually *transitioning to more effective governance arrangements* over time, a topic to which I now turn.

2.2.3 Governance and transitions

Transitioning to more adaptive governance arrangements (that is, interlinked at multiple levels and scales) has been highlighted as critical to society's ability to manage water use sustainably. These transitions might be triggered by rapid environmental change as much as by human design, obliging reorganization and renewal, and thereby offering opportunities for building resilience (Folke *et al*., 2005). Therefore understanding processes of transitioning, and factors that may enable transitions in ecosystem management, has become an important focus of environmental social science (Folke *et al*., 2005; Biggs *et al*., 2010).

In this context, the literature on transitions stresses a number of key factors in catalysing adaptation of governance structures. The nature of formal organizations is the first such issue. Organizations are never static, and water management organizations particularly are always having to deal with crisis and changing state policies on water management. Thus, understanding the impact of structural society transformations on water use is critical to predicting transitions. Such transitions emphasise the importance of cross-scale and cross-level interactions to induce change towards sustainability (van de Kerkhof and Wieczorek, 2005), with the interplay between individual actors, organizations, and institutions at multiple levels viewed as central in such transitions (Olsson *et al*., 2006).

Crucially, effecting transitions also requires knowledge sharing among and between actors at multiple scales and levels, and a social learning process across these levels and scales (Pahl-Wostl *et al*., 2007) (Figure 2.5). From this perspective, therefore, transformations at micro-scale through, for example, innovative approaches to water delivery or storage developed in a locally 'protected environment' (e.g. large-scale research projects, subsidized pilot studies at the farm level) and/or in new areas of application such as the restoration of riverine landscapes, is not sufficient in itself to bring about transitions to more sustainable water use. This requires multiparty collaboration involving stakeholder groups at different scales, working in organized networks e.g., authorities, associations, agriculture, urban interests, etc. It is only through coordinated, multi-level and multi-scalar interactions of this sort that change to more sustainable water regimes can be achieved. Hydrological and agricultural landscapes encompass environmental variability, legal frameworks, and, very often, deeply-rooted societal norms and cultural values (Pahl-Wostl, 2007). They provide the *selection environment* within which policy options for particular water management regimes unfold. The landscape scale is linked with the micro- and meso-scales through feedback processes that operate both ‘bottom-up’ (e.g. diffusion of innovation) and ‘top-down’ (e.g. selection of regime). This distinction between macro-, meso- and micro-scales is common for studies of complex adaptive water management systems and consequently is adopted here.

A third aspect of transitioning from the current dominance of ‘command and control’ mechanisms in water resources management in developing countries involves bringing both economic and non-economic sources of incentives together to promote the cooperative behaviour that is critical for ‘self-organization’ to emerge (Dietz *et al*., 2003; Akamani and Wilson, 2011). As Vincent (2007, p.6) points out, “Economic incentives are especially important if rapid changes in human behaviour are desired”. This is equally important to the mobilization of more extensive networks of actors across scales and levels, vital to coordination of collaborative learning and raising public awareness – both parts of the transitioning process (Folke *et al*., 2005; Olsson *et al*., 2006). Moreover, leadership is needed to provide trust-building, vision, and meaning among actors across scale and levels of water management, again a key requirement for transition to more sustainable patterns of water use (Folke *et al*., 2005; Biggs *et al*., 2010).

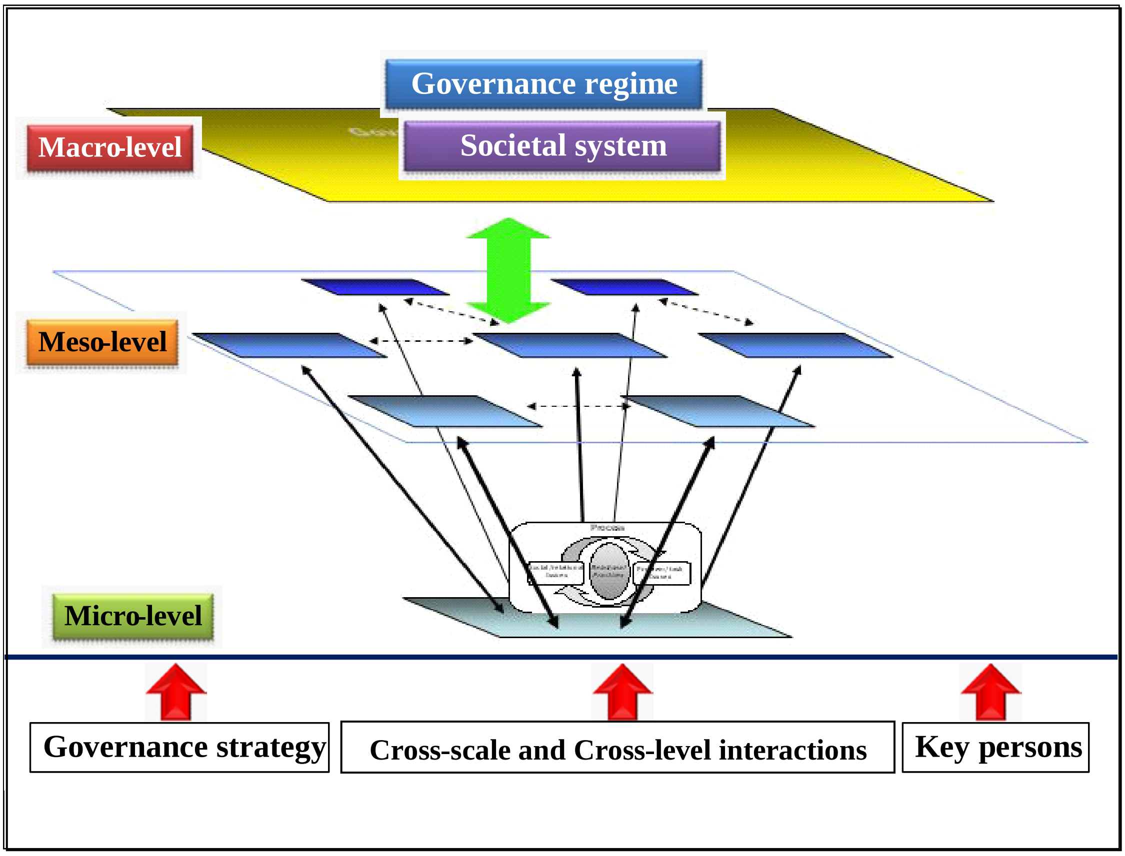

Figure 2.5: Multi-level transitions as part of a governance approach

Source: Adapted from Pahl-Wostl *et al.* (2007)

Lastly, successful transitioning seems also to depend on mobilizing extant informal networks. These provide the necessary continuity and stability in the midst of change for actors directly involved in water management, while also facilitating new information flows, identifying knowledge gaps, and providing nodes of expertise in hydrological and ecosystem management that can be drawn upon at critical times. In a sense, such networks offer an anchorage for participants that is 'out of the fray' of regulation and implementation (Folke *et al.*, 2005). These extant networks therefore enable more detailed consideration among participants of sustainability 'visions' and how to establish and organize the transition arena. Such visions are considered essential to identifying a workable transition agenda, and deriving necessary transition pathways. They also can provide the basis for establishing whether transition experiments are needed, and for monitoring and evaluating these transition experiments as a basis for making adjustments in vision, agenda, and coalitions (Olsson *et al.*, 2006; Loorbach, 2010; Voß and Bornemann, 2011). The overall aim is to better organize and coordinate transition processes at territorial and societal levels, and to attempt to steer water management in a sustainable direction.

van de Kerkhof and Wieczorek (2005) propose four aspects to stimulate learning among actors with a view to driving forward transitions in governance. These relate to commitment, fairness, transparency, and competence. *Commitment* refers to the willingness of stakeholders to invest time and effort in the transition process, to actively contribute to collaborative discussion, to be critical but open to new information, and to learn from each other. This is to ensure that participants in transitions have sufficient opportunities for learning, for example by providing them with relevant information, or by giving them sufficient opportunity and freedom to initiate transition experiments. They also need to have a certain degree of ownership in the transition process, which refers to the responsibility for the choices to be made with regard to the formulation of a transition agenda, the development of sustainability visions, and the execution of transition experiments.

Fairness is an important condition for learning, as it facilitates an open discussion in which minority viewpoints are not a priori excluded; it prevents the process from merely being about power and bargaining; and it allows not only learning about new and innovative options and projects to induce the specific transition but also deliberating about the different arguments for and against these options and projects. *Transparency* of the transition means that the participants are able to check whether the process is sound and whether it gives them sufficient opportunity to achieve their own interests. It increases the opportunities for learning as it enables the participants to fully concentrate on the contents of the discussion without being occupied with other matters, such as planning and procedure. It is also an important condition for commitment, as the involved actors need to have insight into the costs and benefits of participation before they can commit themselves to the transition management process. *Competence*, which can be understood as the ability of the participants to deliberate about different aspects of the transition theme and to make informed choices with regard to both the nature of the problem and the possible solutions to this problem, enables participants to prioritise the information and knowledge available.

The notion of transitioning to more sustainable forms of water management is used here to clarify how stakeholders translate factors and contexts, influenced by cross-scale and cross-level interactions of adaptive governance, into active strategies for guiding local actors on water management into the future.

2.3 Sociospatial relations and water management

The previous section examined governance, adaptive governance and transition concepts, and how they can be put into practice in water management. I have argued that these three concepts are particularly useful for understanding social organization and 'out-of-territory' connections in mediating patterns of water management in developing countries. However, as important, is the 'in-territory' associations of geographical place influencing organization culture, that is the place-specific values, beliefs and norms that affect water allocation and delivery priorities, and ultimately the transition to more sustainable water management. These sociospatial relations, I contend, are equally important as governance relations, exerting a particularly important effect on site-specific use of water resources.

2.3.1 The importance of politics of space to sustainable water management

Within analyses of water management, concepts of space and scale are usually taken for granted as synonymous with the nested territorial 'containers' within which social and political life take place (Taylor, 1999). However, to put sustainable water management into effect, the consideration of how different actors come together across space, levels and scales at different times to gain support for their policies, programmes and projects must be considered. The concept of *politics of space* has been advocated as a means of gaining more insight on how different actors from different places and levels interact (Kirby, 1993; Massey, 1994; Cox, 1998; Lebel *et al.*, 2005). Space is not only a backdrop to our activities; it is also a contingent outcome of societal and biophysical processes that create places and positions that links us to our environment (Kirby, 1993; Sheppard, 2002). Space in modernity has been linked with principles, rules, rationality, science, administration, bureaucracy, and institutions to work together (Taylor, 1999; Amin, 2002). In politics, however, "it emerges through various actors' attempts to frame reality in different ways that promote their interests and enable them to implement policy and mobilize politically" (McCann, 2003, p.160). Both space and place are therefore equally important in the search for identifying possible societal-wide solutions to local water resource dilemmas.

2.3.2 The interrelation of different foci: politics of scale, position and place

The field of sociospatial relations encompasses a variety of different political concepts, which are particularly important from the point of view of this study (see figure 2.6). *Politics of scale*, for example, concentrates on situations where different actors at the local-regional-national-international scales contest the spatial extent and resolution of information and decisions (Towers, 2000; Bulkeley, 2005; Lebel *et al.*, 2005). Gupta (2011, p.6) states that "the theory of politics of scale argues that social actors have a diversity of reasons to scale up or down issues, and it is collective national politics that determines what is scaled up and what is not." Gupta claims that, typically, there are four types of argument advanced by actors for 'scaling up or down', as follows:

(i) to enhance understanding of a problem through greater resolution regarding critical local and contextual elements;

(ii) to promote effective governance through using existing institutions and mobilizing local people;

(iii) to promote domestic interests by avoiding liability for externalized effects and protecting national interests; and

(iv) to promote extraterritorial interests through divide and control, inclusion and exclusion strategies, and to bypass specific bodies and procedures at global level that are seen as a hindrance to policy-making.

Brenner (2001, p.600) suggested that the "politics of scale" should denote "the production, reconfiguration or contestation of particular differentiations, orderings and hierarchies among geographical scales-not only local-urban-regional-national and so forth, but also, more generally, their embeddedness and positionalities in relation to a multitude of smaller or larger spatial units within a multitiered, hierarchically configured geographical scaffolding." Thus to encourage more sustainable water management it is important to recognise that not all forms of scale politics are about administrative areas, hydrological units or ecological processes; it is also vital to consider informal norms, codes, temporal cycles and patterns, and local knowledge (Cash *et al*., 2006). The benefit of using scaled knowledge in water management enables particular interventions, patterns of governance, or modes of water allocation to be more easily justified or rationalised to local stakeholders, because they will have had to participate in decisionmaking for this knowledge to be accessed in the first place (Molle *et al*., 2008; Lebel *et al*., 2008).

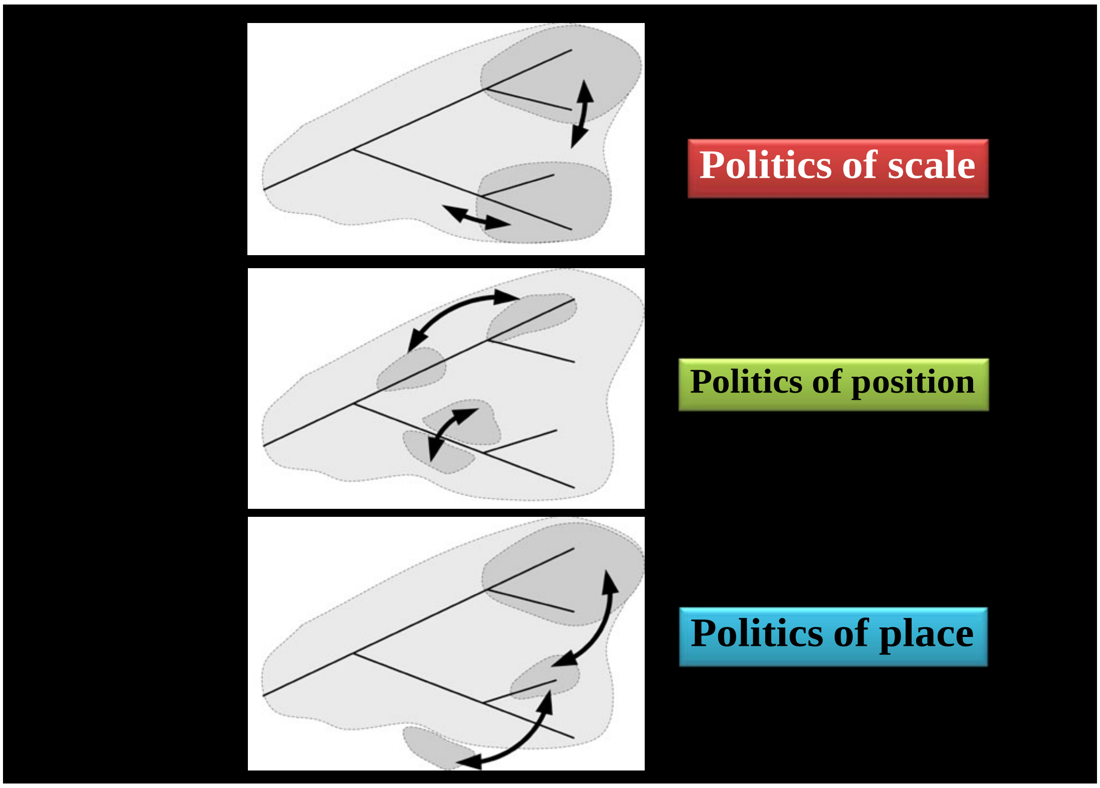

Figure 2.6: Sociospatial relations of actors in water management

Source: Adapted from Lebel *et al.* (2005)

A sociospatial relations approach also demands examination of the *politics of position*, which refers to societal interaction between locations as a result of their relative physical location: for example, between upstream and downstream water users, or those on different banks of a river. Position is important because it describes how different actors are situated with respect to one another in space. This can have a crucial impact upon power relations between actors, both in the sense that some positions tend to be more influential than others in determining water access; and in the sense that emphasizing the situated nature of all knowledge challenges the power of those who claim objectivity (Sheppard, 2002). Politics of position can be a particularly important driver of cooperation or collaboration among water users (Lebel *et al*., 2005).

The final consideration is *politics of place*: that is, the power relations among stakeholders that arise because of the special characteristics of the places interacting above and beyond those arising from scale or position. For example, one form of politics of place is the symbolic use of sites of communal victory, or defeat, to gain leverage in discussion or negotiation with other stakeholders (Lebel *et al*., 2005). Yung *et al*. (2003) concluded that place analysis can lead to the understanding of people's viewpoints and relationships on natural resource use and conservation, and how those viewpoints contribute to conflict and conflict resolution at specific sites. Furthermore, it can increase the effectiveness of communication because managers, policymakers, and stakeholders have a better sense of what other groups mean when they describe their interests in relation to a particular place. If people feel that their positions are understood and heard, they are more likely to engage in public participation processes.

Building on these themes, Lebel *et al.* (2005) argue that local level studies of water use need to synthesise accounts from actors at different scales, places and in different positions in order to identify the advantages and disadvantages resulting from control being vested in particular authorities. Typically actors coalesce around stories in specific narratives as a basis for building alliances to advance their interests in water management.

In my analysis, therefore, I shall be combining insights from this sociospatial relations approach alongside the adaptive governance approach already outlined in two distinct ways. First is to understand how existing water management patterns and relations between scales have emerged. Second is to provide a theoretical lens for understanding the challenges involved in achieving sustainable water management in particular places. Thus combining these two theoretical lenses provides me with the necessary in-depth analysis needed to scrutinize contemporary and likely future water management practices in the study area, and the dilemmas that water resource managers face.

2.4 Conclusions: towards a theoretical approach

It is important to realise that the theoretical literatures sketched out here provide complimentary analytical functions, in terms of clarifying local political priorities for water (sociospatial relations), and in identifying the decisionmaking and decisiontaking activities at other levels and scales that intimately affect these localised politics (governance approaches). As Cash *et al.* (2006) acknowledge, different actors have different aspirations for water management and, on this basis, may seek to strengthen or weaken cross-scale linkages, as the range of benefits and risks from such interactions are rarely symmetric; in effect, scale and level issues are often strongly linked with local territorial politics. Therefore, ignoring cross-scale interactions, or focusing only upon a single place or geographic site without examining cross-level interactions is bound to lead to partial understanding of water politics and, ultimately, to management problems.

As I show, these two approaches affords valuable new insight into a range of feasible policy options around which sustainable water management might emerge (Figure 2.7). In particular, sociospatial relations and adaptive governance provide a potent means of identifying how water transitions might be encouraged in the study area in future. In the next Chapter, I show how these theories have shaped my research design and my identification of a series of research propositions for empirical analysis in this thesis.

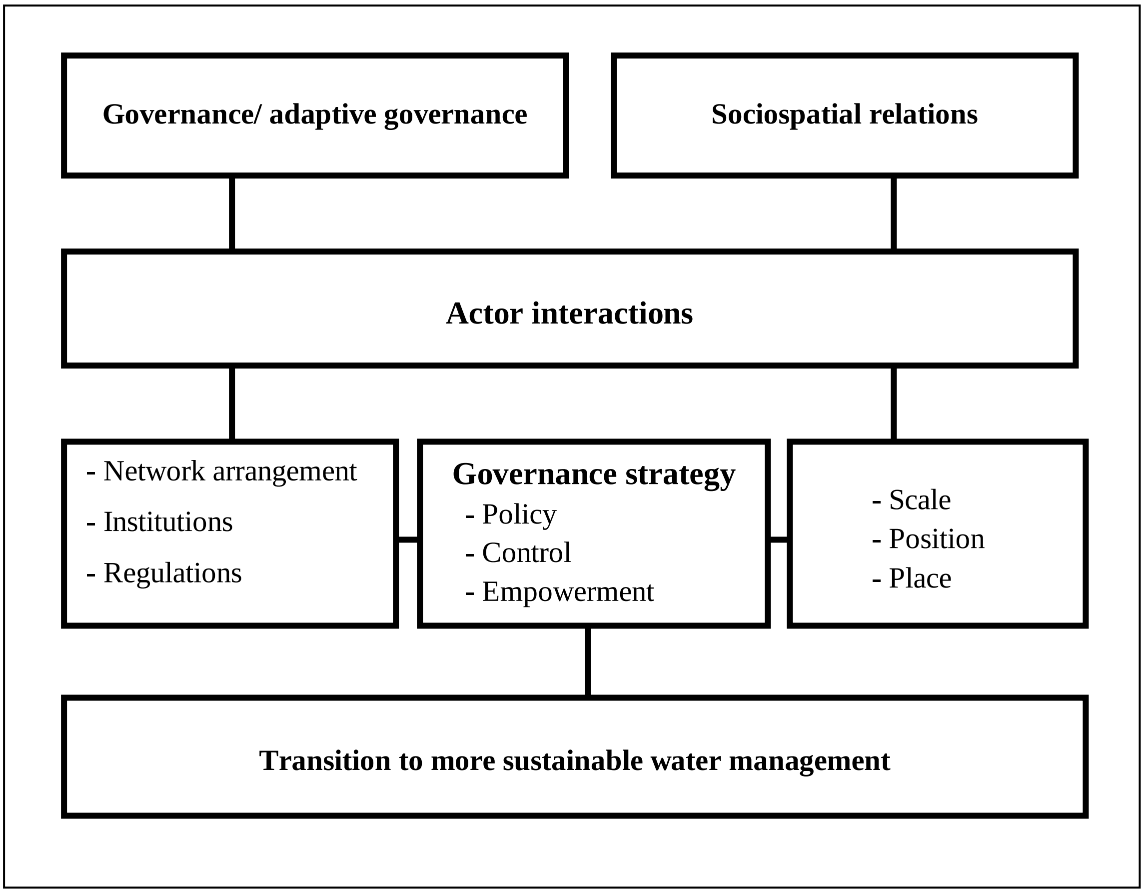

Figure 2.7: Theoretical framework of the thesis

Source: Author

CHAPTER 3: METHODOLOGY

3.1 Introduction

This Chapter sets out the techniques used and the process of research, along with the justification of study area selection and rationale for the study's data collection and analysis methods. The Chapter is split into three parts based on the study's data collection periods. The first part discusses the 'preparatory phase', which put into effect the theoretical approach discussed in Chapter 2 and its relevant notions as a basis for shaping the research design. Seven research propositions derived from the governance and sociospatial relations literatures are identified for empirical testing in subsequent Chapters. I also outline ethical issues and my own positionality as a researcher. The next research phase was primary data collection, which consisted of preliminary study and fieldwork data. Multiple techniques, including semi-structured face-to-face interviews, group discussions, remote interviewing, field observation, and administration of questionnaires were used to collect data and record the experiences, feelings and opinions of participants. Data management and data analysis associated with this second phase of the fieldwork is then described. The final part of the Chapter reflects on the successes and limitations of the data collection and analytical techniques used.

3.2 Preparatory phase – research design

The main objective of this phase was to establish an appropriate research design, based upon the theories and concepts set out in Chapter 2, before undertaking fieldwork data collection. Thus in 2010, time was spent on developing a framework for data collection and analysis. This comprised: developing my theoretical framework and research propositions; identifying study sites within the study area; selecting appropriate research techniques, and developing my research ethics strategy. Here I explain these activities and the relationship with my research practice.

3.2.1 Thesis's research propositions

The study focuses on the challenge posed to existing water management arrangements by governance and sociospatial relations and its consequences locally and regionally. Typically, water governance comprises interpersonal and interorganizational relations that link actors involved in decision-making both 'horizontally', that is, across sectors and between urban and rural areas; and 'vertically', ie. from local to international scales (Tropp, 2007). Effective governance needs appropriate formal and informal arrangements to enhance 'joined-up' decisionmaking by institutions at different levels and scales (Grigg, 2011). From a governance perspective, state actors are certainly not the only or necessarily the most significant participants: non-state actors, such as private sectors and civil society, often play a variety of pivotal roles in water management (Bulkeley, 2005). By utilizing the governance literature, therefore, I sought to examine the interrelations between all relevant stakeholders in agricultural water management in north west Thailand.

In particular the notion of adaptive governance has been applied with great success to water management. As discussed in the preceding Chapter, this perspective emphasises the importance of cross-scale and cross-level interactions and actor participation (Berkes, 2009; Huitema *et al.*, 2009; Pahl-Wostl, 2009; Clark and Clarke, 2011) in helping provide interaction of different kinds of water knowledge, and facilitating coordination that enables co-operation over accessing of different resources, so bringing together different actors and resolving water conflicts (Berkes, 2009). Folke *et al.* (2005) identify four interacting aspects in achieving adaptive governance of complex social-ecological systems: (i) knowledge construction and understanding the dynamics of resources and ecosystems; (ii) translating ecological knowledge into adaptive management practices; (iii) support for flexible institutions and multilevel governance systems, and (iv) dealing with external perturbations, uncertainty and surprise. However comparatively few studies have sought to establish the importance of these claims empirically. I therefore sought to investigate through the thesis whether and to what extent cross-scale and cross-level interactions and 'bridging organizations' were evident in the study area following recent changes nationally that seek to place water allocation and use on a more sustainable footing.

According to adaptive governance studies, effective coordinated action across these different scales and levels is needed to effect transitions to more sustainable forms of water management (Olsson *et al.*, 2008; Rotmans *et al.*, 2001; Loorbach and Rotmans, 2006). These transitions require four suites of change/adaptation in existing forms of water governance as follows: (i) structure of the problem in question, to develop a long-term sustainability vision and establish and organize the transition arena; (ii) develop future water management visions, a transition agenda and derive the necessary transition path; (iii) establish and carry out transition experiments and mobilize the resulting transition networks; and (iv) monitor, evaluate, and learn lessons from the transition experiments and, based on these, make adjustments in visions, agenda, and coalitions (Olsson *et al*., 2006; Loorbach, 2010; Voß and Bornemann, 2011). I considered the transitions concept within adaptive governance to be a robust organizing device for understanding how change might be steered towards more sustainable water management outcomes.

As set out in Chapter 2, alongside governance I also employ the complimentary literature on sociospatial relations to give greater depth to my analysis of local territorial water practices and traditions, specifically how individuals and communities interact with each other over water use in different positions and places. Thus the notion of 'politics of scale' prioritises examination of how actors contest the spatial extent and resolution of information and decisions (Towers, 2000; Bulkeley, 2005; Lebel *et al.*, 2005). In the context of encouraging more sustainable water management, it is important to recognise that not all forms of scale politics are about administrative areas, hydrological units or ecological processes; it is also vital to consider informal societal rules, norms, communal procedures and local knowledge (Bulkeley, 2005; Cash *et al*., 2006). Hence Lebel *et al*. (2008) have noted that reliance upon particular 'scaled knowledges' can result in groups being included or excluded from water resource decisions where participation may be essential to deal with tensions, conflicts, and contradictions within and between scalar formations. 'Politics of position' is social interaction derived from the relative physical location of actors, for example, between upstream and downstream communities, or between groups on different riverbanks. Position is important as it can determine how actors at the same scale relate to one another with respect to water use. So some positions tend to be more conducive than others in determining water access.

More generally, the situated nature of all knowledge challenges the power of those who claim objectivity in terms of water allocation (Sheppard, 2002). For 'politics of place', it is the power relations among stakeholders that arise because of special territorial characteristics above and beyond those arising from scale or position. Yung *et al*. (2003) conclude that place analysis can lead to a greater understanding of people's viewpoints on water resource use and conservation, and how those viewpoints contribute to conflict and, potentially, to conflict resolution.

In order to make these two literatures tractable to analysis, I devised seven research propositions to test key arguments proposed in governance and sociospatial studies through my primary empirical research (see Figure 3.1). Three research propositions were developed to test sociospatial relations for empirical testing in Chapter 5 to complement those informed by governance perspectives. These research propositions are as follows:

Proposition 1: Scale defines actor relationships in terms of actors accepting or challenging norms and beliefs pertaining to water management, and participating in new water management arrangement.

Proposition 2: Differences among actors in water norms and beliefs at local scale gives rise to particular water politics that shape ‘solutions’ to local water allocation and delivery problems.

Proposition 3: Local water politics influence the viability of cross-scale interactions that seek to specify collaborative water management among state and non-state actors, and hence the transition to more sustainable water management.

These research propositions derived from the central arguments of the politics of space literature, that prioritise the influence of geographical scales, position and place on stakeholder relationships (Proposition 1); the significance of embedded beliefs and norms in water management (Proposition 2); and their influence upon current patterns of water governance locally (Proposition 3). Thus, these propositions enabled me to evaluate local water politics in the study area by synthesizing the effect of territorial influences on promoting local actors’ water interests across scales and levels.

In order to examine *governance relations* across scales and levels, and to investigate whether cross-scale and cross-level interactions existed in practice in water management, a further four research propositions were developed for empirical testing (Chapter 6). My aim in drafting these research propositions was to provide me with the empirical basis for assessing the local capacity to transition to more sustainable water management in the study region. These four research propositions on governance relations were as follows:

Proposition 4: Recently introduced organizational mechanisms promoted at the local scale empower non-state actors to have legitimacy in water management comparable with state agencies.

Proposition 5: Cross-scale and cross-level interactions encourage local actors to engage with actors at other scales and levels, so facilitating collaborative water management in the study area.

Proposition 6: Collaborative water management within the study region offers opportunities for state and non-state actors to engage in social learning and networking.

Proposition 7: Formal and informal institutional mechanisms promoted to actors across scales and levels can resolve water allocation problems and encourage the transition to more sustainable water management.

I derived these research propositions from the main theses set out in the governance and adaptive governance literatures, namely that there should be equal participation of all relevant stakeholders in decisionmaking (Proposition 4); secondly, that both formal and informal institutions shape effective governance (Proposition 7); and thirdly, that cross-level and cross-scale interactions need to be examined if a transition to more sustainable patterns of water management is to be encouraged (Proposition 5 and Proposition 6). The research propositions thus sought to address the main arguments in the theoretical literatures on governance by providing a means for their empirical validation.

Dietz *et al*. (2003) and Newig and Fritsch (2009) both comment that face-to-face communication is a basic requirement for water governance and adaptive governance. Their argument is in line with Nardi and Wittaker (2002), who also contend that actor interaction is crucial for sustaining the social relationships that make distributed work, such as water management, possible. Therefore to utilize adaptive governance in this research, I used face-to-face interviewing as one of my principal data collection techniques to elicit attitudes and opinions on water governance from interviewees at different scales and levels. This technique was very useful as it allowed me to probe for in-depth responses, while also giving me the opportunity to study daily water management practice at first hand in remote rural communities (Olson and Muise, 2010).

Using the sociospatial relations approach alongside the governance approach thus provided me with a powerful theoretical lens for understanding the challenge involved in achieving sustainable water management. At the same time, it allowed me to see the extent to which governance approaches (see Figure 2.7) accurately reflected contemporary water management practice in the study area, and the dilemmas that water resource managers faced, which many of my respondents reflected upon in interview.

From this brief discussion of the data needed for this twofold theoretical approach, informants' interactions, experiences and opinions emerge as indispensible to gathering information on contemporary patterns of water management. Observational and interview-based techniques were therefore combined with field notes and group discussion in order to obtain data from key actors. In particular, semi-structured interviews and focussed discussions in groups provided me with a range of rich data to understand, explain and interpret the contemporary water management situation in north west Thailand. For these reasons the thesis adopted a qualitative approach to uncover and understand contemporary water management practices through accessing a wide range of personal user and administrative experiences.

Transition to more sustainable water management

Sociospatial relations approach

Proposition 1	Scale defines actor relationships in terms of actors accepting or challenging norms and beliefs pertaining to water management, and participating in new water management arrangement
Proposition 2	Differences among actors in water norms and beliefs at local scale gives rise to particular water politics that shape 'solutions' to local water allocation and delivery problems
Proposition 3	Local water politics influence the viability of cross-scale interactions that seek to specify collaborative water management among state and non-state actors, and hence the transition to more sustainable water management

Water governance/ adaptive governance approaches

Proposition 4	Recently introduced organizational mechanisms promoted at the local scale empower non-state actors to have legitimacy in water management comparable with state agencies
Proposition 5	Cross-scale and cross-level interactions encourage local actors to engage with actors at other scales and levels, so facilitating collaborative water management in the study area
Proposition 6	Collaborative water management within the study region offers opportunities for state and non-state actors to engage in social learning and networking
Proposition 7	Formal and informal institution mechanisms promoted to actors across scales and levels can resolve water allocation problems and encourage the transition to more sustainable water management

Figure 3.1: The seven research propositions

Source: Author

3.2.2 Study area selection

As state-led irrigation for agriculture is the empirical focus of the thesis, the first criterion for site selection was to identify suitable Thai state-led irrigation projects. The main theoretical concept I use, governance, highlights the requirement to focus on specific water management decisionmaking arenas that bring relevant actors together. The second criterion necessary to ensure my study aim and objectives were accomplished was that the study area must have research participants who were willing and able to share their experiences to provide primary data, and whom have past and present experiences in water management and water governance. Taking these criteria into consideration led me to identify a study area in north west Thailand close to the area where I had conducted Master's level research on water management issues. This offered me the advantage of being able to build upon and deepen my previous research experience.

Using these criteria, the study site chosen was the Mae Tang Irrigation Project (MTIP), focusing on the irrigated area of Integrated Water User Group Zone 10 (IWUG Zone 10) positioned at the boundary of the MTIP area (see figure 3.2), namely Nam Bo Luang. This area is substantially different from that with which I was familiar with my Master's work, and it had a number of features which shaped my research practice. The first was that farmers here have to contend with the disadvantage of being situated at the end of the main delivery canal. IWUG Zone 10's location means its water users, particularly in the dry season, always have to share 'their' water with non-agricultural water user groups such as Government agencies, tourism organizations and businesses. Secondly the area contained both state-led irrigation management and two local irrigation projects (*muang fai*), namely Mai Rai Ror Weir (MRRW) and Kor Mai Ton Weir (KMTW). These two types of water governance manage water in a relatively self-contained way: indeed, they had never exchanged ideas on water allocation or delivery, or sought to share their water to solve allocative problems, despite the fact that most of IWUG Zone 10 members used to be members of *muang fai* (that is, before MTIP's irrigation canal and ditch system was constructed). Thus, state intervention has effectively separated water users, providing me with the challenge of seeking to identify appropriate governance mechanisms that might improve cooperation and collaboration between the two systems.

The innate characteristics of this study area thus allowed me to examine how the theoretical approaches outlined might be used to understand and to reconcile actor interactions of both water governance modes, how local sociospatial relations shaped water use, and to advise on transitioning to sustainable water management.

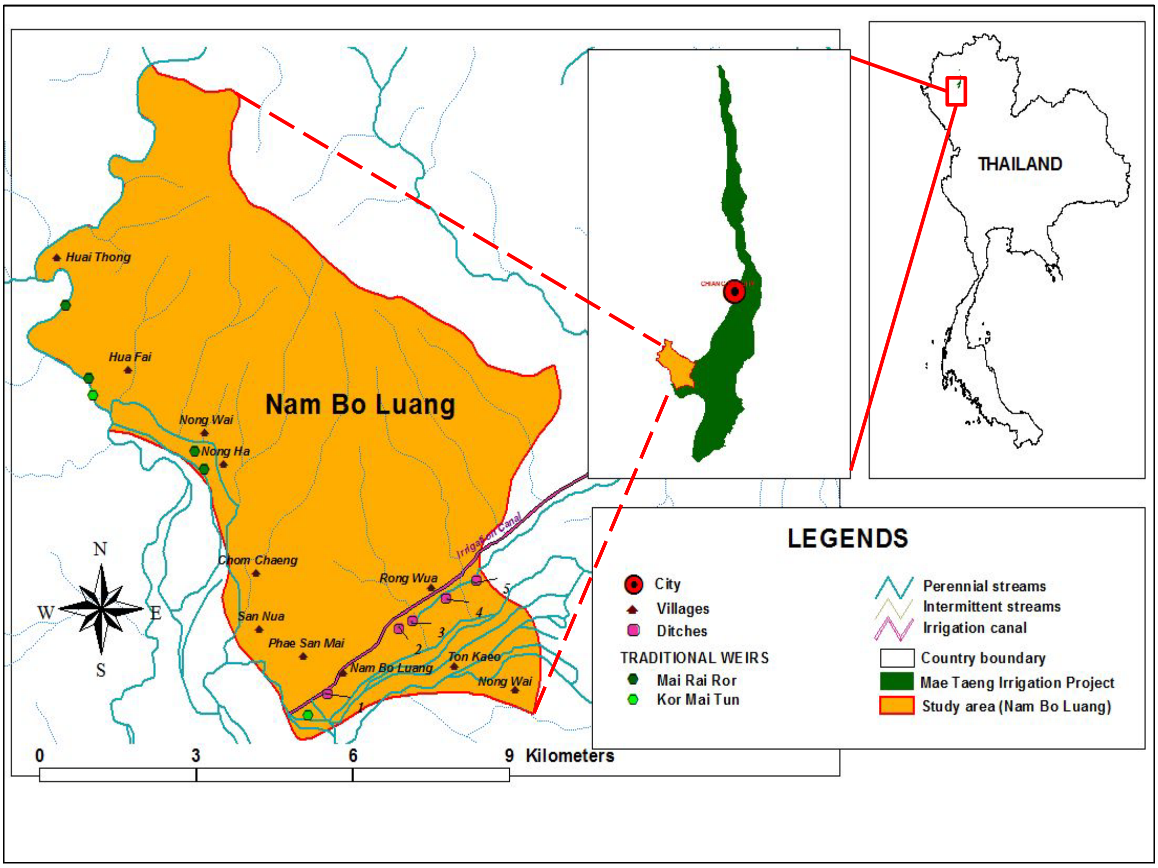

Figure 3.2: Nam Bo Luang's two water governance modes, with their irrigated areas

Source: Author

<u>3.2.3 Participant selection</u>

Participant selection drew upon fieldwork experience derived from my preliminary pilot study, undertaken in 2010. Crucially, using governance and sociospatial relations as the steering concepts of this research stressed collaboration among actors as a basis for effective governance in water management. Similarly any transition to more sustainable water management in the study area would need greater interplay and interaction among actors at multiple scales and levels. Thus, the target sample population for the study required participants from state-led irrigation projects, farmers, private agencies, *and* participants from the two *muang fai* systems. Key informant selection in each target group or sampling group was very important to gather the most relevant data for the study, thereby obtaining a 'representative characterization' of the sample population I was interested in (Rice, 2010).

Purposive sampling was employed, based upon the theoretical requirements, to select informants from Government agencies, private sectors and administrator groups (representatives of farmers) in the study area and to ensure balance of group sizes where multiple groups were selected (Black, 1999; Kuzel, 1999). For group members or farmers, the snowball technique was chosen to expand the sample while retaining a high proportion of 'information-rich' respondents (Kuzel, 1999). The selected technique was applied to interviewees whose farms were situated at the top, the middle and the end of the delivery laterals according to geographical location advantages and disadvantages of receiving water. This enabled me to identify respondents who could provide detailed first-hand knowledge of water allocation and management issues (Taylor and Bogdan, 1998).

Participants from Government agencies with responsibilities for water management were approached as they handled the national government policy for implementation. Respondents in this group comprised, first, a sample group of Mae Tang Irrigation Project (MTIP), including its Chief of Water Distribution and Maintenance, Head of Water Distribution and Maintenance Zone 4 (responsible for delivering water to IWUG Zone 10) and Zone Assistant of Water Distribution and Maintenance Zone 4. This group was selected as they played crucial roles in the study area, as well as working with farmers and non-agricultural water users at all levels.

Secondly, a sample group of the Joint Management Committee for Irrigation (JMC) was created by me including representatives from eight Subdistrict Administrative Organizations (SAOs) and two Royal military campuses (both heavily reliant upon irrigation water from Mae Tang Irrigation Project). The role of the Joint Management Committee for Irrigation is considered in detail in Chapter 6, as it provides a forum for bringing together participants in water planning, water management and infrastructure maintenance with Mae Tang Irrigation Project officials and other water user groups.

Participants from private sector organizations were considered especially important as they included non-agricultural water users, which are of growing importance regionally. Indeed, MTIP is now obliged to provide water to support urban economies and tourism according to the national economic development policy (see Chapter 4). The sample group included representatives of four organizations: the Chiang Mai Provincial Waterworks Authority, the Chiang Mai Night Safari, the Royal Flora Ratchapruek Chiang Mai, and His Majesty's Northern Study Centre of Sustainable Economy. In each case, the interviewee selected was the person responsible for water delivery planning.

The last group in the fieldwork sample comprised participants from Water User Groups (WUGs), mainly farmers and members of MTIP and *muang fai* systems. These participants were divided into water management/administration and water participation.

'Managers and Administrators' were farmer representatives who took responsibility for water allocation on behalf of their members, and who tackled water allocation problems as and when they arose. Respondents in this group consisted of one sample group of WUA (including the WUA chief, WUA vice chiefs, a WUA Deputy

Chief of Water Distribution and Maintenance and a senior farmer), selected as they worked with all chiefs of IWUG and controlled group functions through rules and regulations, and the roles and responsibilities of members. A second sample group was drawn from IWUG Zone 10 (including the IWUG Zone 10 head and his four deputy heads), as WUGs offered a focus for farmers in every water management activity by obliging members to respect the water management rules, and controlling water delivery in sub-canals and ditches for members to ensure that water was fairly shared and thoroughly (Water Management Development Group, 2011). Thirdly, sample groups were drawn from Mai Ray Row Weir and Kor Mai Tun Weir, comprising weir chairmen and their assistants. This group was selected as they are entirely responsible for *muang fai* functions through rules and regulations, roles and responsibility of members, and so could provide me with up-to-date and longitudinal data that might affect the ability of water management and water governance in *muang fai* irrigated areas.

Interviewees thus comprised both rank-and-file farmers from IWUG Zone 10 and *muang fai*, establishing data collection on day-to-day water management methods for cultivation through the wet and dry seasons. Apart from this, respondents offered their opinion on participation, perceptions, attitudes towards prevailing modes of water management in the study area.

All in all, the total number of interviewees was 192, with their precise composition set out in the five tables below.

Table 3.1: Research participants from Government agencies

Agency	Interviewee's role	Participant number	Total participants
Mae Tang Irrigation Project	Chief of Water Distribution and Maintenance	1	14
	Head of Water Distribution and Maintenance Zone 4	1	
	Zone 4 assistant	2	
Chiang Mai Municipality	Mayor	1	
Rim Nue Subdistrict Municipality	Mayor	1	
Hang Dong Subdistrict Municipality	Mayor	1	
Mae Tang Subdistrict Administrative Organization	Chief Executive	1	
Kee Lek Subdistrict Administrative Organization	Chief Executive	1	
Nong Kaew Subdistrict Administrative Organization	Chief Executive	1	
Yoo Wa Subdistrict Administrative Organization	Chief Executive	1	
Ta Wang Praw Subdistrict Administrative Organization	Chief Executive	1	
Royal Animal and Land Farm Department 3	Master	1	
Royal Pack Squadron Department	Master	1	

Table 3.2: Research participants from private sector organizations and companies

<table>
<tr><th>Agency</th><th>Interviewee's role</th><th>Participant number</th><th>Total participants</th></tr>
<tr><td>Chiang Mai Provincial Waterworks Authority</td><td>Manager</td><td>1</td><td rowspan="4">4</td></tr>
<tr><td>Chiang Mai Night Safari</td><td>Project Manager</td><td>1</td></tr>
<tr><td>Royal Flora Ratchapruek Chiang Mai</td><td>Director</td><td>1</td></tr>
<tr><td>His Majesty's Northern Study Centre of Sustainable Economy</td><td>Manager</td><td>1</td></tr>
</table>

Table 3.3: Research participants from Water User Association (WUA) and Integrated Water User Group Zone 10 (IWUG Zone 10) (MTIP)

<table>
<tr><th>Agency</th><th>Interviewee's role</th><th>Participant number</th><th>Total participants</th></tr>
<tr><td rowspan="4">Water User Association</td><td>Chief</td><td>1</td><td rowspan="4">7</td></tr>
<tr><td>Vice Chief</td><td>4</td></tr>
<tr><td>Deputy Chief of Water Distribution and Maintenance</td><td>1</td></tr>
<tr><td>Senior farmer (Consultant)</td><td>1</td></tr>
<tr><td rowspan="6">Integrated Water User Group Zone 10</td><td>Head</td><td>1</td><td rowspan="6">81</td></tr>
<tr><td>Deputy Head</td><td>4</td></tr>
<tr><td>Water user of Rong Wua Village</td><td>26</td></tr>
<tr><td>Water user of Nam Bo Luang Village</td><td>28</td></tr>
<tr><td>Water user of Ton Kaew Village</td><td>12</td></tr>
<tr><td>Water user of Nong Wai Village</td><td>10</td></tr>
</table>

Table 3.4: Research participants from *muang fai* irrigation systems

<table>
<tr><th>Agency</th><th>Interviewee's role</th><th>Participant number</th><th>Total participants</th></tr>
<tr><td rowspan="6">Mai Ray Ror Weir</td><td>Chairman</td><td>1</td><td rowspan="6">64</td></tr>
<tr><td>Chief (Chairman assistant)</td><td>4</td></tr>
<tr><td>Water user of Hua Fai Village</td><td>12</td></tr>
<tr><td>Water user of Nong Waii Village</td><td>23</td></tr>
<tr><td>Water user of Nong Ha Village</td><td>14</td></tr>
<tr><td>Water user of Jom Jang Village</td><td>10</td></tr>
<tr><td rowspan="4">Kor Mai Tun Weir</td><td>Chairman</td><td>1</td><td rowspan="4">22</td></tr>
<tr><td>Chief (Chairman assistant)</td><td>2</td></tr>
<tr><td>Water user of Ton Kaew Village</td><td>9</td></tr>
<tr><td>Water user of Nong Wai Luang Village</td><td>10</td></tr>
</table>

Table 3.5: Total number of participants in the study

Agency	Participant number
Government agencies	14
Private sector organizations and companies	4
Civil society (farmers)	174
Total participant number	**192**

3.2.4 Research ethics

Previous sections demonstrate how primary research relied upon contact with individuals and communities in the field. Ethical considerations inevitably needed to be addressed during primary data collection and post-data collection phases, requiring me to protect the rights of participants, communities and environments involved in, or affected by, my research.

The University of Birmingham (UoB) established the ‘Code of Practice for Research’ (2011-2012) to ensure research practice meets required ethical standards, and embeds good practice in all aspects of the researcher’s work. In essence, the general principles of this Code require research activities not to harm participants; to respect respondents’ privacy; to respect the rights of all participants; and to ensure informed consent is granted (Bryman, 2008; Hay, 2010). My research design was approved by UoB’s Humanities and Social Sciences (HASS) Ethical Review Committee.

A participant informant sheet and consent form was created according to the ‘Code’, in order to ensure that participants’ rights were respected during the research process. I designed the sheet and form to suit participants with any level of educational attainment and after that translated it into Thai. For participants with a lower level of literacy than others, I explained in person the purpose of the study and the data requirements before enrolment into the research. Respondents were free to withdraw from the study at any time, for any reason. The sheet and form was provided by me as a researcher before the interviews and anonymity guaranteed for all participants. This was to ensure confidentiality of the research.

3.2.5 Researcher positionality

Critical reflection upon the positionality of the researcher is now regarded as a vital factor that affects the execution of field research (Taylor and Bogdan, 1998; Miller and Crabtree, 1999; Silverman, 2000; Silverman, 2010). As much time is spent in the field with participants, my positionality could result in me having biases with some participants that might influence the ways in which I conducted research or interpreted research results. To avoid these problems, I always referred in the field to my study methodology. Moreover to gain data from participants I found it crucial to be open, constructive and cooperative with my research participants and organizations during fieldwork (c.f. Hopkins, 2007). As Hopkins (2007, p.388) notes, "In doing research, it is important that researchers are considerate of both the similarities and differences between themselves and research participants". Positionality also requires similarities to be taken into account between informants and researchers – for example, in culture, education, social and economic status. As a result, during fieldwork, I tried to use my Thai nationality and my local origins to create a close bond with respondents in the study area. My idea in doing so was that they would then feel more at ease in giving me their honest views and opinions. As Dwyer and Buckle (2009) note, building this 'trusted' status allows researchers more rapid and complete acceptance by their participants. Shared nationality automatically provides a level of trust and openness in research participants that would likely not have been present otherwise. Certainly in practice, participants were typically open with me, permitting rich and insightful qualitative data to be gathered. I followed Hopkins and Dwyer and Buckle's suggestions by conveying to respondents that I was a local, and by speaking the same dialect as local people to cement my relationship with them. This allowed me to establish a rapport with my study participants, drawing upon our shared experiences and attributes. Our similarities and frequent discussions during field surveys enabled a close rapport to build between us. I was also open and deeply interested in the experience of my research participants, and committed to accurately representing their experiences.

To sum up, I strived to be aware of my positionality particularly while I was in the field but also while undertaking data collation and synthesis, and, crucially, in interpreting my research results.

3.3 Implementing empirical data collection and data analysis

Following completion of the preparatory phase of the project, in phases 2 and 3 my research activities moved to data collection and analysis. These phases are considered in detail below.

3.3.1 Gaining access

As the study involved different types of water management organizations - state-led irrigation project (MTIP) and local *muang fai* irrigation systems – my research involved varied research settings. First was *'closed' and 'private' settings* (Silverman, 2000), such as MTIP, local administrative organizations, and private agencies. Here to conduct fieldwork I needed to speak with organizational 'gatekeepers' and seek their formal permission to conduct research. Second was *quasi-public settings* (Taylor and Bogden, 1998), such as MRRW and KMTW, where access was freely available as they are community-based, but where I needed to obtain permission from community leaders to enter and ask for interviews.

Access to both types of irrigation management was through ‘gatekeepers’ who exercise great control over research activities, as Glesne (2006, p.44) makes clear: “Gatekeeping refers to your acquisition of consent to go where you want, observe what you want, talk to whomever you want, obtain and read whatever documents you require, and do all of this for whatever period of time you need to satisfy your research purpose”.

Thus the MTIP’s ‘gatekeeper’ was the Director who has responsibility for managing officials and all activities in ‘the project’, as well as working with every level of stakeholders. ‘Gatekeepers’ could also identify for me respondents whom might provide the necessary information for my study. As a result, I drafted an introductory letter in Thai that described my research and asked for their participation. The same method was used to gain access to the gatekeepers themselves, who were key figures in each organization, such as local administrations organizations and private agencies.

Gaining access was vital to developing trust with water stakeholders prior to them sharing their experiences and observations. Fortunately, no rejections emerged when fieldwork data collection was conducted. Notwithstanding, gaining access through ‘gatekeepers’ can lead to other participants being marginalized, as gatekeepers try to control knowledge availability (Broadhead and Rist, 1976; Silverman, 2010). I avoided the ‘gatekeepers’ influence in steering me to particular people by employing the snowball technique (mentioned in section 3.2.3) to identify those farms that were located at the end of the canals as they always face with disadvantages over accessing water (Chambers, 2013). I also managed this issue by actively seeking out ‘typical’ farm businesses and conducting interviews where it was convenient for these respondents, for example in village halls, temples or private dwellings.

After securing clearance from 'gatekeepers', pilot and primary and secondary data collection were undertaken, as described in the following section.

3.3.2 Data collection and data analysis

Data collection was divided into two activities; secondary and primary data collection. Secondary data was sought to provide background information on the MTIP and its water user groups, and *muang fai* systems. Thereafter, preparing for the first fieldwork was initiated. Preliminary data collection or the pilot study was done in August - September 2010. The objectives of the pilot were to (i) check the appropriateness of the selected study site and sample groups; (ii) identify key informants for later fieldwork; (iii) contextualize the study and the primary interactions of each stakeholder; (iv) develop preliminary knowledge of water management context and governance style; and (v) to collect the data for subsequent analysis.

Data collection comprised three elements. The first utilized semi-structured interviews based on prepared question themes to ascertain water management challenges and difficulties from MTIP officials. These interviews required respondents to reflect on their governance style, sectoral integration and scale of analysis and operation. Question themes were standardized to ensure comparability of data sets and to assist cross-checking and accuracy of the collected data.

The second and third stages also used semi-structured interviews to understand the structure of IWUG Zone 10 and *muang fai* systems. The participants included the leaders, their assistants and members. The same processes, method and question themes were used for IWUG Zone 10 and *muang fai* samples. All participants were interviewed separately face-to-face to allow for considered answers that provided depth to the analysis undertaken (Longhurst, 2010). Questioning was semi-structured (Longhurst, 2010). I sought to establish a rapport with my interviewees by asked general questions early on, before focusing on more substantive research topics as Taylor and Bogdan (1998) suggest. Each interview took about one to one and a half hours, during the course of which I would take brief notes including my observations of the respondents' actions and feelings. All interviews were digitally recorded to capture the richness of responses from my research subjects.

Once each interview was completed, they were transcribed into Thai and then translated into English. Next, a summary report was submitted to my supervisors by email from the study area. All data and transcriptions were kept in a file in my computer which only I and my supervisors could access to ensure the respondents' confidentiality. Once every transcription was completed, analysis was begun by looking at the responses to each individual question and coding up interviewees' responses, based on foundation themes of governance and sociospatial relations. I also tried to reflect on what was not in the data by considering what interviewees had omitted in their answers to my questions (Ryan and Bernard, 2003, cited in Bryman, 2008, p.555).

Once preliminary data collection was completed and analysed, fieldwork data collection was begun. This was undertaken between 2011 and 2012. As well as deepening the findings obtained from the pilot study, I conducted work on two recently introduced organizational structures, the Joint Management Committee for Irrigation (JMC) and the Water User Association (WUA). Interviews within the Joint Management Committee for Irrigation were conducted with the heads of ten local administrative organizations, four private sector bodies and WUA representatives (see Chapter 6). Interviewees were selected based on their administrative role in water allocation planning. As both JMC and WUA were 'private-setting' organizations, official letters were drafted in order to arrange interviews. Each letter contained my details, a brief outline of my research project, methods and process of data collection and a self-administered questionnaire with clear instructions. In the letter, I offered to conduct a face-to-face interview (based on the structured questions in the questionnaire), in case they requested and/or they need additional information. I chased up individuals who did not reply. For the administrative group of WUA, which is under the responsibility of MTIP, gaining access was less problematic as they knew in advance about the study through the MTIP's Director.

Questions were carefully crafted based on the governance and sociospatial approaches outlined in Chapter 2, focused on the seven research propositions. Questionnaires consisted of both closed and open questions and were divided into seven sections: organization details, water allocation from MTIP, MTIP's water governance, social learning and networking, sociospatial relations, the role in water management as a member of JMC, and the respondents' own comments and suggestions (see Appendix

1). This method was chosen because it was more convenient for respondents working in organizations, as they could complete the questionnaire when they wanted (Bryman, 2008). Completed questionnaires were reviewed by me and in case of non-responses were returned for clarification.

Key informants were targeted for in-depth semi-structured interviews in order to explore topics in depth, and yielded invaluable insights. In addition, this data had greater depth and quality as I was able to follow up on answers and probe for greater detail. Questions could be added or altered in real-time if needed. It also allowed me to explain or help clarify questions, increasing the likelihood of insightful responses. Similarly, face-to-face contact allowed respondents to open up on a one-on-one basis and for me to be more flexible in administering interviews to particular individuals. In-depth semi-structured interviews with all key informants from the pilot study were conducted separately and took about one and a half to two hours each on average.

After obtaining data from sample groups of MTIP, private agencies, JMC and both *muang fai*, I focused my attention on group members who were farmers in IWUG Zone 10, MRRW and KMTW with the objectives of comparing data gathered from the water administrator groups, to gain cross-comparative experiences, feelings, opinions and attitude in their water use, their leader management, and to gauge the interaction and relationship among farmers and their leaders. Group discussions then followed, focussing on the administrative groups of IWUG Zone 10, WUA and JMC as well as the representatives from MTIP. Each group contained between 3-7 participants based upon the number of administrators in each group. I acted as a facilitator and moderator in these discussions. Following Opdenakker (2006)'s recommendation, I ensured that one or two people did not dominate these meetings.

Each group discussion lasted approximately one to two hours, with participants asked to reflect on how the efficiency and sustainability of water management might be improved; how the group maintained and built its networks in water management; and what their opinion was of the main difficulties arising from current water allocation arrangements. After the group discussions were completed, I summarised the issues they raised and requested that they give me any additional information.

The dynamic and fast-moving nature of water policy debates and management change in the study area meant that I needed to follow up developments once I had returned from fieldwork and prior to the final write-up of the thesis. Logistical considerations (chiefly time and finance) prevented me from returning to the field to conduct these meetings in person. So, in 2012 I decided to conduct telephone and Skype interviews with my key respondents to track any further changes in water management and governance. I began each remote interview with the prepared question themes and spent roughly half an hour talking with each respondent. Telephone interviews needed to be recorded in order to produce transcripts for analysis, so consent form was provided in advance already, and I asked again at the start of the telephone call.

Once all transcriptions were completed, data analysis was begun. Miller and Crabtree (1999, p.129) suggest that researchers "must keep redescribing and adjusting, gathering new information; this is the iteration between data collection and interpretation". I followed these instructions throughout the research process, and this reflected the dynamics of my data collection.

The informing theoretical approaches employed in this thesis of governance and sociospatial relations provided me with the primary focus for coding and interpreting data. Then, I concentrated on four types of themes in the data as Strauss and Corbin (1990) suggest; interaction among actors, conditions, strategies and tactics and consequences, in each approach. I started with interpreting actor interaction and while I was reading each transcription line by line, I used coloured-codes where the informants indicated how they engaged with others, what they thought of others, and what others did to them with respect to the seven research propositions. After that, I focused on whether similar interactions emerged in the data under each approach, underlined the 'strategies and tactics' of what people did in certain situations or how they handled particular events, and the 'consequences' of these strategies (Cope, 2010). Apart from the seven research propositions, repeated phrases or words were also recorded where these offered new insights into data interpretation. Thus by using these analytical categories to code the data, I was able to connect one code to another code as well as to make new connections, so identifying potential new investigative themes.

Where quantitative data arose from the questionnaires, it was interpreted using simple arithmetic analysis, for example data expressing percentage of respondents' answers.

Synthesising these qualitative and quantitative data sets allowed a picture of the current actor interactions in water management at each scale and level to emerge, as well as the problems and recommendations which could be used to identify further mechanisms to facilitate collaboration and resolve coordination problems. All of these helped me understand how key actors engaged with these issues, and how conditions of good water governance might be implemented to create more sustainable water management arrangements in the study area.

3.4 Conclusions

This Chapter has set out how governance and sociospatial relations as key theoretical concepts informed the methodology of the thesis. I have clarified the data collection and analytical approaches used to fulfill my research aim and objectives. In summary, data collection methods comprised: (i) 192 face-to-face in-depth semi-structured interviews with key actors; (ii) 20 questionnaires distributed to actors on the JMC committee, including representatives from WUA, MTIP, local government administrative organizations and private agencies; (iii) four group discussions with actors from a state-led irrigation project; and (iv) 20 remote interviews with four administrator groups.

The interconnected data collection phases proved largely successful, enabling me to gain ‘rich information’, first-hand knowledge, facts, feelings, opinions, and recommendations, from my respondents. The research techniques I applied in the fieldwork were also effective in that they allowed participants to reveal their thoughts and opinions frankly and openly. In addition, fieldwork brought different *muang fai* and MTIP groups into contact helping the search for more collaborative water management approaches. Presentation of the outputs from data collection is discussed in the following Chapters.

CHAPTER 4: CONTEMPORARY WATER GOVERNANCE IN THAILAND: THE INFLUENCE OF THE NATION STATE ON LOCAL WATER MANAGEMENT

This chapter outlines the national context for Thailand's water management, focusing on irrigation and the impact of national legislation and patterns of administration on the development of water governance at provincial and local levels, which I then examine in detail in Chapters 5 and 6. Data for this Chapter is derived from Government reports, national water policy reviews and other published documentation, in Thai and English.

The Chapter is structured in four interlinked parts which correspond to chronological development in Thai national water management and its governance in each period. Physical geography, water resources and hydrological characteristics of Thailand are set out in the first section in order to provide an overview of how physiographic factors have shaped past and present water management arrangements. I then outline traditional water management systems that were dominant before Thailand began to implement its National Economic and Social Development Plan in the early 1960s as a means of encouraging greater economic development nationally; part of this Plan was to adopt a national water management policy. The third section then discusses the country's water management transition to comply with National Development Plans, particularly as these apply to agricultural activities. This has resulted in successive Thai governments seeking to exert complete legal control over national water management at all scales and levels as it has applied to agricultural and rural communities. However, centralized water management has coincided with major water scarcity and supply issues, including those arising from climate change, and greatly increased competition to abstract water among industrial, domestic and agricultural sectors. The fourth section reflects on these challenges to water supply. I then draw together the main points of the Chapter and consider the role they might play in inhibiting or promoting the transition to more sustainable water management nationally.

4.1 Thailand: physical geographical and water resource characteristics

Thailand is located in tropical south-east Asia, and is part of the Indochina peninsula. It lies on the geographical coordinates of 15° 0' 0" N, 100° 0' 0" E, covering an area of 514,000 square kilometres in the centre of the South-East Asian peninsula (Thai Meteorological Department, 2012). It is bordered by Myanmar (Burma), the People's Democratic Republic of Laos, Cambodia and Malaysia, and has 2,420 kilometres of coast line on the Gulf of Thailand and the Andaman sea (Figure 4.1). Thailand stretches 1,650 kilometres from north to south, and from east to west 780 kilometres at its widest point (UN Thailand, 2012).

Figure 4.1: Location of Thailand

Source: World Atlas (2012)

Thailand is usually classified into five geographical regions according to economic, social and ecological criteria (UN Thailand, 2012). These are the central, northern, north-eastern, south-eastern and southern regions respectively. The central region (including Bangkok Metropolitan Region) is dominated by the basin of the Chao Phraya River, which runs from north to south and after crossing Bangkok flows to the Gulf of Thailand. The northern region is mountainous and remains the most heavily afforested area of the country. The main centres of population are in the narrow alluvial valleys along the four north-south flowing rivers which unite in the northern central plain to form the Chao Phraya. The north-eastern region (Isarn) constitutes approximately one-third of the country's surface area, comprising the Korat Plateau (which is bounded on the north and east by the Mekong River) and to the south by the Dongrek escarpment. The region is drained by the Mun and Chi rivers, both tributaries of the Mekong. Approximately one-third of the national population lives in the north-east. The south-eastern region is relatively less populated and includes hill country from Bangkok to the Cambodian border; it is characterized by higher rainfall and poorer soils than the adjoining central region. The southern peninsula has the highest rainfall nationally. It is the principal rubber-growing area, and contains extensive alluvial tin deposits (UN Thailand, 2012).

Located outside the typhoon belt, Thailand can be divided into two climatic zones (UN Thailand, 2012). The north, north-east, south-east and central regions (including Bangkok) have a climate with three distinct seasons: rainy, from June to October; cool, from November to February; and hot, with the highest temperatures and sunniest periods from March to May. Temperatures in Bangkok vary between 20˚C in December and 38˚C in April with an average humidity of 82 percent. Winter temperatures in the north can fall to 10˚C or lower. The average rainfall in these regions is 1,572.5 millimetres per year (Thai Meteorological Department, 2012). The southern region has a characteristic tropical rainforest climate. Rainfall occurs virtually throughout the year, although a number of micro-climates can be found. There is little variation in temperature, which is on average 28˚C throughout the year. March and April are normally the driest months in the south. The periods of maximum rainfall in these areas vary according to climatic sub-regions (UN Thailand, 2012).

Thailand's average annual water volume is estimated at 213,424 million cubic metres with 183,001 million cubic metres falling in the rainy season, and 30,423 million cubic metres in the dry season (Royal Irrigation Department, 2012). The country is the world's largest rice exporter, and agriculture is a major contributor to the national economy, especially in terms of providing employment (Roonapai, 2006; Kisner, 2008). As a result, water is in great demand to support the agricultural sector, with 106,169 million cubic metres or 65 percent of the total water demand accounted for by irrigation (Royal Irrigation Department, 2011).

Irrigation development has been an essential component in Thailand's agricultural and overall economic development. I consider this water-agriculture interrelation in detail in the following sections.

4.2 North west (NW) Thailand and traditional approaches to water management

River basins have been a critical physiographic context for agricultural development throughout Thailand's history (Lebel *et al*., 2009). As a result, 'know-how' in water use and water management is a key agricultural technology (Vorathepputipong, 1996; Surarerks, 2006; Neef *et al*., 2007; Ounvichit *et al*., 2008). In this section I describe the historical arrangements and traditional water management systems in place nationally prior to adopting the First National Economic Plan in 1962.

Human development of water resources in Thailand was pioneered in the country's northern region with the explicit aim of serving the needs of agriculture. Written records confirm that the northern Thai (or Lanna Thai) people designed and introduced *muang* *fai* irrigation management for agriculture more than 700 years ago (Surarerks, 2006). *Muang fai* thus predates Phya Mangrai's (king of the Lanna Thai kingdom from 719-774 AD) founding of the regional capital Chiang Mai, and the proclamation of the first recorded irrigation law (*Mangrai Sart* or *Winitchai Mangrai*) in 1296 AD. Indeed, some documentary sources from the Lanna Thai state that *muang fai* irrigation was in existence 1,300-1,400 years ago (Surarerks, 1968).

Under *muang fai,* farmers manage water by building a small weir (*fai*) to raise water levels in rivers and divert the overflow water into cultivated (typically rice) fields through an earth canal (*muang*). This kind of traditional irrigation for agriculture is still called the "people's irrigation system" (Vorathepputipong, 1996, p.27). The *muang fai* system was very effective as it represented a highly appropriate technology developed to take full advantage of the northern region's hydrological and physiographic characteristics, with its steep slopes and plentiful water (Kao-Sa-Ard *et al*., 2001). *Fai* helped conserve water, and, by diverting supplies from upstream to downstream lowlands with more fertile soils and less water along *muang* networks, farmers could effectively manipulate cropping patterns (Lert-Wicha *et al*., 2009). Farmers' local water knowledge and 'folk wisdom' built up over generations and allowed agricultural communities to make the most of locally available waters, and, through *muang*, control water flow as needed to rice fields. Thus *muang* could be used to slow water delivery rates and so manage agricultural lands appropriately.

As a result, *muang fai* water management determined a small-scale pattern of agriculture, first in the north and then increasingly nationally as this irrigation practice spread, encouraging a relatively low rural poulation density during Thailand's early modern period. *Muang fai* is a small-scale hydrological resource management system, and is not really viable for farm areas larger than about 1.6 square kilometres (Lert-Wicha and Wichienkiew, 2003). Its physical structures are built from easily sourced locally available materials, chiefly bamboo wood and rock. Thus, communities could easily finance *muang fai* themselves as the cost of infrastructures was cheap. Moreover, farmers are in complete control of water management as the system is based on mobilising local knowledge, starting with construction, then water delivery, water allocation and finally routine maintenance tasks. Furthermore this knowledge is intergenerational, with competence for water management remaining in local hands (Tan-Kim-Yong, 1993, cited in Kao-Sa-Ard, 2001, p.258).

Sittilert (2003, p.80) characterises these traditional water management systems as follows: "The structure of the weir and the structure of the diversion systems consists of the main weir made from wood, which is replaced periodically. The site of the weir might be moved upward or downward, but it always needs to be well maintained. Some weirs are made from stone, impeding river flow to raise waters to the desired level. When water is required, farmers divert water into a main channel which is on a higher level than cultivated land, sending water down smaller channels that branch off. When the water is diverted into rice fields, '*Tae*' or small water tubes made from bamboo are put into the small channel (*lam muang soi*) to divert water to ditches (*lam muang sai kai*) leading to the paddies. Excess water flows into a dredging canal (*lam muang sia*), which might act as a main channel of lower – lying areas".

Muang fai administration is accomplished through 'water user organizations' (Figure 4.2). These organize farmers to use water from the same weir at the local scale, making water user organizations the basis of a rural community-based natural resource management system that addresses the needs of productive agricultural areas (Lert-Wicha *et al*., 2009), as each weir irrigates land farmed by many villages. Water management is set out under customary law called '*Sanya muang fai*', which nowadays provide the regulations governing consent and agreement of all members. These regulations are administered by a range of locally elected officials including *huana muang fai* (chair), *rong huana muang fai* (deputy chair), *phuchuai huana muang fai* (assistant), *lam nam* (water messenger), and the water users themselves. The *Sanya muang fai* sets the annual work calendar (June to mid- November (only in the rainy season)), including dredging and repairing the system, setting exemptions for those who are ill or unable to work, establishing the rate of fines for those who do not work as scheduled and for those who 'steal' water or cause damage to weirs, failure to maintain the system such as dredging canals, and setting down penalties for being absent from meetings (Surarerks, 2006).

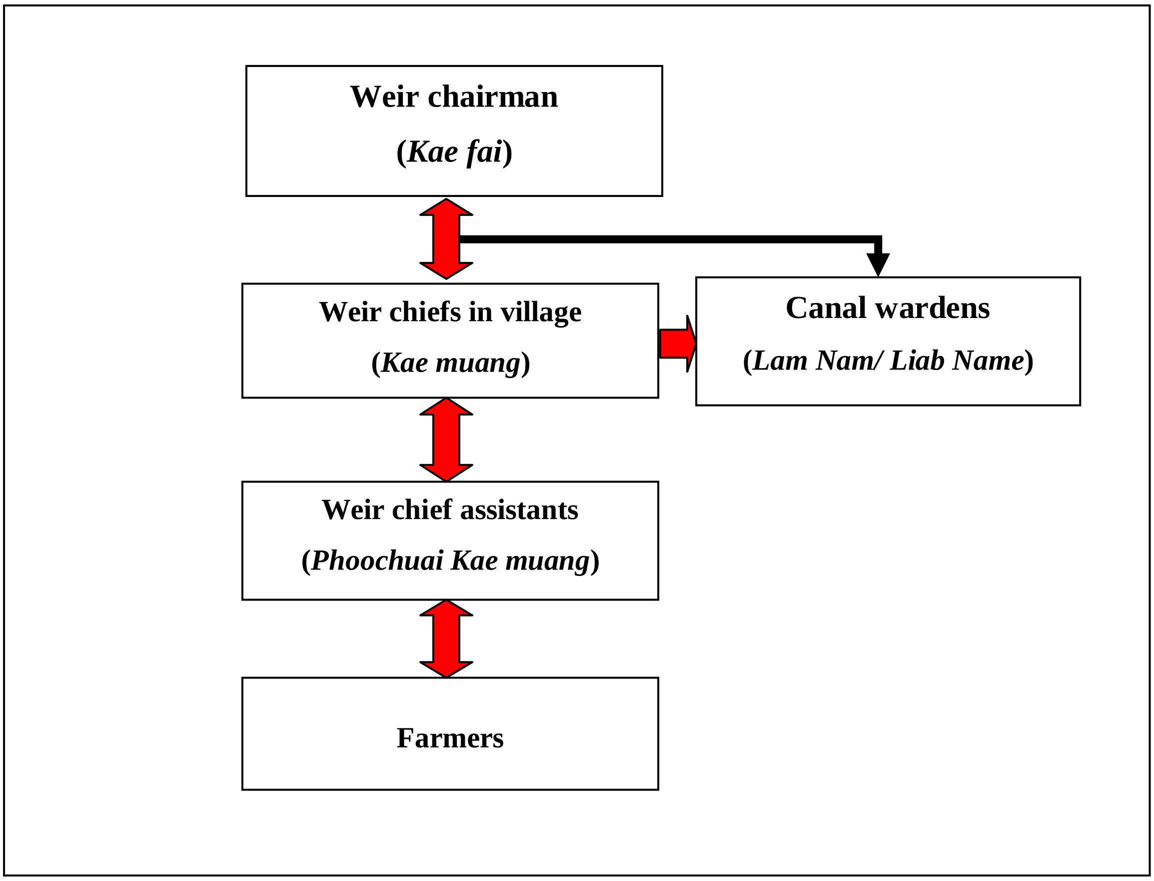

Figure 4.2: ***Muang fai*** **organization**

Source: Author's interview

Sanya muang fai also codifies water use rights and specifies how to share water among members based on water availability, farm size and number of rice paddies, as well as the physical characteristics of the irrigated area. Members have to pay *kha nam* or an irrigation fee to fund the administration. The administrators collect the fee from the water users on different occasions and in various ways according to the agreement made between the administrators and the water user members. Generally, a rate is set for *kha nam* by determining the amount of cultivated land owned by farmers who use the water. The rate is always set out in the *muang fai* agreement (Surarerks, 2006).

These water management rules and regulations were stipulated in the *Muang Fai and Phanang Act* of 1934, and the Peoples' Irrigation Act of 1939, enacted by the Thai government in order to centralise control of local irrigation systems as well as protect and retain people interests. This was because problems emerged with water delivery and supply in some regions. As a result, farmers who owned land at the end of canals were unable to access sufficient water, resulting in frequent conflicts over water use (Palayasoot, 1982). However, after the enactment of the Peoples' Irrigation Act, *Sanya muang fai* or agreements and regulations made under *muang fai* were no longer effective (Palayasoot, 2005).

Chiang Mai has a long history of *muang fai* systems, as it is in the central part of Upper Ping River Basin, where irrigation practice dates back about 1,500 years (Surererks, 2006). Cohen and Pearson (1998) reveal that there were three main reasons why Chiang Mai Basin was appropriated for *muang fai* irrigation systems. The first was the area had a relatively high catchment-to-ratio area, so water was plentiful in the rainy season. Secondly, the basin had sloping terrain, so flooding was not excessive. Lastly, water in the main rivers rarely dried up in the dry season, as there were occasional showers over in the surrounding mountains, resulting in groundwater being topped up.

Since then, transformation of water and land use in Chiang Mai has been dramatically changed by the expansion and intensification of agriculture, urbanization, industrialization, and tourism. Hence this area was a selected target for introducing river basin organizations to promote integrated water resources management (see Chapter 1). These physiographic changes also affected *muang fai* systems across the region, such as in Nam Bo Luang, San Pa Tong District. Promoting intensive agriculture along with a growing number of various types of economic activities led to insufficient water for farmers.

This opened up the possibility for state-sponsored irrigation, which began in earnest with the diversion and use of unregulated stream flows to address water shortages during the dry season. Again, water shortages and storage solutions have a very long national history. In the Sukhothai period (c. 13^{th} century AD), for example, the late King Ramkhamhaeng the Great had water storage tanks built on the outskirts of the former Thai capital to supply the township, which is the earliest recorded instance of storage of water resources in the country. Similarly in 1624, in the reign of the late King Prasartthong work was begun on a reservoir at Tharuthongdang in Saraburi province to supply royal plantations and for domestic use in the Tharu Kasem Royal Villa.

However, the first recorded attempt to provide modern irrigation over large cultivated areas occurred just over 100 years ago when the country began to increase rice exports. The focus for this new development was a large irrigation system and associated water conservation scheme in the lower Chao Phraya basin (1896). By 1915, the first large scale gravity irrigation project had been completed, covering an area of 1,088 square kilometres on the Pasak river (Palayasoot, 2005).

Subsequently, modern irrigation began in the Northern region in 1930, in the Northeast region in 1938, and in the Southern region only in 1948. The Government responsibility for irrigation changed organizations as a result of this dramatic expansion in irrigable area. In 1902 the *Krom Klong* (Canal Department) of the government was established. Its original functions were to redredge and dig canals in the lower parts of Thailand's central plain. In 1914 *Krom Thodnam* (Water Diversion Department) was established to replace *Krom Klong*, which was then renamed by royal decree *Krom Jalaprathan* (Royal Irrigation Department, hereafter RID) in 1927, assuming at this time responsibility for all national water resource development projects (Palayasoot, 2005). State irrigation development was given legislative basis nationally under the State Irrigation Act (1942).

This Act began a process of profound change in the national water management paradigm away from *muang fai*, which was dependent on the availability of water for rice planting only in the rainy season. Under *muang fai*, rice production was used for sustenance or trading among village members, rather than for commerce. Under the new state management paradigm, these traditional ways of water management came under increasing pressure as rice production became the main national export good. Economic demand began to dominate the country's water management, particularly in irrigation, with massive consequences for water management nationally.

4.3 National economic growth and development in Thailand: the emergence of 'command and control' water management, 1958-1996

Once an export market for rice had been established in the early 20th century, successive Thai governments began to play important roles in water management and in developing irrigation systems with the purpose of facilitating expansion of the paddy rice sector. Governments acted in effect as a national supply-side water manager (TDRI, 1990), a role promulgated especially through measures introduced under the First (1962) through to the Seventh National Economic and Social Development Plans (1996).

Economic and social development in the 20th century was driven by successive governments. From 1958, the International Bank for Reconstruction and Development gave advice on investment in irrigation system development to the government in order to improve the efficiency of rice production for the export market. Thus rice production became integral to national economic growth in Thailand – a plank in the country's economic development strategy (Isawilanon, 2009).

Between the First National Economic Development Plan (1962-1966) and the Fourth National Economic and Social Development Plan (1977-1981), national governments gave relatively high priority to agricultural development, as approximately 80 percent of the total working population was engaged in farming and rice production. Agriculture contributed the largest share to the country's national income, and was the principal source of supplies for domestic commerce and industries, and for export (The National Economic Development Board, 1967). As a result, expansion of agricultural production would increase by no less than four percent per annum following substantial increase in government investment in agricultural infrastructures for irrigation and rice storage. This also coincided with the beginning of the 'green revolution' and the introduction of modern plant breeding and harvesting technologies, markedly changing the character of *muang fai* towards an export-oriented agriculture (Yaowalert, 2002; Isawilanon, 2009).

Irrigation development was focused on constructing storage tanks and reservoirs with canals, ditches and dyke systems to facilitate the rapid increase in water demand in agriculture (The National Economic Development Board, 1966). Large and medium-scale state-led irrigation projects were completed at this time, such as Lam Pao, Bhumiphol, Sirinthorn and Huay Luang Dams, with economic support from the World Bank (The National Economic Development Board, 1971). This development also included the People's Irrigation projects promotion in the Central plain and the Northeastern region.

At the same time, this "era of dam construction" (Yaowalert, 2002, p.2) also had to support more electricity generation, an irrigation system and to boost tourism. Thailand changed from being primarily agricultural to having an increasing emphasis on industrial exports as a newly - industrialized country. This drive to become a leading rice exporter, and Thailand's emergence as one of the newly industrialized countries (NICs), the so-called fifth 'tiger' economy of Asia, greatly increased national water demand.

The Royal Irrigation Development (RID) was charged with the country's irrigation development and management at all scales. RID began to work with other national agencies, including the Electricity Generating Authority of Thailand (EGAT), and to work over more closely with government agencies with agricultural responsibilities, notably the Ministry of Agriculture and Cooperatives, and the Ministry of the Interior (especially the Land Development and Cooperative Promotion Departments). Part of RID's response was to introduce Water user organizations (WUO). Although Thailand already had water user organizations under *muang fai*, the first water user association (WUA) was established in 1963 at the Gud Ling Ngor Irrigation Project, Udon Thani Province, expressly to take forward state-led irrigation. This association was given legal status under the Civil and Commercial Code (1966). After that, water user associations were established regionally in order to expand intensive rice production and to strengthen farmers associations and cooperatives, and farmers' education programmes in the principles of intensive irrigated farming (The National Economic Development Board, 1971).

Water User Associations spread rapidly across Thai regions with the main objectives of water delivery and maintenance. However, WUA administrative structures did not sufficiently support water allocation and maintenance to members. WUA size did not suit increase in farm scale and the increasing number of members, and it was very difficult for RID to oversee the activities of water users. As a result, some farmers remained outside the WUA system since there was no law to enforce them not to use irrigation water. Consequently by the early 1980s, RID slowed the establishment of WUAs and commissioned research to improve WUO constitution and management. The conclusion of this work was that WUO's optimum size should be a small number of farms to ensure water management was not overly complex, and remained in touch with on-farm developments. RID's emphasis was thus on WUOs with small memberships and clear lines of water responsibility, with the aim that farmers would be able to quickly learn new irrigation methods and improve their own water management practices and community farming institutions.

As part of the Fifth National Economic and Social Development Plan (1982-1986), the government remained focused on improvement of irrigated land in order to create a national irrigation system and to increase national agricultural productivity. Moreover, the irrigation development policy attached importance to expanding the land area under irrigation through water pumping projects and small water resources initiatives. This was backed up with institutional reform targets that anticipated all farmers' groupings and agricultural cooperatives would be merged into national bodies (National Economic and Social Development Board, 1981).

The Sixth National Economic and Social Development Plan (1987-1991) recognised the increasing water demand for human consumption as well as for agriculture as a result of national population growth. Water previously allocated for irrigation was now needed for other purposes, including electricity generation, water transport, salinity control, and water supply for communities and industries. As a result, water scarcity emerged for the first time as a national challenge (National Economic and Social Development Board, 1986). The direction of national water management policy was concentrated on systematic planning of water resource development. Notwithstanding, Sethaputra *et al.* (2001) state that this guidelines were not implemented thoroughly, with most agencies still operating independently.

The last national plan relevant to the study is the Seventh National Economic and Social Development Plan (1992 – 1996), which foresaw increased water demand both nationally and at basin level. By the early 1990s, conflicts were already apparent among users with different objectives, including water for agriculture, household consumption, and for industrial use resulting from the country’s extremely rapid economic expansion, while the administrative efficiency and the water procurement capability had not been sufficiently improved (National Economic and Social Development Board, 1991). As a result, Thailand was confronted with water resources management problems at two scales. Nationally, Thailand had problems with water policy and planning, budgeting the overall administrative framework and disseminating information. At basin scale, problems were evident with fragmentation of agency responsibilities, lack of proper management mechanisms and inadequate participation of stakeholders. Consequently the Seventh Plan set targets for upgrading management of all water resources nation-wide, beginning with the 25 river basins.

These River basin management plans were first initiated in 1994 when the Thai government allocated a budget to study and prepare a strategic plan for water management on the Chao-Phraya River. This was the initial step that reflected the state’s attempt in practicing water management, matching global water management priorities through the Integrated Water Resources Management approach (Bhakdikul, 2005). Thus, after the completion of a preliminary river basin study, a sub-committee was established in 1998 to manage water in the Chao-Phraya basin with the task to set up a permanent River Basin Committee (RBC) (GWP-Southeast Asia, 2009). These RBCs have been rolled out nationally, and typically comprise members from government Departments, state enterprises, representatives of local organizations and water users’ organizations, and stakeholders who work or live in the focal river basins. By 2003, basin organizations had been established in all of the 25 major basins.

Kaewkulaya (2004) identifies that because of the lack of coordination among agencies, the Thai state decided to establish a central agency in water resources management in order to formulate plans, coordinate plan implementation and carry out other works concerning management of water resources. This became the National Water Resources Committee (NWRC), established in November 1996, and chaired by the Prime Minister with membership drawn from civil service permanent secretaries, heads of state enterprises, representatives of water user organizations of all sectors, technical experts, and representatives of non-government organizations (see Figures 4.3 and 4.4).

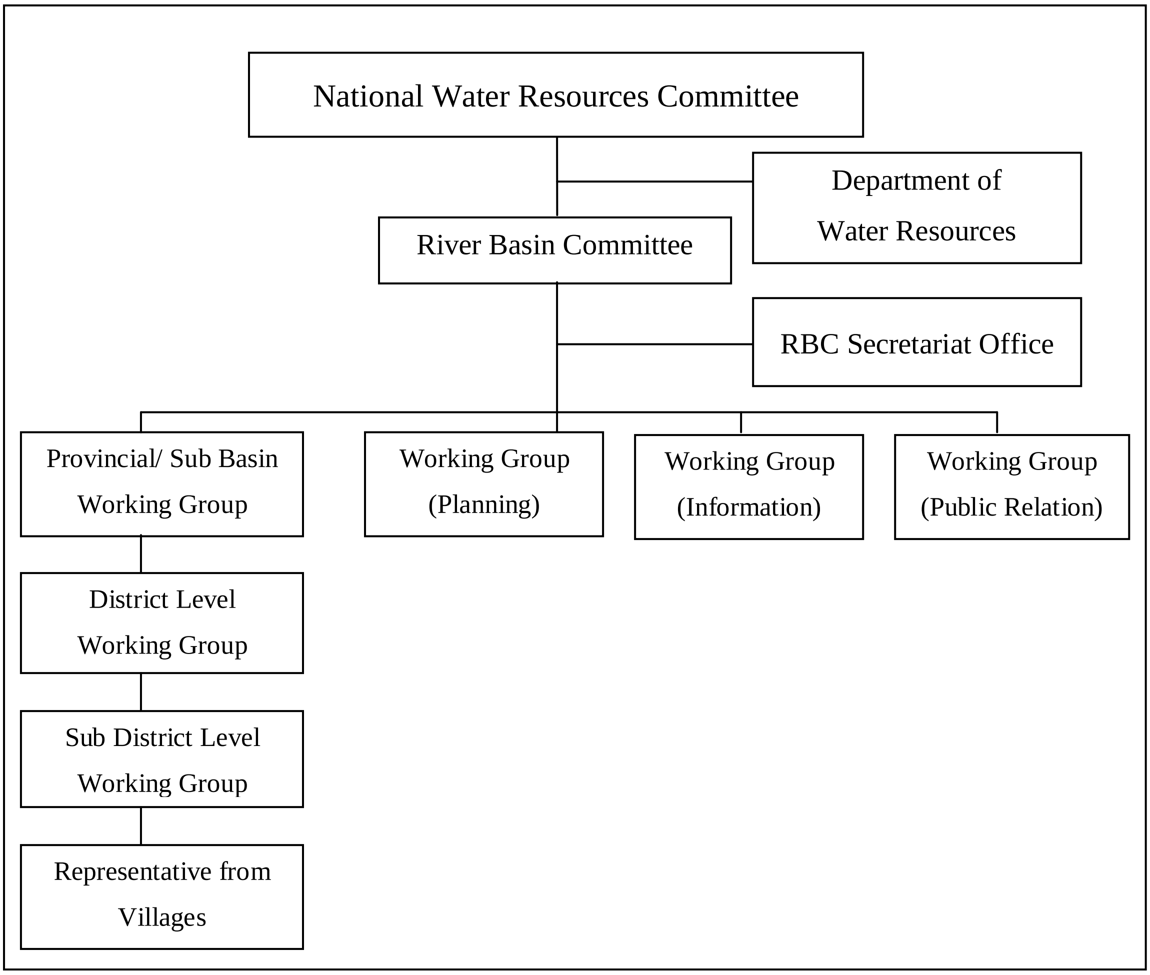

Figure 4.3: Structure of river basin organization

Source: Pattanee (2008)

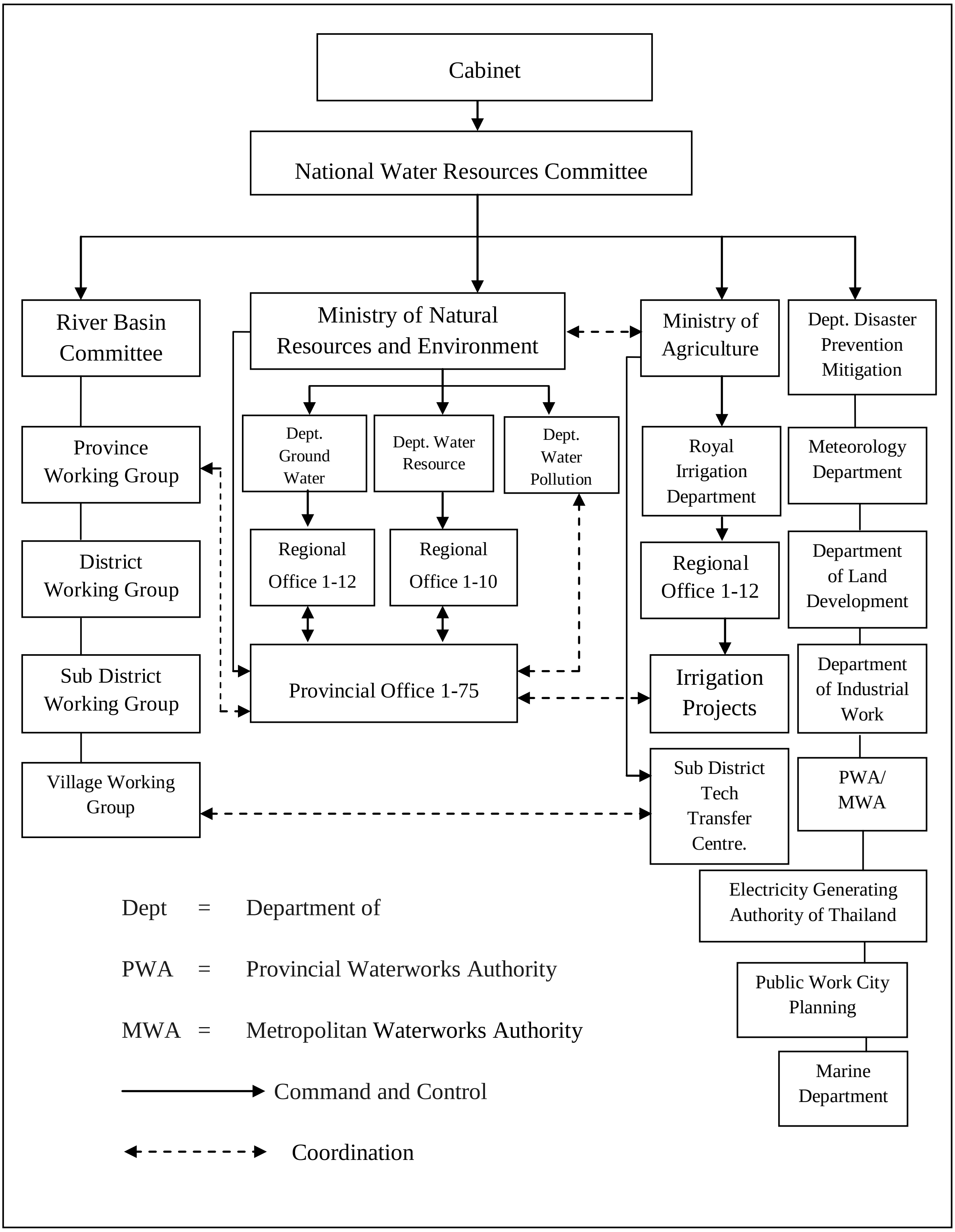

Figure 4.4: Structure of national water management

Source: Pattanee (2008)

Under the seventh National Economic and Social Development Plan, the state has sought to encourage more efficient use of water and to recognise supply of irrigation water is increasingly limited and often falls short of fulfilling demand (Table 4.1). One measure considered was the charging of water fees in irrigated agricultural areas, and the setting up of a water utilization and delivery system to distribute water from the main waterways down to the farm level. Farmers who used this water were encouraged to participate in the planning of water distribution and maintenance of the distribution system at the farm level (National Economic and Social Development Board, 1991). However, Sethaputra *et al.* (2001) note that by the end of the Seventh Plan, water resources management in Thailand had not changed significantly since water supply and distribution is operated as an open-access system whereby water can be consumed free of charge by all economic sectors, especially agriculture.

Table 4.1: Progress and trends in water resource development, 1962 – 1996

National Economic and Social Development Plan	Irrigation area (square kilometre)	Percentage of irrigation area over total area	Capacity (million cubic metre)	Percentage of increasing in capacity over previous year
First Plan	16,000	3.031	14.472	n.a.
Second Plan	17,600	3.418	15.079	4.19
Third Plan	24,000	4.484	24.347	61.46
Fourth Plan	25,600	4.939	25.462	4.58
Fifth Plan	30,400	5.834	28.669	12.60
Sixth Plan	33,600	6.458	30.200	5.34
Seventh Plan	35,200	6.760	31.662	4.84

Source: Budhaka *et al*. (2002)

In summary, irrigation development for supporting national agriculture can be divided into three activities, namely: water management at on-farm level; water management through new infrastructure provision; and water management through allocation (ie. at river basin scale). Regarding on-farm water management, RID have organized water user groups with the intention of bringing greater coordination to agricultural water use for the state through registered organizations, i.e. water user's cooperative or water user's association. At infrastructure level, operation and management staff were appointed in RID to take care of the new irrigation facilities financed and constructed by the government. A project engineer was made responsible for overall project water management. A continuous flow system in main canals and lateral canals was made standard operational practice, important in a country with a tropical climate. In principle, water management was based on partnership between RID and water users (Palayasoot, 2005). Lastly regarding management of water resources, RID's Head Office and RID's Regional Offices were responsible for water allocation among the irrigation projects through sharing of the common water resource. Allocation of water was based on the available amount of in-flow, demand from various water users, and other factors including lag time for released water to reach intake facilities, and need for discharge to raise water levels. At the national scale, the National Water Resources Committee (NWRC) now holds responsibility for water resources development and management alongside their counterparts in provincial government. Furthermore, Committees for River Basin management have begun to be established in some basins (Palayasoot, 2005).

The resulting new paradigm of centralized water management has impacted greatly on the traditional *muang fai* system, particularly in northern Thailand. Cohen and Pearson (1998) acknowledge that after the expansion of the state irrigation projects, intensive agriculture began to rapidly expand with assistance from government. Farmers grew tobacco, soybeans, peanuts, onions, garlic, vegetables, peppers, and rice in the dry season and in either double or triple cropping sequences. Some of the most intensive cultivation methods (triple cropping) took place in areas irrigated by communal systems. These inevitably exacerbated conflict among farmers, given that more and more farmers were competing for scarce water resource. Sittilert (2003) reported that new large state-funded irrigation projects constructed in many major river basins could provide water for intensive and diverse crop cultivation all year round. Consequently, many farmers abandoned their weirs. Cohen and Pearson (1998) point out that *muang fai* became increasingly dependent on the state for technical and financial assistance for weir maintenance, due to the mounting difficulties farmers faced in carrying out annual weir repairs; the competing labour demands of multiple cropping, and the rapid depletion of hardwood and bamboo materials caused by deforestation. Also, there were needs for state intervention to resolve irrigation disputes and to build large reservoirs to provide supplementary water during the dry season. These changes further increased the state's 'control and command' approach to water management.

Indeed 'command and control' water management developed substantially in the mid-late 1980s, with the introduction of several government agencies that figured in national and local water management, as follows:

- Ministry of Natural Resources and Environment (MONRE), with main departments namely Department of Water Resources (DWR) and Department of Groundwater (DGR), Pollution Control Department (PCD) including Wastewater Management Authority (WMA).
- Ministry of Agriculture and Cooperatives (MOAC), including two main departments – Royal Irrigation Department (RID) and Land Development Department (LDD).
- Ministry of Interior (MOI) including Metropolitan Waterworks Authority (MWA), Provincial Waterworks Authority (PWA), and a number of local government agencies (LGAs) - such as municipalities.

- Ministry of Industry (MOInd) including Industrial Estate Authority of Thailand, and Department of Industrial Works.
- Ministry of Energy (MOE) including Electricity Generating Authority of Thailand

As a result, irrigation management in all regions has now been subject to centralization processes for more than thirty years with the sole aim of increasing commercial production and export opportunities. *Muang fai*'s persistence in the face of this change testifies to the presence of strong local social organization, local development capacity, and local social and political force (Tan-Kim-Yong, 2000). Having established recent drivers for centralizing water management functions and capacities within Thailand, in the following section I consider the need for developing more flexible and adaptable water management approaches nationally.

4.4 Water as a source of complexity, uncertainty, unpredictability and conflict: a role for adaptive governance?

Between the Eighth National Economic and Social Development Plan (1997-2001) and the Eleventh National Economic and Social Development Plan (2012-2015), the Thai state has adjusted the state's strategic focus to take account of encouraging greater public participation at all levels of state projects under the 'good governance' principle, with the aim of achieving sustainable development in all sectors, including water management (sustainable water management was in fact first raised as a government aim in the Eighth Plan). With these National Plans, development decisions, implementation and relevant powers are intended to become more decentralized to local scales. In effect, the state is seeking to build a new role for itself not as the central decision-maker, but as a facilitator of public policy on water instead.

The Eighth National Economic and Social Development Plan was the first step towards adopting this new approach by creating an 'enabling environment' for wider societal participation. This changed emphasis arose following realization that growth had negative impacts on national culture, traditional ways of life, community, family and social values (National Economic and Social Development Board, 1996). There was little coordination among related agencies, which in a few cases results in overlapping project areas (Sethaputra *et al*., 2001). The involvement of the local population was very limited, often causing misunderstandings between line agencies and local groups.

Consequently the rhetoric on irrigation changed, shifting from 'command and control' to 'people-centered development'. The planning process was also shifted from a compartmentalized to a more holistic approach. To attain these new objectives and development targets, the concept of 'good governance' was introduced into state discourse on water as a basis for strengthening the relationship between government and people, through collaborative and participatory efforts (National Economic and Social Development Board, 1996). The second strategy was to reform the development process regionally, through encouraging greater integration of functions and more participation by all stakeholders, improving the efficiency of public government agencies at the central level, and introducing a new set of development indicators suitable for the monitoring and evaluation of holistic development (National Economic and Social Development Board, 1996).

These changes sought to encourage greater participation by local people and communities in irrigation management. To reach this objective, there was expansion of the public sector's role in promoting participation in irrigation management, development of information networks on natural resource and environmental conservation, and provision of greater opportunities for local communities and people to participate in irrigation. For example, in Part 6 Chapter 3 of the Eighth National Economic and Social Development Plan the Government set out strategic objectives to expand the public sector's role in promoting popular participation in natural resource and environmental management by changing the attitudes of government officials, and by upgrading the capacity of relevant government agencies for effective cooperation with and facilitation of local communities in conservation of natural resources and environments, in such a way that they will be of real benefit to these communities (National Economic and Social Development Board, 1996, p.115).

This new emphasis on public participation also affected national irrigation. The goal of irrigation was changed from a quantitative orientation, to a more qualitative approach (the so-called "Sustainable Development Approach" – Water Management Development Group, 2003, p.19) by encouraging the use of "more appropriate technology". The main supporting legislation was amendment of the Constitution of the Kingdom of Thailand (1997) concerning community rights and power.

National water management strategy is now based around the following guidelines (Budhaka *et al*., 2001):

1. Organizing supervisory and coordinating mechanisms for the development of water resources at both national and river basin levels in order to ensure consistency and continuity in the work of all related agencies.

2. With the participation of all parties concerned, setting up appropriate systems at various levels for the allocation of water resources between the various types of water consumer, based on the principles of necessity, priority and fairness.

3. Collecting fees for water from industrial and agricultural producers and from domestic consumers. The price structure for domestic consumption and industrial usage will be adjusted to properly reflect the real cost of procurement, production, distribution and wastewater treatment.

4. Improving the transmission and allocation systems for both irrigation and domestic usage in communities, in order to minimize wastage of clean water through leaks.

5. Conducting public information campaigns to promote thrifty and effective use of water, encourage the use of water-saving devices and the re-use of cooling water and treated wastewater in some industrial activities.

The Ninth to Eleventh National Economic and Social Development Plans (2002-2012) sought to further this shift from the supply-side approach to the demand-side strategy for irrigation, concentrating on the organizational and institutional aspects in order to reduce costs while promoting sustainability and environmental conservation. A comprehensive overall basin water management strategy has now been substituted for a project-by-project approach. This strategy was formulated by integrating institution, policy, legal and technical measures, and attempts to provide guidance for the systematic development, management and protection of river basin water resources in order to meet the increasing demands of socio-economic and population growth in the basin area. Incentives, regulations, permit restrictions, and penalties that helped guide and convinced the people to use water efficiently and equitably were also established to recognize that water was a tradable commodity. The government also tried to create an institutional framework of water administration with users' participation by transforming its strategy and operating style in order to give the opportunity to stakeholders, especially local people, to participate in water resources management. Lastly, the private sector was encouraged to play a more important role in water resources management, especially concerning wastewater in urban areas.

These amount to substantive changes in national government policy on water resource use, including irrigation, and clearly require a radical reappraisal and reorganization of government agencies and national water management priorities. In particular, RID as the main government agency responsible for irrigation development and management to supply water demand in agriculture activities, industry use and domestic consumption, has had to change radically its roles to meet these reformulated national objectives for water use and supply. RID's main response has been to introduce the concept of "Participatory Irrigation Management" (PIM) (Figure 4.5). PIM seeks to satisfy the irrigation needs not only of farmers (WUO), but also local administrative organizations (Provincial Administrative Organization (PAOs) and *Tambol* (Sub district) Administrative Organizations (TAOs). Therefore, PIM seeks to address the new national decentralized water management policy (Water Management Development Group, 2003). Clearly this pattern is very different from the previous driver of national policy, where emphasis was placed on engineering aspects for headworks and main water distribution systems with little importance attached to on-farm facilities development, water management, and water users' organization and irrigated agricultural activities. The country is now committed to taking PIM forward (Palayasoot, 2005).

As a result, irrigation operation and maintenance is now focused on the participation of water users over the efficient use of irrigation water. There are three types of PIM, including participation pre-irrigation construction, during construction, and post construction (Water Management Group, 2003). PIM assumes that the success of water management in irrigation project depends on the active participation of individual water users or members of WUOs. However, Palayasoot (2005) disputes this approach, claiming that most WUOs are not strong enough due to lack of active local leadership, and weak administration and management.

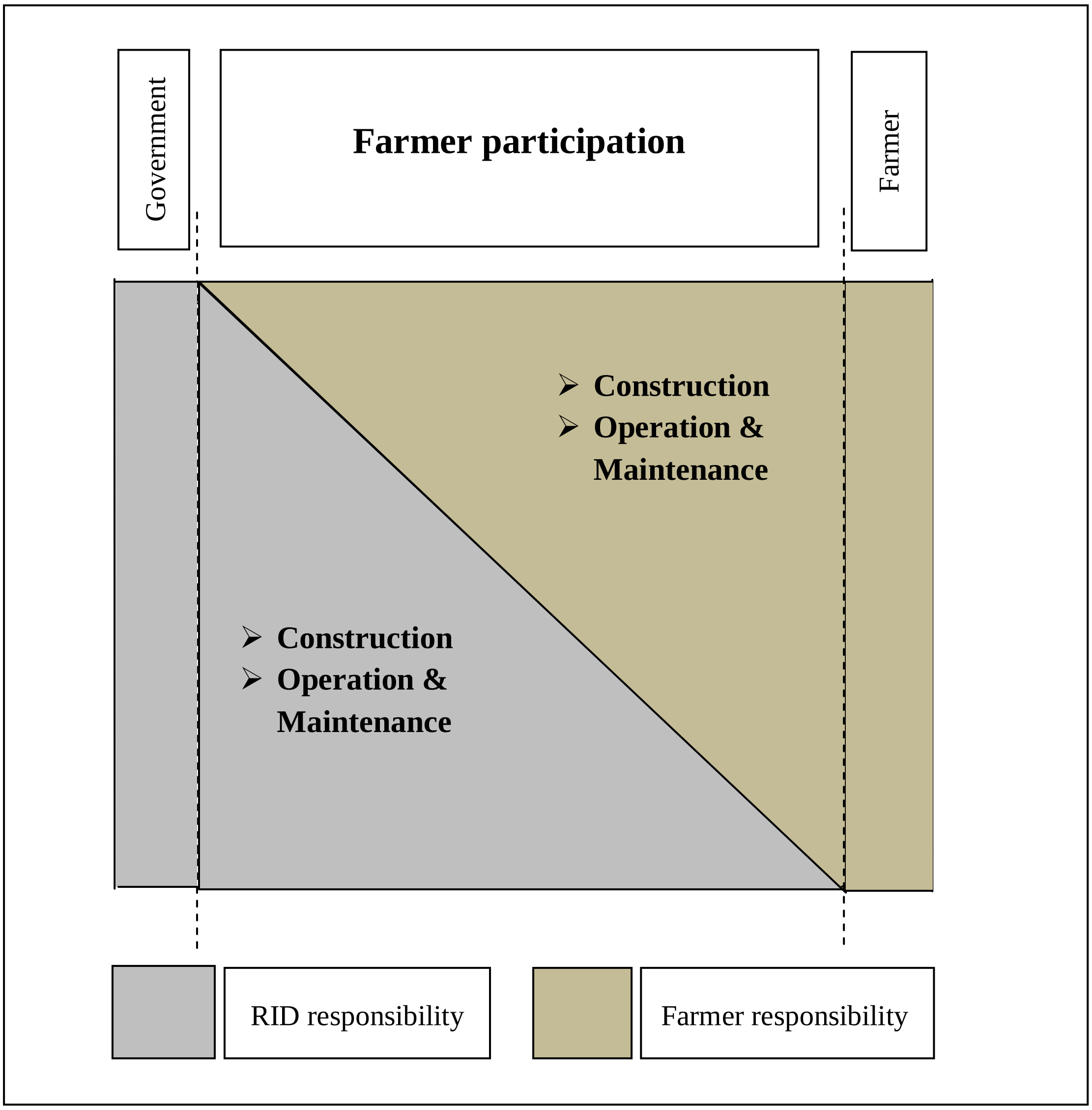

Figure 4.5: Participatory Irrigation Management

Source: Water Development Management Group (2003)

In conclusion, the Eight and the Eleventh National Plans have concentrated on improving the performance of government agencies, including RID, to achieve the principle of good water governance; and on encouraging greater stakeholder participation in water management.

It is these recent developments in water management that provide the context for my empirical examination of changing patterns of water governance at the provincial scale, focused on Chiang Mai province in the north west of the country. In particular, by focusing upon the seven research propositions set out in Chapter 3, I seek to establish how far the new top-down objectives for PIM are being realised locally and regionally; and how existing local water politics have mediated and moderated this new approach to irrigation management.

4.4 Conclusions

The Thai national water management paradigm has changed significantly from 'managing people to suit water conditions', such as in *muang fai*, to 'supply-side management' with water used as the country's principal driver of national economic policy between the First to the Seventh National Development Plan. As a result, water and irrigation development and management has come under the 'command and control' of state agencies, which have invested heavily in irrigation infrastructure. The effect on agriculture has been to radically transform traditional farming systems towards intensive production practice, causing conflict with other water users, and dependence on government assistance. At the same time, due to centralized water management, national water policy and legislation has increased dramatically, resulting in fragmented, overlapping, and often conflicting agencies and water competencies, as well as changed organizational goals and responsibilities. PIM as a form of adaptive governance, then, potentially offers a mechanism for returning people to the centre of water practice and policy development as they have rights to participate in and monitor all management sectors performance, based on good governance principles.

The next chapters examine both state-led and traditional forms of water management, enabling comparison to be made between stated government policy and the actual practices in irrigated agriculture at the provincial and local levels.

CHAPTER 5: SOCIOSPATIAL RELATIONS AND WATER MANAGEMENT IN CHAING MAI PROVINCE, NORTH WEST THAILAND

This Chapter examines the research propositions of Chapter 3 relating to sociospatial interactions in water management in north west Thailand (Propositions 1-3 respectively). The Chapter begins by identifying the day-to-day experience of water users in the MTIP and two *muang fai* (MRRW and KMTW) irrigation systems, as a foundation for evaluating the three research propositions.

Primary data for the Chapter was derived from fieldwork, conducted among farming communities and policy officials directly involved with both state-led and *muang fai* modes of water governance in Nam Bo Luang, Chiang Mai province. Data collection was gained from participant observation, and through conducting semi-structured in-depth interviews (focused on key themes of sociospatial relations and water management at various scales, positions and places) during 2010 and 2012 with representatives from WUGs and local irrigation systems, officials from MTIP, as well as agricultural communities in eight villages in Nam Bo Luang.

Each proposition is tested through detailed examination of primary data, collected using various research methods (see Chapter 3), and is used as a basis for validating documentary evidence, presented in Chapter 4, on the influence of the nation state on local water management practice. Verbatim responses from interviewees are used to evaluate current interactions between water user group and communities at the local scale with state organizations at other scales in the study area. These results are then subjected to further validation through interview and group discussion with ‘water policy practitioners’, reported in Chapter 6. The critical issue of how space and governance furnish particular mechanisms to facilitate transition to more sustainable water management in the Thai north west is then considered in Chapters 7 and 8.

5.1 Contemporary water governance modes in Chiang Mai province, Thailand

Currently water management in Chiang Mai has two distinctive governance modes. The first is state-sponsored water management, chiefly overseen by government agencies, notably Thailand’s Royal Irrigation Department (RID). The second is the *muang fai* system of water management, discussed in detail in Chapter 4, where local communities manage water and associated irrigation infrastructure through a diversity of long-established collective approaches (Cohen and Pearson 1998; Bastakoti and Shivakoti, 2005). State intervention in irrigation has transformed water infrastructures as well as altering (and, in many cases, reducing) the participation of farming communities in water management (Budhaka *et al.*, 2002; Palayasoot, 2005; Turral *et al.*, 2010). Thus across the province there is an emergent water politics, fuelled by the Thai state’s modernisation goal of addressing the water demands of urban areas in preference to *muang fai’s* sole aim of serving local agricultural needs. Resulting conflicts have greatly reduced water availability for paddy rice cultivation and exacerbated tensions among water users (Walker, 2003). This development context poses substantial challenges to provincial water management. The following sections examine these in detail, from the perspective of local agricultural communities directly affected by decisionmaking through state-led and *muang fai* irrigation systems.

5.1.1 State-sponsored water governance: the case of IWUG Zone 10

As set out in Chapter 4, over the last decade the Thai state has become increasingly involved in modernizing water management practices in response to the declining volume of the Mae Taeng River. This has occurred partly because of the dramatic increase in leisure and tourist-related activities abstracting water for their own purposes. Ironically, government agencies (many of which are situated along the bank of the main irrigation canal) have also engaged in large-scale abstraction, further reducing the volume of water allocated to agricultural users.

The Mae Tang Irrigation Project (MTIP) is one of the modern irrigation programmes in north west Thailand introduced under the First National Economic and Social Development Plan (see Chapter 4). Under its terms, RID replaced three local weirs on the Tang River and five weirs on the Ping River, with the goal of supplying irrigation water for agriculture in five districts of Mae Tang, Mae Rim, Muang Chiang Mai (City Centre), Hang Dong, and San Pa Tong.

One of the country's larger irrigation projects without reservoirs, the MTIP office and its headworks are situated in Mae Tang District, Chiang Mai. 'The project', as it is known to farmers, abstracts water from the Tang River (a tributary of the Ping), into a single irrigation canal that supplies water to a land area of 186.4 square kilometres. The Tang River has its maximum water volume estimated at 800 cubic metres per second and the minimum volume at two cubic metres per second. Average annual rainfall in the province is approximately 1,103 millimetres per year (Mae Tang Irrigation Project, 2010).

The MTIP is a dense irrigation network. The main canal is 74.6 kilometres long, 35.6 kilometres of which are concrete and 39 kilometres earth. There are 23 laterals and 38 sub-laterals, with a total length of 239 kilometres (see Figure 5.1). In addition, there are 910 ditches of 759 kilometres length, and 38 ditches for excess water (119 kilometres). In total there are 1,066 weirs, pumping stations and others structures across this extensive network.

As befits its original goal, the main aim of the MTIP is to support agricultural activities, domestic water consumption and secondly to underwrite tourism activities. Thus as well as serving farming needs, water from 'the project' is used by Chiang Mai Provincial Waterworks Authority, and government and private agencies, including Chiang Mai and Chiang Mai Rajabhat Universities, 41st squadron of The Royal Wing of the Thai Air Force, the Royal Livestock and Arable Farm Department and Chiang Mai municipal authorities.

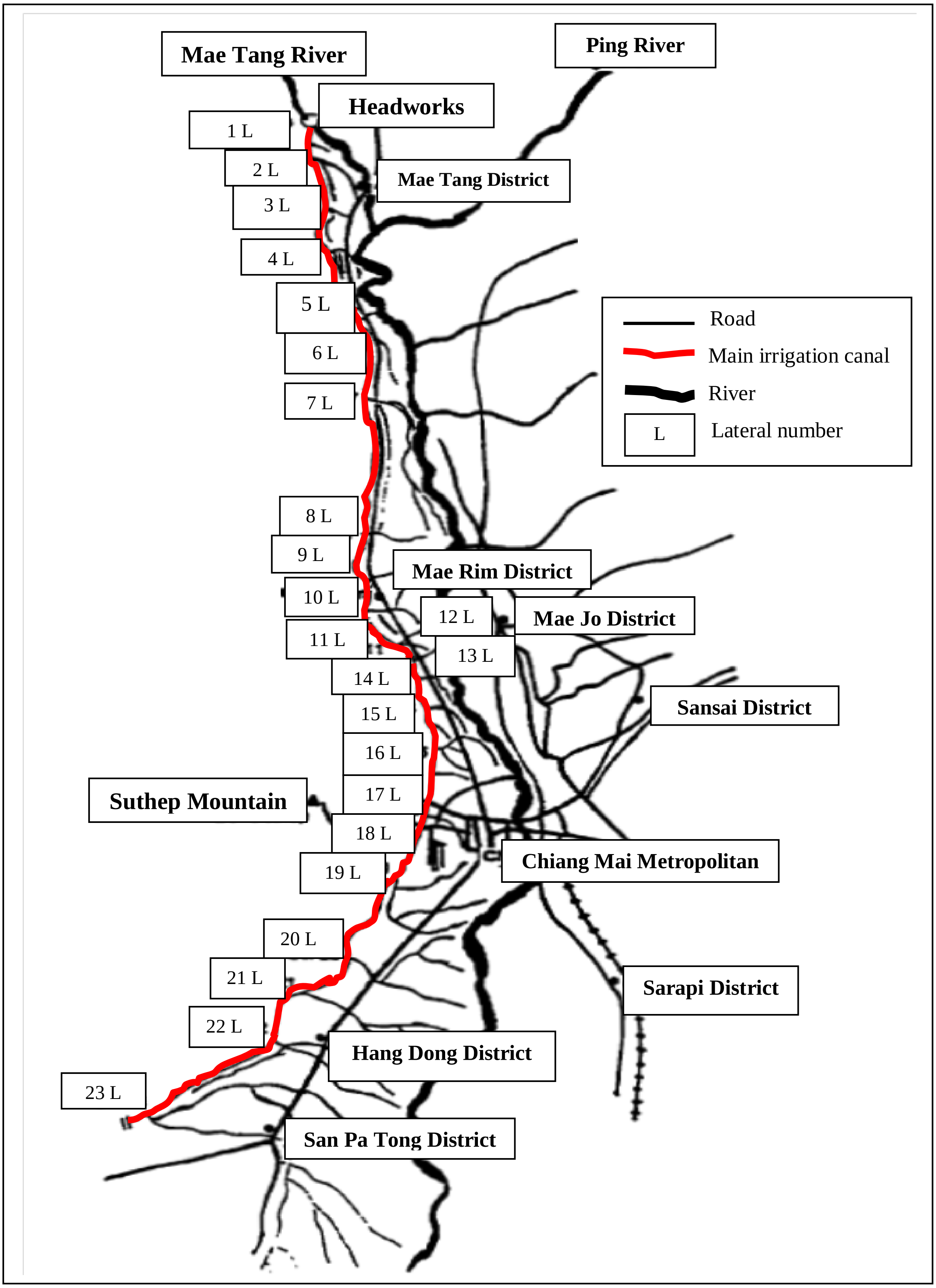

Figure 5.1: Boundary of Mae Tang Irrigation Project

Source: Adapted from Mae Tang Irrigation Project (2010)

Supplying water for the urban and industrial sector was not originally a responsibility of 'the project', but has become so recently as a result of continued rapid economic growth of the Chiang Mai metropolitan area. The large scale of water abstraction by non-agricultural users is exemplified by Chiang Mai Provincial Waterworks Authority, which accounts for around 4.32 million cubic metres per annum from MTIP for urban consumption, government agencies and academic institutions (Mae Taeng Irrigation Project, 2010). Tourism activities and military bases are also big consumers.

A project engineer is responsible for overall management of the MTIP, while the Chief of the Water Distribution and Maintenance Division is answerable for management of the lateral channels off the main irrigation canal. Until 2010, there were two types of organization involved in agricultural water allocation and irrigation management in the MTIP. First was the water user group (WUG). Each WUG is tasked with managing a defined sub-section of the overall canal network. Farmer membership is not formally arranged, but is an essential pre-condition for them to receive water. Once WUGs have enough members to manage their own needs, they can link together along the same lateral to establish the second type of organization, an integrated water user group (IWUG). IWUGs oversee a substantial length of the canal network, or a defined sub-area of the project network (see Figure 5.2).

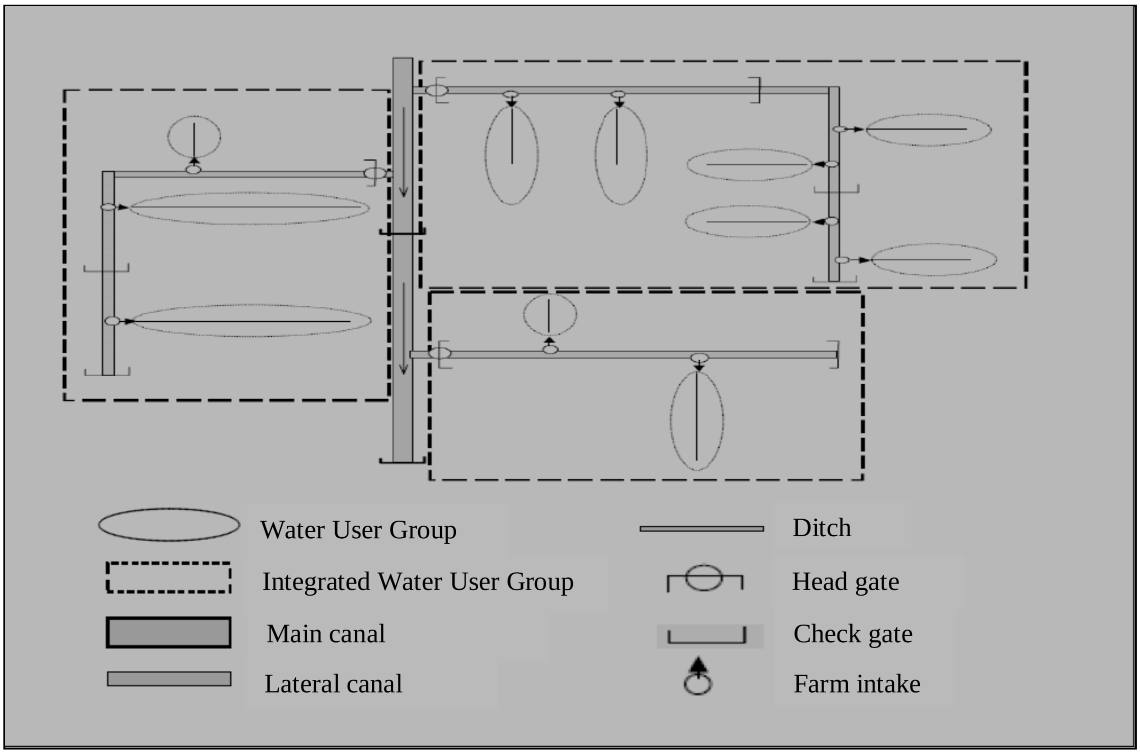

Figure 5.2: Water Users' Group and Integrated Water User Group responsibilities and organization

Source: Water Management Development Group (2003)

IWUG Zone 10 – a focus for empirical research in this thesis – is typical of other IWUGs across the province. This IWUG oversees water management in two channel systems, which deliver water from Lateral 23 of the main canal to rice fields amounting to a total irrigable area of about three square kilometres. Its irrigated area covers four villages in Nam Bo Luang Sub District, namely Rong Wua, Nam Bo Luang, Ton Kaew, and Nong Wai. Each channel system has an irrigation manager and a couple of administrators to facilitate water use for members by looking after general paperwork and supervising irrigation operations. These managers are in charge of repairing irrigation structures, opening and closing canal gates and sluices, maintaining these (see Figure 5.3) in proper condition, handling water conflicts and problems among members, and informing the zone assistant of water distribution and maintenance needs. They also work alongside the zone assistant in the 'project' structure, whom is responsible for supervising water distribution to laterals and ditches. IWUG activities are informed by the prevailing water modernization paradigm of RID, characterized by Lebel *et al*. (2009, p.137) as "a centralized technical bureaucracy diligently pursu[ing] visions in which it br[ings] standardization and orderliness to diverse locally managed irrigation and rain-fed farming systems".

Figure 5.3: Focal irrigation systems in the IWUG Zone 10 area

Source: Author

This has brought about a step-change in agricultural productivity, but increased water abstraction by non-agricultural sources means water supply now has to address multiple and often conflicting demands.

Increased agricultural intensification has also meant that water allocation now has to be regulated throughout the year. Typically, irrigation water is allocated at roughly 24 cubic millimetres per second in the wet season, falling to around two cubic millimetres per second in the dry (author's interview). Inevitably, this influences farmers' production yields and profitability. Nonetheless in theory all irrigation channels should be able to provide water through the year, with IWUG officials disseminating information (specific date and time) to farmers on its day-to-day availability. From interview testimonies, members abstract water on an hour-by-hour basis when it is extremely scarce.

Usually, 'project' staff will inform farmers about the water volume they will receive and let them know when water will be released. However, even though project administrators provide accurate information to farmers on the date and times of opening sluices to each lateral, members still compete to use their allocated water. Most members are also not content with their daily quota. So to request irrigation, members contact their manager who then informs the zone assistant, the head of Water Distribution and Maintenance Zone 4, and the chief of the Water Distribution and Maintenance Division at the headwork. These officials confer before a decision to open sluices is taken. Although 'the project' has reasonable allocation capacity, disputes over water from among user groups at different laterals, as well as urban demand and the requirement of government agencies, always occur during the dry season[2].

As well as ‘the project’, sub-district administrative organizations also play an important role in assisting water allocation in times of shortage and in dredging lateral irrigation channels when these become silted up in the rainy season. This role was formalized legally in 2010 under the law of transferring irrigation work to local government, enacted only after intense public lobbying by WUG members. However, as the Chief of Water Distribution and Maintenance Division acknowledged in interview, while the sub-districts “*assist farmers by providing fuel for water pumping, the main reason behind it is to secure their support during provincial and national elections.*”

Based on this overview, Figure 5.4 clarifies the complexity of water governance arrangements at local scale in northern Thailand. ‘The [Mae Taeng Irrigation] project’ emphasises structures, roles, and programmes that are formulated nationally and extend downward to the study area. Certainly there are national benefits from this ‘top-down’ decision-making in that all local areas are treated identically. But increasingly, the different geographic conditions, water demands, and knowledge sets of localities are proving to be out of step with these hierarchical arrangements (Thomas, 2006). Thus in IWUG Zone 10, when farmers are confronted with water allocation problems, in practice they must notify project officers and await solutions. Clearly this lack of

[2] In an attempt to resolve these, in 2010 th Chiang Mai Office (in collaboration with RID and project officials) set up the Joint Management Committee for Irrigation (JMC) (Figure 6.4 and 6.5), to bring together representatives from all provincial water users including the 9th Regional Office of the Provincial Waterworks, The Chiang Mai Night Safari, The Royal Flora Ratchapruek Chiang Mai, His Majesty’s Northern study Centre of Sustainable Economy. I examine the role of the JMC in Chapter 6.

delegated powers is a major obstacle to solving water management problems in a timely fashion and in a way that meets local stakeholder needs.

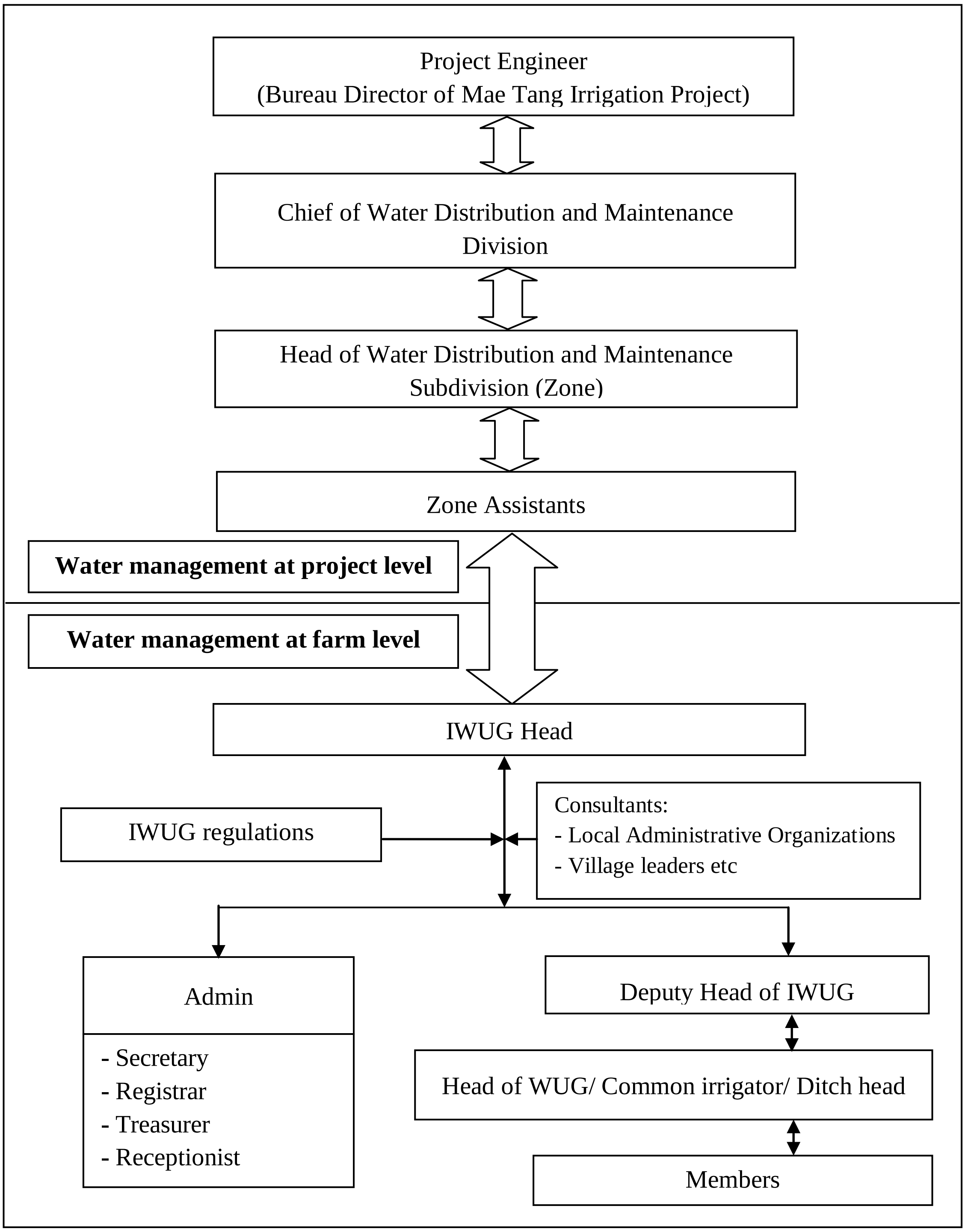

Figure 5.4: Structure of the Mae Tang Irrigation Project

Source: Author's interview

5.1.2 *Muang fai* irrigation: Mai Ray Ror Weir and Kor Mai Tun Weir

The traditional form of irrigation in Chiang Mai, *muang fai*, sees water drawn from the Mae Khan river, which flows parallel to the Mae Taeng Irrigation Project's main canal. Two weir systems were the focus of research in this thesis, on account of their specific characteristics (see Chapter 3). These weirs are Mai Ray Ror Weir (hereafter MRRW) and Kor Mai Tun Weir (KMTW). MRRW and KMTW were built by communal efforts over 100 years ago from locally sourced materials (chiefly rocks, boulders and bamboo). Subsequently both have been partly rebuilt using concrete (Figures 5.5 and 5.6). MRRW is 50 metres wide, and the main canal about five kilometres long. The headwork is at Hua Fai village, and has an irrigated area of 1.12 square kilometres servicing the irrigation needs of around 200 farmers.

Figure 5.5: Mai Rai Ror Weir and its irrigation systems

Source: Author

KMTW’s concrete rebuilding was undertaken for the villages by the Department of Agricultural Extension. This weir is 54 metres wide, with a 10 kilometre long main canal. Water from this weir supplies 1,000 members over an irrigated area of about 1.6 square kilometres.

Figure 5.6: Kor Mai Tun Weir and its irrigation systems

Source: Author

Irrigation management for both weirs is conducted entirely independently of ‘the project’, via irrigation committees and farmers’ water groups. These irrigation committees consist of three-four members: a weir chairman, a weir chief (a village representative), and two or three more villagers, acting as weir chief assistants and farmers' representative (see Figure 4.2). Local committees are responsible for weir management and repairs, and for allocating water among members according to need. The committee and farmers' water group draw up regulations for water use, and set out conditions for repairing weirs. Each member must agree to abide by the regulations, which are numbered and signed off by them in a document called a weir contract. This sets out the responsibilities of the committee and the rights, duties and responsibilities of members. In turn, these rights and responsibilities are derived from historical experience and traditional forms of knowledge acquisition which contrast strongly with the modernization paradigm discussed in Chapter 4. From farmer interviews, *muang fai* knowledge sets emphasize decentralization, intuition on the part of farmers, responsiveness to natural environmental rhythms and seasonal cycles, and promotion of local variety and biodiversity.

The chair and weir chiefs are elected by their members, while the rest of the committee is appointed by their respective villages. With the help of assistants, the weir chairman organizes meeting dates, schedules necessary repairs and dredging works, water allocation, manages disputes and works in a supervisory capacity. Assistants also help manage the irrigation system and disseminate information to the membership. Water management at the main weirs is the responsibility of the chair, while at the field level, it is the role of respective weir chiefs, their assistants and farmers. Activities here are similar to those of the main weirs, consisting of canal work, water allocation and agreeing and enforcing regulations. Where laterals branch into minor channels delivering water into paddies, farmers are effectively in complete charge, without committee involvement.

Generally, the weir chairman can release water to members' farms without difficulty. The committee allocates water according to availability in each season, which is broadly similar to the water management of 'the project'. On the other hand, when water volume is scare, water rotation is selected to deliver to the irrigated area. The volume of water which each farmer receives depends on the area of land owned. Thus, before each member will receive water, a report of farm size owned by each member is sent to the weir chief. After that the weir committees will inform each member of the width of the sluice (*tang nam*) they are permitted to use to allow water flow into their rice fields. The sluice width also depends on the area of land owned.

Overall, this localized and traditional form of water governance emphasises individual participation in water allocation and delivery. The role of communal decision-making is also prioritized, in contrast to the WUGs and IWUGs of the MTIP. Yet development pressures and growing demand for water in Chiang Mai means state-society relations within water management are interlocking and co-produced. Crucially, from this brief overview of the two governance modes, *both* suffer in terms of their reduced capacity for learning, lack of knowledge sharing, and the need for coordination between them if more sustainable patterns of water management are to be realised.

In order to establish how and in what ways spatial characteristics might be affecting the emergence of more sustainable water management, I now examine the three research propositions set out in Chapter 3 relating to the role of sociospatial relations in the operation of water governance locally. A central focus of the Chapter is then how space delimits existing stakeholder positions on water management within and across scales.

5.2 Politics of scale, position and place in state-led and traditional water management systems

From the preceding description of the two systems of water governance, it is clear that space not only creates material advantages and disadvantages in water allocation. It also acts as the *arena for contestation* between different rules, administration, bureaucracy, and institutions that, potentially, could deliver more sustainable water management.

Hence, based on the theoretical work on sociospatial relations set out in Chapters 2 and 3, I argue that geographical scale and location influence water allocation and delivery, and, moreover, that place-specific values, beliefs and norms also affect day-to-day water management priorities. Clearly therefore, there is a need to examine how individuals and communities interact with each other over water management at different scales, positions and places. This is the focus of Propositions 1, 2 and 3, which address directly Lebel *et al's* (2005) argument that considering these different sociospatial concepts together can help the process of devising more sustainable water management strategies.

In order to evaluate how sociospatial relations affect different patterns of water management, in this section I examine empirical evidence to support or refute Propositions 1-3 of Chapter 3. I begin by testing evidence to confirm or refute Proposition 1.

5.2.1 Scale and actor relationships (Proposition 1)

Proposition 1 states “Scale defines actor relationships in terms of actors accepting or challenging norms and beliefs pertaining to water management, and participating in new water management arrangements”. It focuses on whether scale shapes relationships between actors over water management, and consequently how scalar relations might affect their participation in new governance arrangements.

From the analysis of national water management evolution and irrigation development in Chapter 4, water management policies are clearly formulated by central government, with the Thai state acting as ‘supply-side water manager’ (TDRI, 1990). The state’s goal has been to expand agricultural production to increase the country’s GDP. To do so, the state has created multiple scales and levels of irrigation management, with the aim of making irrigation easier to administer and to assess performance of responsible agencies in irrigation development from the national to local level. Thus scales and levels of water management in the study area were constructed by Thai governments as part of successive National Economic and Social Development Plans (see Chapter 4). It is interesting to note that before the First Plan (1962), farmers were largely unfamiliar with notions of scale, boundary, and level of water management. On this point, the ex-MRRW weir chairman commented:

“Our muang fai system developed because farmers situated near Mae Kan river needed to use water for their agricultural activities. So, weir groups were established to construct irrigation systems, including dykes, canals and ditches to divert, irrigate, and slow down and drain water. These included our weir. This is crucial as it helps divert

water from the river to supply farmers in many villages in Nam Bo Luang and Ban Mae sub-district. Locally, muang fai is the system that spans across the productive areas of the village. In fact, muang fai is a type of organization that links various communities together. Even though there is labour division through water use regulations to manage members, all of us work together on it as a unit. So until recently it could be said that there was no 'scale' or 'level' of water management. Members just focused on the whole picture of muang fai, as it was the traditional system. So, there was no 'zone' or 'scale' dividing us, as is found in the modern irrigation project" (Author's interview, 07/08/2010).

Scale in *muang fai* systems is thus much less important, as irrigated areas are small, compared to the large irrigated expanse of the state-led MTIP (see Chapter 4). Moreover, *muang fai* systems are structured so that local people can afford the time and expense to maintain structures relatively easily, as materials are readily available. *Muang fai* also employs local knowledge and simple technology in every part of its operation, such as delivery systems, water allocation, and maintenance. As a result, farmers can handle their water use demand, as well as relay this knowledge and technology from generation to generation (Tan-Kim-Yong, 1993, cited in Kao-Sa-Ard *et al*., 2001, p.258).

While scales of operation in *muang fai* systems are straightforward, members must negotiate a highly structured system of regulation regarding water use as a condition of being allocated water for their crops. Thus the chairman of KMTW noted that:

"KMTW members have always been treated equally on the basis of water volume allocated. Water users pay an annual fee to me and the weir committees, as we dedicate ourselves to overseeing water management to members – it costs maybe three pence per km^2. Members also need to attend the weir meeting twice a year, one held before the rainy season rice harvest and the other before the beginning of dry season cropping, with the main purpose of informing members of new rules and regulations. After the meeting, annual canal dredging will begin and all members have to help out with this activity. In cases where members are unable to take part, they have to pay a fine of four pounds per day. If there wasn't a fine, it wouldn't be fair on the members who do help dredge the canal. Rules are rules. You have to respect the principles of water management" (Author's interview, 14/09/2010).

However, for the reasons given already, complex scale politics seldom arise in *muang fai* as farmers and weir chiefs rarely need to refer to other scales of management to settle water allocation issues. As the MRRW chairman confirmed: "*Water's used for agriculture and consumption only in our irrigated areas. Luckily for us, we don't need to share our water with others*". This makes it easier for *muang fai* committees to conserve water and to quickly solve problems that arise over water allocation. As a result, allocative decisions are more straightforward than in 'the project'. But the simplicity of this governance mode and its sole agricultural beneficiary also prevents *muang fai* from offering a template for sustainable water management across the province, given growing multiple demands upon water use.

In Nam Bo Luang there are now both *muang fai* and state-led irrigation systems through MTIP. Scaled relationships over water use are different under the MTIP compared to the *muang fai* system of irrigation. MTIP's responsible areas cover four villages in Nam Bo Luang, namely Ton Keaw, Rong Wua, Nong Wai and Nam Bo Luang. All members supplied water by MTIP are in one of its water user groups, IWUG Zone 10. Within this IWUG Zone, four hydrological scales of water management can be discerned (Figure 5.7). The smallest scale is the irrigation ditch, while the largest is the project's overall operational area. Each scale has its own actors and responsibility. In interview, a zone assistant confirmed that:

"As MTIP has only one main canal and has to feed water for five districts in Chiang Mai, the easiest way to do so is to divide this responsibility up between four Water Distribution and Maintenance subdivisions (Zones). The first zone is located at the project headworks, allocating water to Mae Tang and Mae Rim Districts. Water delivery for the second zone goes to part of Mae Rim District and city of Chiang Mai. The third zone is responsible for the rest of Chiang Mai city and Hang Dong District. And the fourth zone delivers water to part of Hang Dong and San Pa Tong District. The project and these zones play important roles in water allocation and infrastructure maintenance at the project level. In addition, we work with all IWUG heads in opening and closing sluices when water delivery rotation is needed in times of drought. Agricultural experts also assist decisiontaking in devising water allocation quotas for farms. We give some advice on how to establish and develop water user groups as well as providing knowledge of how to use water for agriculture efficiently. Apart from this, the project provides some funds to improve delivery and drainage systems, but focuses

chiefly on the project level or main canal. At the farm level, laterals and ditches, water user groups have to devise water allocation with their chiefs and tailor their budget to maintain the systems they have. Project officials do not get involved at this level, unless there are problems that the groups cannot resolve" (Author's interview, 02/09/2010).

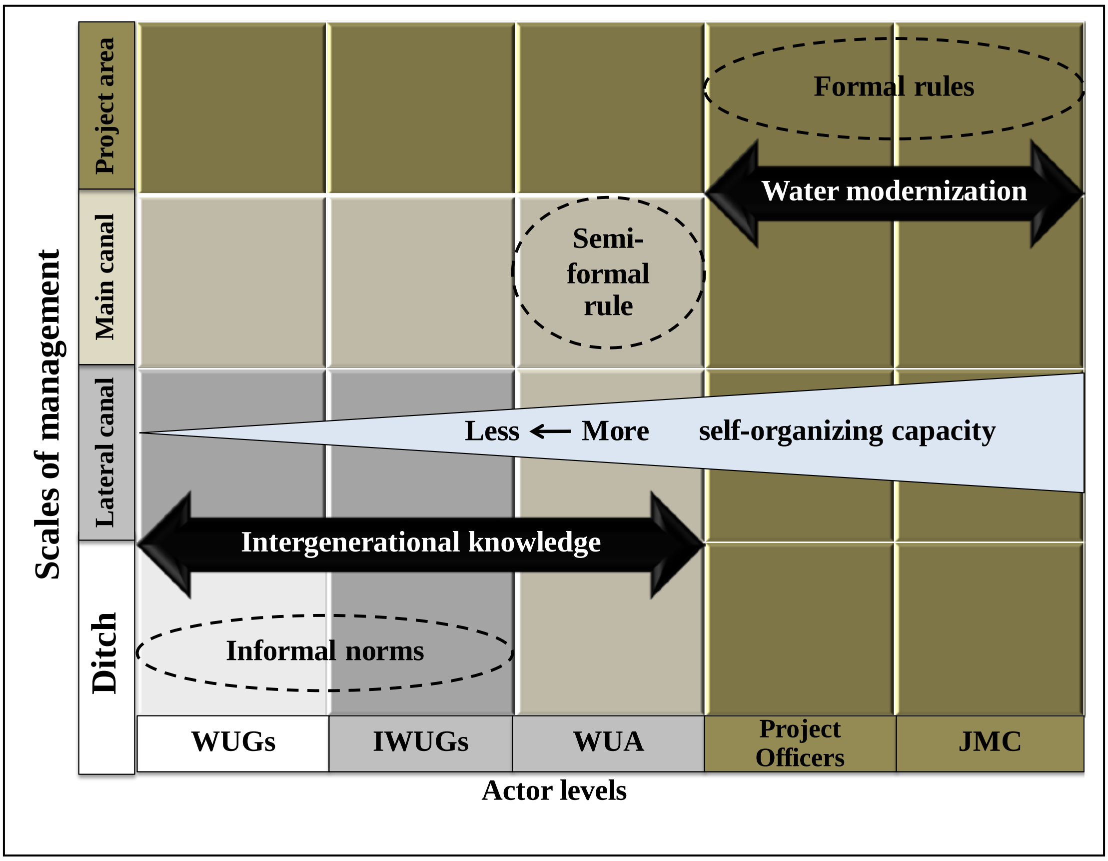

Figure 5.7: Scales and levels of stakeholder involvement in the Mae Tang Irrigation Project

Source: Author's interview

This response demonstrates how the relationship between officials and farmers has been separated by administrative scales. Even though the intention of 'top-down' water management is to provide equal access to water to all actors, interviewees emphasized that their daily experience proved 'the project' was complex and lacked the necessary flexibility to facilitate sustainable water use, with allocation and dispute resolution involving officials and multiple organizations at different scales and actor levels. Thus one farmer commented that:

"To receive water, particularly in the dry season, certain steps must be followed. First of all, a report on the crop type and expected harvest area (compiled by the group head) is handed to the IWUG Zone head to put together a water delivery plan with MTIP officials and JMC. Once the plan's agreed, 'the project' will release the water. The chief of Water Distribution and Maintenance Division will confirm with the subdivision head by phone, and the zone assistant informs the IWUG Zone head about the number of days they can use water. Project responsibility stops at this stage. The rest, on-farm level, requires the IWUG head to call the representative of each ditch or basic water user group head – again, to put a delivery plan together" (Author's interview, 6/09/2010).

Similarly, water users at lateral and ditch scale have to follow strict water use regulations as well as their own group rules as a precondition for receiving water. IWUG Zone 10's head commented:

"In our group, to receive water you need to follow the group rules. For instance, when the water rotation is selected as the way to allocate water, members must use water according to the arranged water volume. In addition, members must obey the group agreement and the regulations, such as help preventing irrigation infrastructures,

dredging and maintaining ditches before water delivery season, and pay for the water fee to the administrator group and WUA" (Author's interview, 9/09/2010).

Although members' responsibility is set at the farm level in order to support water management of the administrator groups, many respondents whose farms are situated at the end of the laterals complained that they were ignored by the IWUG head when water becomes scarce. One member told me:

"Personally, I'm not impressed the way the project and IWUG Zone 10 head work, as my rice fields are at the end of the lateral. The head rarely takes care of water for me. He manages water for only 7-8 ditches and my area is far from the beginning of the lateral. I understand that the remuneration is very little, so I guess that it's doesn't even cover the gasoline cost to drive out to see me" (Author's interview, 17/09/2010).

In theory, the state-sponsored system can claim to provide a centrally coordinated form of governance ensuring a secure water supply and fair allocation. However, disputes over water allocation among actors at local scale are endemic, particularly in the dry season. One farmer pointed out to me:

"In the dry season, farmers plant soybean and dry season rice. Dry season rice begins between November and December or after harvesting wet season rice. Although water is plentiful during this period, it begins to get scarce in March and April as the rice grains begin to swell. Soybean is planted in January and harvested in May. Water is needed in April as soybean growth really takes off then. As a result, the dry season is a

season of water crisis - members don't respect each other and they fight for water. The water allocation schedule is not respected anymore because farmers at the canal head abstract a large amount of water and leave only a little for the rest" (Author's interview, 2/09/2010).

The Head of IWUG Zone 10 accepted this situation, commenting that:

"*Once water's been available to members in my area for four days or more, I always share it with the adjoining IWUG Zone 12, as we share the same lateral canal. Each group has two days to use water. Normally, water users at the end of the lateral (IWUG Zone 12) are allowed to abstract water before my members at the beginning of the lateral. Sometimes they use water more than the days they were allowed, for example on the third day. This situation forces my members to use water into the evening or right up until midnight of the third day. This always leads to conflicts over the water and allegations of water theft*" (Author's interview, 30/09/2010).

As these interviewees' comments confirm, in effect, irrigation management is controlled at a higher organizational scale than WUGs or IWUGs, tending to place 'remote', overly formalized conditions on daily water management. Hence, participants in IWUG Zone 10 are obliged to follow step-by-step procedure and to avoid disagreements with officials if they are to ensure long-term continuity of water supply through the growing season. Not only does this exclude communities from participatory irrigation management: it also greatly complicates the implementation of cross-scale management practice.

This hierarchical approach also makes it difficult to resolve water disputes transparently and accountably. So invariably water users' groups at the channel level are the last to receive water under the irrigation management project. As a result, they are often factious, entering into disputes with other groups at different scales whom they believe are 'stealing water' they feel is theirs by right (c.f. Lebel *et al*., 2005). One farmer with land at the top of a lateral channel stated: "*As soon as I know that water is coming, I start up my pumps straightaway to channel water into my fields, and I'll pump as much as I need. I have to be quick because project staff and bureaucracy cause problems for me*." This comment confirms the problems created by the highly centralized decision-making of 'the project', with the decision to open sluices having to follow a prescribed order.

It was also evident that new IWUG members felt disempowered compared to their old ways of working, particularly from the participatory forms of water management typical of *muang fai*. A head of water user group stated to me: *"Water management and solving water use problems largely depend on 'the project' determination, although muang fai would allow us to have far more say in our water management"*.

From the empirical evidence, therefore, geographical scale not only defines relationships between the state and water stakeholders, and between water stakeholders and other water users; it also defines administrative areas, hydrological units, and particular norms and beliefs of water governance, as Cash *et al*. (2006) identify (see Chapter 2).

Hence, scale significantly affects the efficiency and effectiveness of water governance practice in the study area. Imposing different scales of management means farmers have independently managed water in their own ways, based on their beliefs and norms. Furthermore, there are complexities in water management and solving water use problems, particularly in the state-led irrigation project of the MTIP, where water use involvement as well as water regulation has been determined by central government without members' participation. In effect, 'the project' has absolute authority to control all form of water user organization. Taken together with secondary data presented in Chapter 4, indicating the centrality of state to water management development, these findings confirm Proposition 1.

The transition to more sustainable water management in the study area is not simply dependent on administrative or hydrological scales, however. Differences in beliefs and norms also affect water allocation and delivery. The following section tests how this influences current patterns of water management and allocation.

5.2.2 Socio-cultural norms and beliefs in relation to water allocation and delivery (Proposition 2)

Proposition 2 sought to assess the importance of socio-cultural norms and beliefs, derived from specific territorial influences, and how these beliefs mediate inclusion or exclusion of water users from water resource management decisions. Group norms and beliefs seem likely to exercise an impact upon power relations between actors at different geographical locations, as Sheppard (2002) states that some beliefs tend to be more influential than others in determining water access, so challenging the power of those who claim objectivity in water use. Proposition 2 states:

“Differences among actors in water norms and beliefs at local scale gives rise to particular water politics that shape ‘solutions’ to local water allocation and delivery problems”.

Evidence from WUG meetings in IWUG Zone 10 confirmed that different geographical scales and levels of water management have embedded within them specific knowledge and rules sets. Thus in case of WUGs and IWUGs, knowledge of water distribution, and irrigation infrastructure and maintenance are largely normative science-based, and are the responsibility of experienced project staff trained within the state’s water modernization paradigm. As one respondent stated, “*Project officials manage water because they know how water quantity is calculated and allocated and how to manage it efficiently*.” (Author’s interview, 30/08/2010)

So in IWUG Zone 10, for example, what constitutes water management ‘knowledge’ is defined by ‘project’ officials, who are themselves conditioned by their formalized training, the legal regulations that establish the remit of the MTIP, and the IWUGs. The resulting ‘licit’ forms of water data, and water data collection methods, are often complicated (eg. completion of documentation by farmers often requires assistance from project officials, and lacks consideration of the real needs of members). These distinct forms of knowledge and their mobilization define different types of water users.

Moreover, the recently introduced technologies for water modernization are not necessarily solving water allocation problems. An IWUG Zone 10 member emphasized that:

"*I, personally, believe that the concrete-lined canals of MTIP prevent ground water from 'topping up' water volume in the dry season. And they quickly become clogged up [with sediment] in the wet, which stops the water flowing. So in my opinion the concrete canals do not perform anything like as well as traditional earth canals*." (Author's interview, 5/08/2010)

By contrast, water management among *muang fai* groups is derived from a less formalized tacit intergenerational knowledge of local physical conditions and the drought tolerances of particular crop species, shared among all participants through communal management practices. And, although there are many regulations to observe in weir contracts, at field or ditch scale members are free to arrange water allocation and solve problems over water management without any official oversight.

Furthermore, there is little separation between practical agrarian knowledge and formal rules among weir committees and members in *muang fai* systems. Thus a weir member noted:

"We use our own local knowledge, passed from generation to generation, which underwrites daily water management, while weir rules also originate from previous

practice that's been handed down, meaning our operational knowledge and day-to-day management are very compatible." (Author's interview, 14/09/2010)

In addition, *muang fai* members were also suspicious of the new water management technologies introduced by successive governments spending large sums to modify *muang fai* systems in an attempt to raise their efficiency. Members blamed government authorities for constructing systems that paid little heed to local requirements and did not recognize the maintenance costs involved. On this topic, one farmers' representative commented:

"The government agency commissioned an engineer from the north eastern region -not one of our local people – to redesign our irrigation system. He did not once ask us what we needed, or how to make the changes fit with our existing system. And, as a result, in the dry season water now cannot flow to the end of the lateral and down to our fields. We need to show them they are wrong and get them to alter things to the way we want, but this is difficult as they are government employees." (Author's interview, 18/09/2010)

These comments confirm the interrelation between water norms and beliefs and different knowledge sets, and specifically how traditional water management of *muang fai* is marginalized by the state's modernization paradigm for water. This explains *muang fai* chiefs' concern that modernizing their irrigation systems would result in '*a mismatch in the operation of space and demands.*' They asserted instead that '*local* *wisdom*' had great potential to inform how irrigation systems might be structured in future so that they do not need to rely on technologically advanced techniques.

A clear link thus emerges between beliefs and norms and two different knowledge sets for water management: what might be termed science-based knowledge and local traditional knowledge. Science-based knowledge projected by MTIP officials provides the foundation for 'modern' water management practice in the province, and the belief that modern irrigation infrastructure are trustworthy and predictable. Moreover, it gives credence to the idea that these structures, financed by government, should be handled and serviced only by 'knowledgeable' people and experts. Thus, norms in water allocation start to become based on a model of 'water expertise' derived from state-based decision making. Formal administration is of course appropriate for government to assess water governance more transparently. The opposite notion of water management is found among farmers, who believe that water is a private, not a public good, hence they have unalienable rights to participate in water allocation decisionmaking.

These differences in water beliefs and norms clearly impede the development of communal projects between *muang fai* and MTIP irrigation systems, as one WUG leader commented:

"MTIP always calls biannual meetings, but these are enough only for 'project' officials to present to members short reports on current practice and their proposed water allocation plans for the forthcoming year. And these meetings are quite formal, too. There's really no other opportunity to deepen our relationships, exchange our

knowledge and experiences, and to gain a better understanding of each others' attitudes and approaches. We need to spend a lot of time together for this to happen".
(Author's interview, 25/09/2010).

Because of this lack of connection between farmers and officials, one deputy head notes how: *"'the project' officials have never understood me and my members"*, while a Zone assistant groused, *"Farmers do not understand us - it seems we speak in different languages"*. Different sets of beliefs and norms thus appear to cause dissatisfaction over irrigation management and can provide misunderstandings between different parties that are enough to give rise to major disputes between them over the allocation and delivery of water, particularly in the dry season.

Clearly therefore, there are different water norms and beliefs at work within Chiang Mai and Nam Bo Luang that shape attitudes and approaches to day-to-day water management. Equally, these beliefs alter the receptivity of farmers and local policy officials to particular policy 'solutions' and even to how 'problems' of water allocation and delivery are perceived, defined and/or framed. In turn, these affect the capacity for MTIP and *muang fai* irrigation systems to work together to address more sustainable water management practice. On the basis of the evidence, therefore, Proposition 2 is confirmed.

5.2.3 Influence of local politics of scale in encouraging collaborative governance (Proposition 3)

Proposition 3 focused on evaluating the occurrence of politics of scale as a supporter or inhibitor of transition to more sustainable water management, which Lebel *et al*. (2008) state involves the power relations of water stakeholders. Yung *et al*. (2003) also acknowledge that 'place analysis' can provide a greater understanding of peoples' viewpoints and relationship with water use, and how those viewpoints contribute to more collaborative governance and water management resolution. Proposition 3 states:

"Local water politics influence the viability of cross-scale interactions that seek to specify collaborative water management among state and non-state actors, and hence the transition to more sustainable water management".

One aspect of this politics of scale relates to geographical situation of water use locally – that is, the 'politics of position' that develop as a result of actors having 'first use' of water for irrigation purposes because of their being located on the upper or lower reaches of the main irrigation canal. 'First use' pertains for example to water users situated close to the main canal (state agencies benefit in this respect) and at the headwaters of lateral channels running off it. I explore this 'politics of position' over water abstraction here.

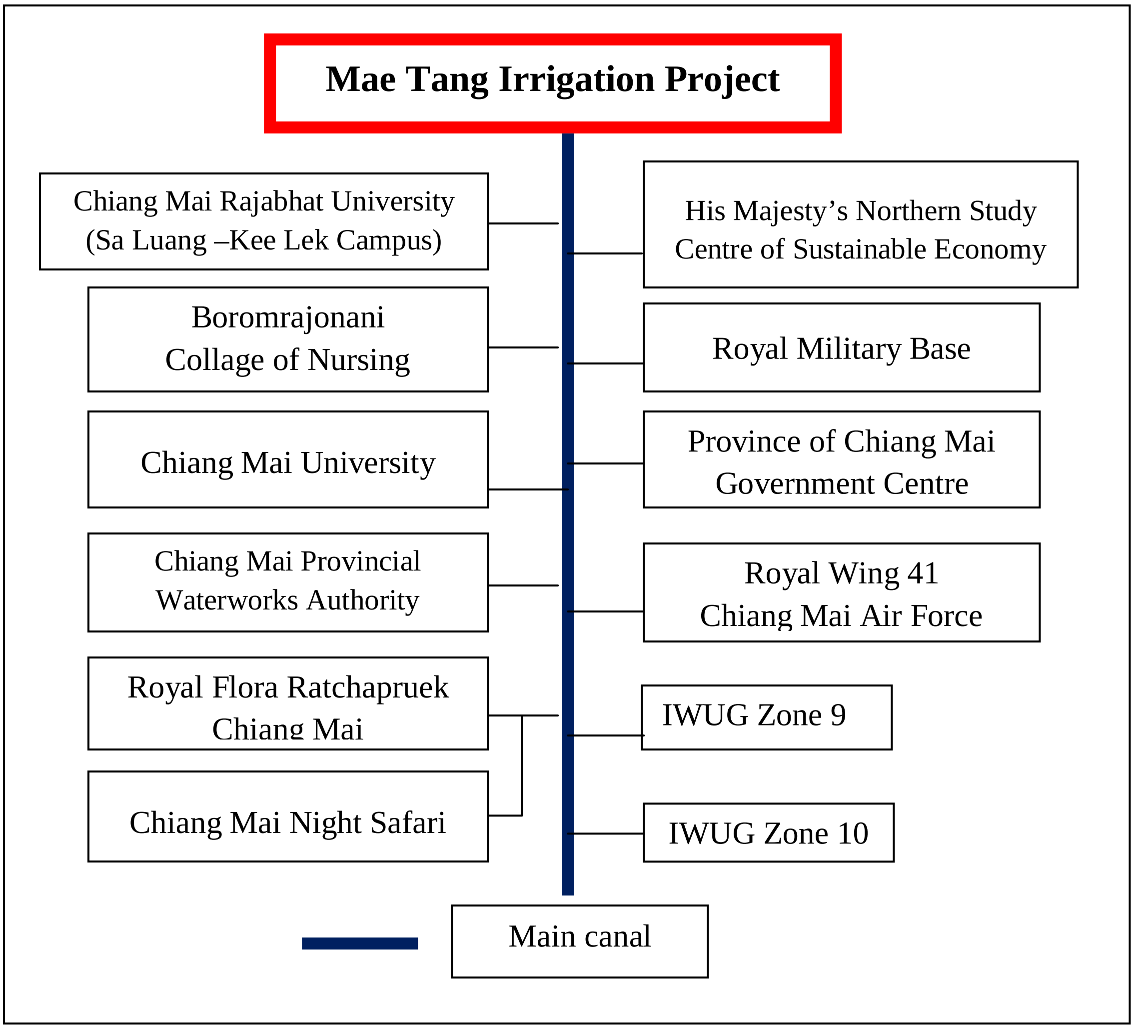

Figure 5.8: Stakeholders in the Mae Tang Irrigation Project

Source: Author's interview

Benefits/disadvantages of 'politics of position' over water use do not just relate to agriculture. The IWUG Zone 10 chief noted to me that:

"*The largest amount of water abstracted by non-agricultural users is Chiang Mai Provincial Waterworks Authority, which MTIP delivers around 4.32 million cubic metres per annum water to supply urban consumption, government agencies and* *academic institutions. And tourism agencies such as Chiang Mai Night Safari also receive approximately 200,000 cubic metres per annum to provide for the needs of animals, while His majesty's Northern Study Centre of Sustainable Economy now needs 20,000 cubic metres during the growing season for its agricultural demonstration plots. Likewise, the military base uses about 1,000 cubic metres per month for their agricultural activities within its campus"* (Author's interview, 12/09/2010).

Disagreements over water allocation between these agencies (see Figure 5.8) and farmers often occur in the dry season. The Head of IWUG Zone 10 told me that, *"I always ask them not to abstract a lot of water and they do compensate us for this with some money. But my members don't want money; they need water for their crops. Farmers like us have a lot of debts and if we cannot produce crops in sufficient quantity, what can we do?"*

Contrasting with state agencies, IWUG Zone 10 is in a relatively disadvantageous position and receives only irregular supplies of dry-season water as actors 'higher up' the canal exercise their spatial advantage by abstracting water for their own purposes. Water theft through illegal pumping and groundwater abstraction is rife in the face of this insecurity of supply (c.f. Lebel *et al.*, 2005), a situation inevitably leading to conflict between water users groups and state agencies. A member justified this to me: *"I have to do this because I need money from my crops. If water cannot flow into my farm, my harvest will suffer and I'll have no money to support my family. And 'the project' cannot guarantee that it can supply water for all members - I see with my eyes the water volume available"*.

There are clear implications of this ‘politics of position’ for water abstraction. Government organizations actively involved in water governance also rely on irrigation water for their own needs, for example, so prejudicing allocative decisions. Indeed, it was the recent siting of Government offices along both sides of the main canal that diverted water away from agricultural users in the first place. This has put ‘the project’ in an invidious situation, caught between increased demands for greater supplies in the dry season from all stakeholders. Interviewees claimed this new client responsibility has also distracted project officials from prosecuting rigorously sustainable water management objectives.

Regarding the two *muang fai* systems, ‘politics of position’ also occurs between upstream and downstream weirs (Figure 5.9). So in interview, a weir leader claimed “*San Poo Lei Weir [the weir located above MRRW and KMTW], diverts water from the Mae Khan river to feed their rice fields without thinking of its downstream neighbours*”. San Poo Lei Weir tends to ‘stretch the rules’ because of its advantageous location, which has led to deteriorating relations with downstream weir members, so obstructing the prospects for sustainable water management.

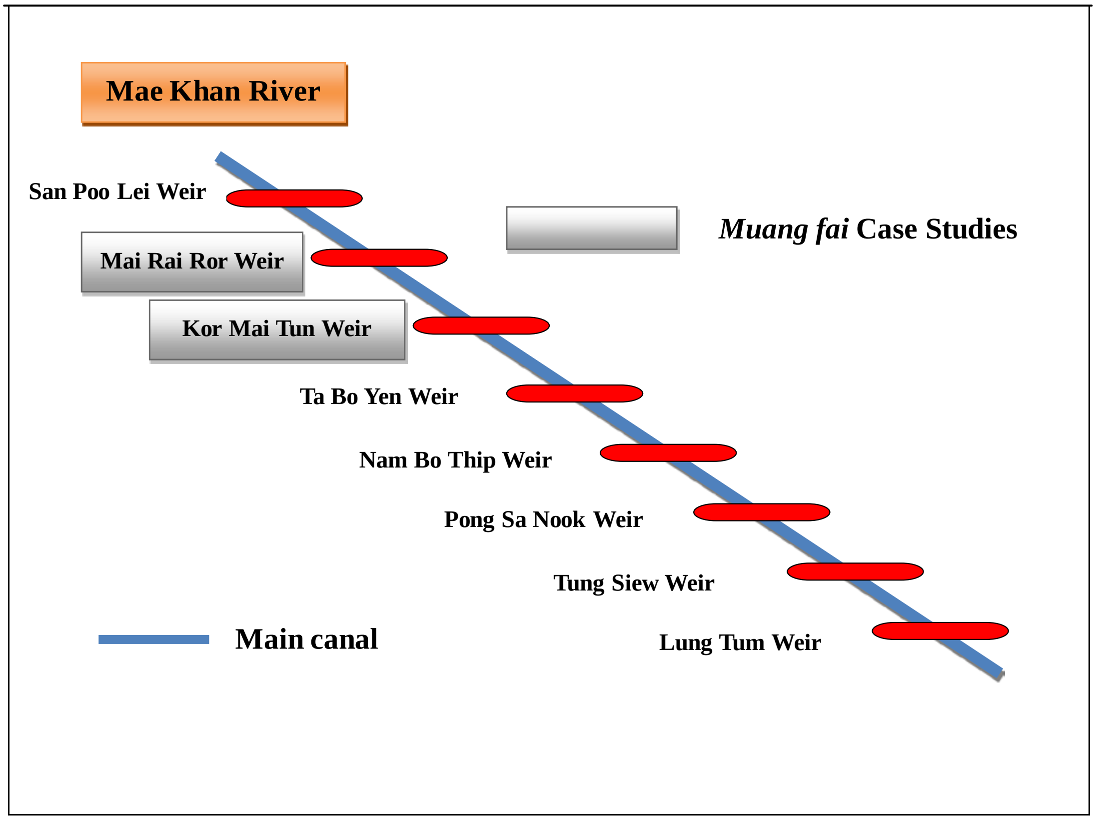

Figure 5.9: Stakeholders in Mae Kan River

Source: Author's interview

By contrast, MTIP seems well attuned to address the politics of scale for irrigation. As the deputy head of IWUG Zone 10 pointed out, structurally

"MTIP has everything that's needed in an irrigation system. They have a substantial budget, they have scientific irrigation knowledge, and they have the key experts in agriculture and irrigation system engineers trained in the big cities. We have to give them credit in managing water, even if it's in a top-down way"(Author's interview, 24/08/2010)

But this hierarchical arrangement brings a heavy administrative burden, and makes the management of water issues more complicated. For example, the benefits of position conferred on government offices and farms at the canal headwaters directly undermine the original agricultural goals of ‘the project’. Politics of place, then, confers positional advantages upon a minority group of powerful state-based actors, while marginalising a far less powerful but much more numerous group locally (farmers). As IWUG Zone 10’s head described:

“Farmers or members at the end of the main canal or lateral like us are labeled ‘the youngest son’. This is because when ‘the project’ delivers water to us, we are the last group to receive it. We have to wait until the head canal members, government and private agencies finish abstracting. Water rotation delivery just doesn’t work efficiently and, yes, conflicts emerge. Sometimes the water quota they allocated us doesn’t come through. In fact, most of us did not get enough water this season, but we cannot complain because we have to depend on ‘the project’. We have to accept this situation” (Author’s interview, 30/09/2010).

The ‘one-sided’ decision-making displayed here clearly causes inequality in water allocation.

For *muang fai*, scales of water management are few and there are much simpler levels of administration. There is also no interference from external organizations except where water disputes occur between weirs and weir members. Notwithstanding, respect for each others’ water rights and the micro-scales and levels of water governance allow weir committees to resolve abstraction disputes relatively easily. In this case, politics of place improves opportunities for equitable water use, rather than complicating management as in IWUG Zone 10.

More generally, the effect of scaled water politics seems to have led IWUG Zone 10 and *muang fai* members to conceal their concerns over water management from each other, preventing the development of mutuality in water management even though both face similar – often identical – supply problems. MRRW's weir chairman told me that:

"Since MTIP was established, as you know some members left this weir and use 'project' water instead. Since then, they have never sent their labor to help us maintaining the weir systems. This means the area now has two distinct modes of water management – so far, we've never been involved with each other. MTIP manage water in its responsible area, and its officials have never contacted us" (Author's interview, 23/08/2010).

On the basis of the evidence provided, then, the influence of scale politics is very apparent, both in terms of administration and knowledge, and in scale separating actors. This is a major obstacle to developing cross-scale interactions between water users, project officials, and other agencies, as well as between MTIP and *muang fai*. In short, there is clear evidence to support Proposition 3.

5.3 The challenges of transitioning to sustainable water management

From the three propositions examined here, there is substantial evidence to explain why transitioning to more sustainable water management has proved so difficult in Nam Bo Luang, Chiang Mai. Interview testimonies confirm that the politics of scale, position and place influence water management knowledge and water management interactions in the study area in terms of actor relationships, differences of norms and beliefs in water allocation, and actor capacity to collaborate on water management issues across scales.

The Chapter has provided a range of empirical accounts from key representatives of farming communities and local water policy officials working within the RID, the MTIP and *muang fai* systems, that demonstrate the relative failure of both modes of water governance to deliver sustainable water management. In particular, knowledge sets and management objectives that underpin MTIP and *muang fai* are markedly different. This is the consequence of allowing science-based techniques, supported by the national modernization policy and economic development, to underpin national water management. This situation ignored embedded local water management knowledge and led to it being regarded as 'the second-best' option. As a result, scale politics have emerged, leading to poor actor relationships that challenge greater participation in more mutually beneficial forms of water management. This is a considerable obstacle to transitioning to more sustainable water management.

Closely related to this, the second difficulty in creating new water management arrangements is building relations between stakeholders at different scales and levels.

As interviewees claimed, positional politics (Lebel *et al*., 2005) have emerged over water abstraction, with water users close to the main irrigation canal and at the headwaters of its lateral channels among the most favourably located actors. In particular on account of their position on the upper reaches of the irrigation canal, state agencies have benefited greatly. This has put the MTIP as a 'state-led' project in an invidious situation in its efforts to settle water conflicts among agricultural and non-agricultural stakeholders. Interviewees alleged that this had also distracted 'project' officials from prosecuting rigorously sustainable water management objectives. At the same time, water management at farm scale face significant problems of 'water theft' as a result of disadvantageous position, a situation inevitably leading to conflict between WUGs, IWUGs and state agencies, particularly in the dry season.

Moreover, even though project administrators provide accurate information to farmers on the date and times of opening sluices to each lateral, members compete to use their allocated water. These comments refer to the highly centralized decision-making of 'the project', with the decision to open sluices following a prescribed order. The result is that, even though 'the project' has reasonable allocation capacity, disputes over water from WUGs at different laterals, as well as urban demand and the requirement of government agencies, always occur during the dry season.

Muang fai interviewees confirmed similar poorly developed linkages between water allocation and water management responsibilities. In *muang fai*, positional politics also play a role, in this case between upstream and downstream weirs. While every weir seeks to meet its members' needs, those upstream tend to 'stretch the rules' because of their advantageous location, leading to deteriorating relations with weir committees away from the headwaters. Water management is less problematic than in the MTIP, as farmers are not encumbered by the demands of non-agricultural users, so the weir committees can focus on the sole purpose of irrigation for their own members. Supply-side issues are therefore much more straightforward than in the MTIP. However, in the dry season water supply is always insufficient, and disputes among weir members and between other weirs routinely occur.

Thirdly, as a consequence of knowledge incompatibility and poor actor connections across geographical scale and positions, there is a pronounced lack of cooperation among stakeholders in the two different modes of water management. Under the state-sponsored system, centrally coordinated, hierarchical water management and planning would appear to ensure a secure supply and fair allocation at each scale. But interviewees said their daily experience of 'the project' confirmed it was simply too complex and inflexible to facilitate sustainable water use, with allocation and dispute resolution involving officials and multiple organizations at different scales and actor levels. Thus, not only does this exclude communities from participatory water management; it also greatly complicates the implementation of cross-scale management practices.

In conclusion, sociospatial relations dominate water management and water governance in Chiang Mai generally, and specifically in the study area of Nam Bo Luang. Politics of scale, position and place over water use tend to separate people, and incompatible knowledge sets as well as water beliefs and norms weaken cross-scale and cross-level interactions. This is analogous with the situation Biermann *et al*. (2012, p.51) describes: “the current institutional framework for sustainable development is deeply inadequate to bring about the swift transformatic progress that is needed”. Effective water governance must now be put in place, and one approach which is under discussion in the theoretical literature is that of adaptive governance (Pahl-Wostl *et al*., 2007). This has been the focus of recent developments by the Chiang Mai provincial government. Consequently in the next chapter I examine two new organizational mechanisms recently introduced by the state to advance the goals of PIM in Nam Bo Luang.

5.4 Conclusions

In this Chapter, I have analysed empirical evidence on whether geographical scale, position and place influence water governance and its implementation in Nam Bo Luang. I have done so by testing the research propositions presented in Chapter 3 of the thesis under three headings:

1. Scale reflection on actor relationships (examining Proposition 1);
2. Varying norms and beliefs in relation to water allocation and delivery (examining Proposition 2); and
3. Influence of local politics of scale in encouraging collaborative governance (examining Proposition 3).

After empirical examination of each of these propositions in this Chapter, I have confirmed their validity as the primary and secondary data demonstrates how space and scale shapes politics and interactions among actors over water use. Each proposition also represented the attempts of various actors to promote their interests, enabling them to attempt to influence policy, and to mobilize politically (McCann, 2003). On the basis of this Chapter's analysis, I conclude that spatial politics defines actors' relationships, norms and beliefs in water management practice, and shapes decisively the viability of cross-scale interactions between actors.

CHAPTER 6: THE ROLE OF ADAPTIVE GOVERNANCE IN WATER MANAGEMENT IN CHIANG MAI

In this Chapter, the focus turns to the analysis of the organizational roles and effectiveness of the Joint Management Committee for Irrigation (JMC) and Water User's Association (WUA) as 'middle ground' mechanisms of adaptive governance; that is, organizations capable of restructuring water management among and between MTIP, farmers and other stakeholders in Chiang Mai. These two organizations were introduced in the study area in 2008-2010 to address some of the difficulties in agricultural water supply and distribution identified in Chapter 5. This Chapter presents a full description of both organizations, before analyzing their effectiveness and utility in resolving these water management challenges.

Primary data for the Chapter was derived from fieldwork conducted among WUA administrators, farmers, MTIP officials and JMC representatives directly involved with water governance at the local and provincial scales. Data collection was gained from 86 semi-structured in-depth interviews, 20 questionnaires, four groups discussions and 20 telephone and Skype interviews (focused on key themes of water governance and adaptive governance) undertaken during 2011 and 2012 (see Chapter 3).

The Chapter has four sections. First is a detailed description of the role and function of JMC and WUA, and discussion of their organizational structure. This develops the idea of their role in water administration as mechanisms of adaptive water management (see Chapter 2). The second part then evaluates JMC and WUA's effectiveness (through testing Propositions 4 and 5 of Chapter 3) in enhancing cross-scale and cross-level interactions over water use. Based on this analysis, I then consider Propositions 6 and 7 to establish whether these recently introduced organizations have assisted in resolving water allocation problems in Chiang Mai. The Chapter concludes with an assessment of the importance of 'middle ground' adaptive governance in promoting sustainable water management among the study area's stakeholders.

6.1 Water management dilemmas at the provincial and local scales: an introduction to JMC and WUA

Chapter 5 identified many water allocation and management problems which advocates of adaptive governance contend can be tackled through developing a 'middle ground' adaptive approach (Gregory *et al*., 2011). This 'middle ground' approach – that is, midway between provincial state and grassroots scales of operation, and adopting elements of both these scales of intervention – appears to have provided the model for the Chiang Mai Governorship's action in 2008 to address the national goal of participatory irrigation management. The new organizational structures were established as follows. In 2008, WUA was set up to be a representative forum for farmers to work with MTIP and other stakeholders at the provincial and local scales, thus responding directly to the national PIM initiative (see Chapter 4). Then, in 2010, the Governorship, in collaboration with RID and MTIP, established the Joint Management Committee for Irrigation (JMC) to bring together representatives from all other provincial water users. WUA and JMC can thus be regarded as a state-led experiment in 'middle ground' governance, with the aim of attaining more sustainable management of scarce water.

JMC/WUA's establishment is based on the assumption that more collaborative practice will develop between agricultural and non-agricultural users through its multi-levelled activities, encouraging new behaviours that engender more sustainable water use (c.f. Berkes, 2002; Smith and Porter, 2010). This Chapter considers the first couple of years (2010-2012) of operation of the JMC/WUA, as a means of evaluating its potential contribution to achieving more sustainable water use.

6.1.1 New 'middle ground' water management organizations and stakeholder responses

Findings from Chapter 5 confirmed that politics of space influence actor relationships (Proposition 1), that there are different, often conflicting norms and beliefs in water management (Proposition 2), and that, consequently, there exist obstacles to collaborative water management in the study area (Proposition 3). It follows that to achieve sustainable water management, novel institutional arrangements for water governance are needed in Chiang Mai. WUA and JMC have been introduced in an attempt to fulfil that role, by bringing together top-down water management with bottom-up water supply and demand issues (see figure 6.1).

In order to gauge the ability of these newly introduced organizations to change existing patterns of water management, I employed the notions of governance and adaptive governance to evaluate stakeholder reflections on organizational activities so far. The results from this section are used to test Propositions 4-7 (Chapter 3) in the following sections and to inform the conclusions chapter.

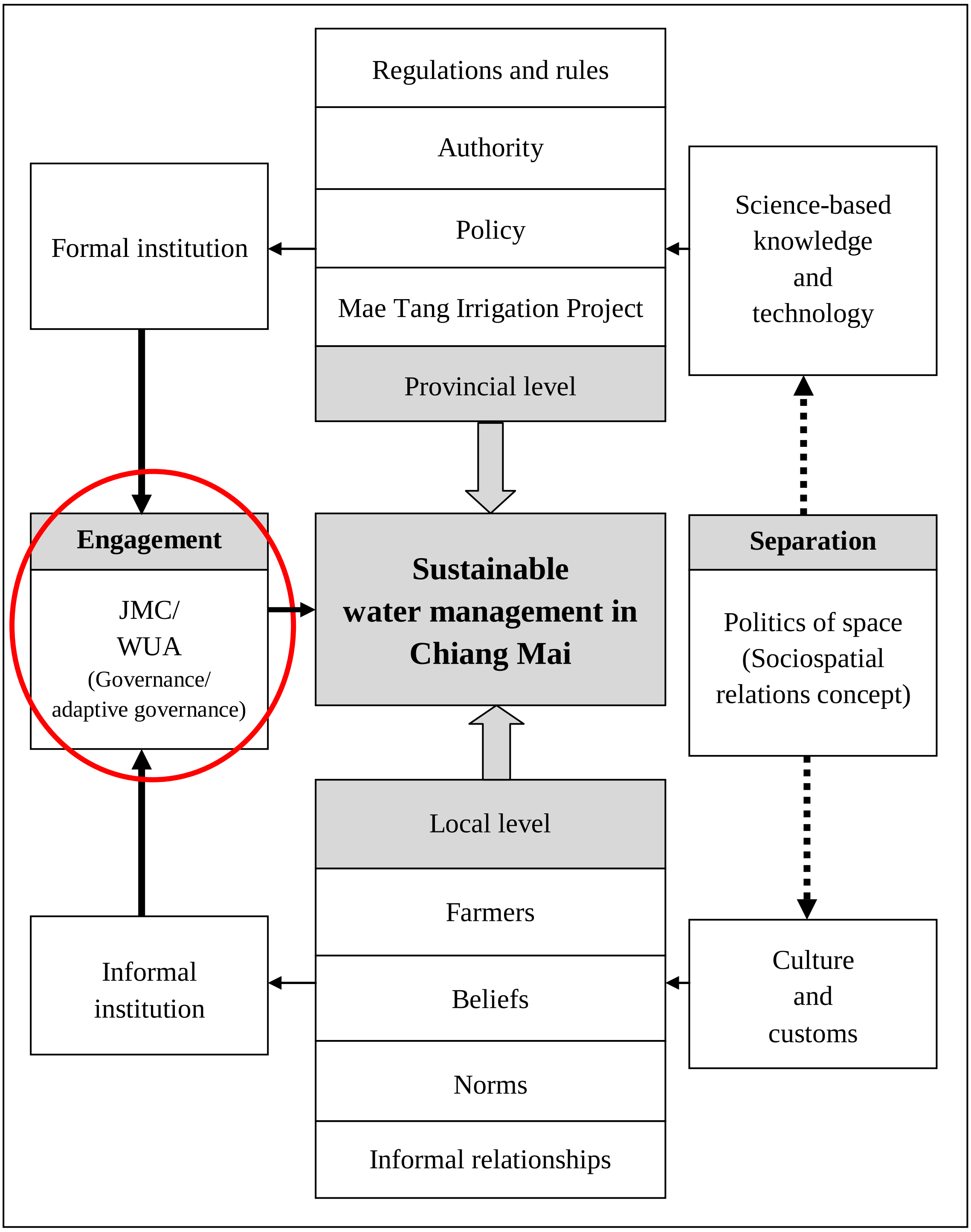

Figure 6.1: WUA and JMC as 'middle ground' organizations in water management

Source: Author

I. WUA's introduction and stakeholder evaluation

The WUA is a logical extension of existing organizational structures within the state-led [MTIP] irrigation system (Chapter 4). In effect, WUA has evolved from WUGs and IWUGs (see Chapter 4 and Figure 6.2), with its scope covering all farmer-led irrigation activities, from ditch to lateral to overall MTIP scale.

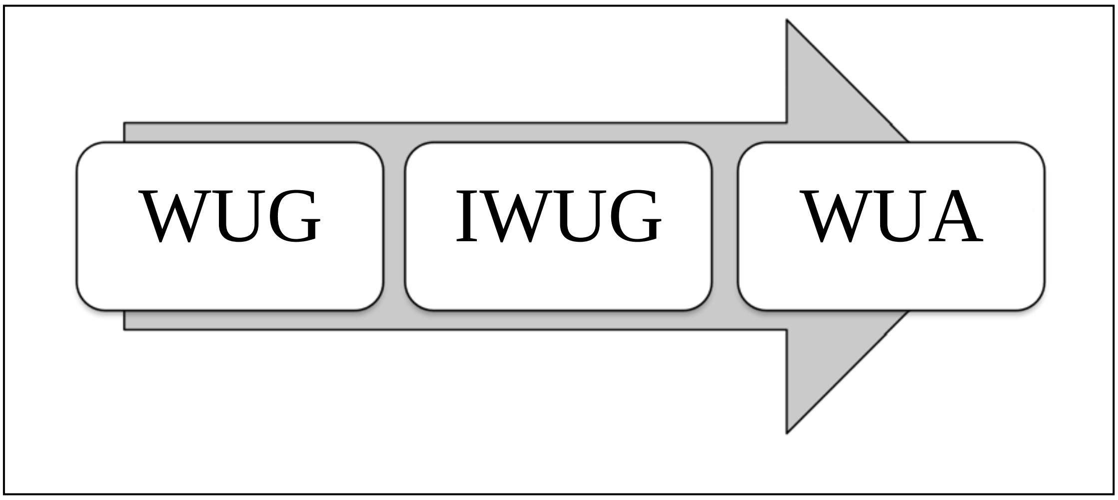

Figure 6.2: Water User Association evolution

Source: Adapted from Water Management Development Group (2003)

WUA is legally registered with the Ministry of Interior under the Civil and Commercial Code (1992). It has the same structure as IWUGs, and shares IWUG aims of instilling collaborative patterns of irrigation. WUA committee office holders are elected by its members and are responsible for managing water from main canals to particular irrigation zones. There are now 35 WUAs across Thailand, covering the country's entire irrigated area (Kamnerdmanee, 2011, cited in Kumnerdpet, 2011, p.176). One of these, the Mae Tang Irrigation WUA, covers five districts of Chiang Mai province.

Mae Tang Irrigation WUA was set up and registered in 2008. The WUA chief described to me how the organization was established:

"During 1997-1998, our irrigated areas faced a water supply crisis. Farmers competed to abstract water as it was not sufficient to meet their needs. The main reason was our irrigation system had only a single dam and no reservoir for water storage. As a result, when there was plenty of water in the rainy season at the headwaters in Wiang Hang (or Mae Tang) District of MTIP, we couldn't save it to be used in the dry season. What tended to happen was that users across the neighbouring five districts – covering about 240 square kilometres – would use water independently of the others. So, to overcome these problems – for example, water user groups in San Pa Tong managed water only in its area – heads of each water user group met and sought to achieve a more collaborative approach. And the result was the Mae Tang Irrigation Water Users Network. Then in 1998 the Network appointed me as its chief. We managed both water allocation and the organization of water users without regulations and law to support us. Later, our administrators had further discussions and agreed to draw up a legal basis for our collaborative activities. This took some time to complete, with Mae Tang Irrigation WUA finally set up in 2008" (Author's interview, 18/06/2011).

Mae Tang WUA's structure is threefold (See Figure 6.3). The first is advisory/consultative, with representatives from the Directorate of the MTIP, the Director of Water Distribution and Maintenance, and the farming community. The second element is WUA committees, with office holders chosen by election; and the last is the involvement of farmers or water user members.

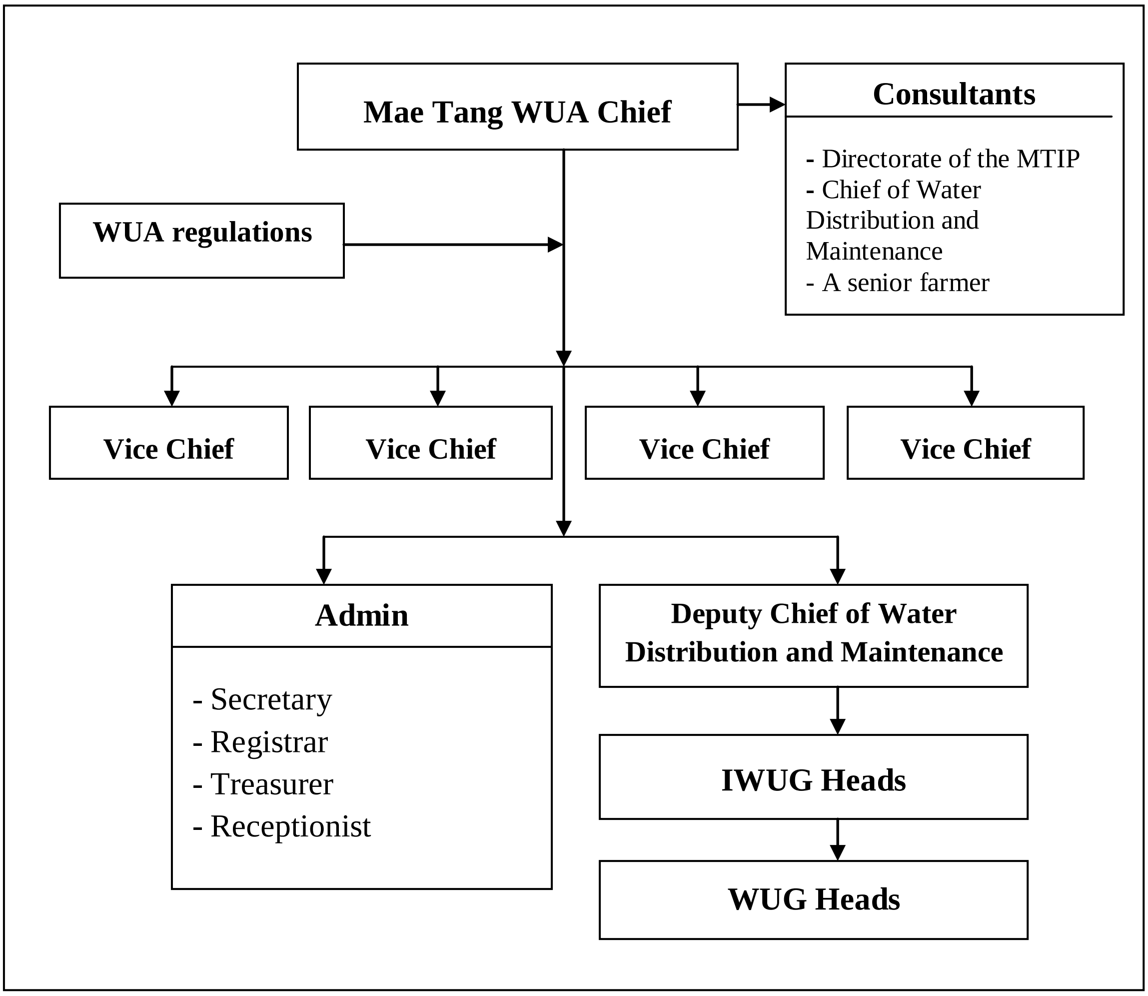

Figure 6.3: Water User Association (WUA) structure

Source: Author's interviews; Water Management Development Group (2003)

WUA's responsibility is to negotiate water allocation for its stakeholders according to farmers' planting schedules. It does so by bringing water users' allocation problems from the local scale to 'the project' and provincial scales of operation. These problems often relate to water scarcity in dry season, including failing to supply water to farmers at the end of the main canal, enforcing regulations among farming members and setting water allocation disputes, and setting and allocating budget for canal maintenance and dredging.

In order to ensure that farmers receive water equally and transparently, according to the agreed rotation plan, and that management problems are resolved satisfactorily, the WUA president and vice-presidents work closely with the 15 IWUG heads, meeting formally or informally at least once a month, or telephoning in case of emergency. This allows WUA to address any management problems and report directly to MTIP and JMC.

Following WUA's introduction, farming respondents claimed that the representation of their allocation needs and problems to MTIP had greatly improved, for example enabling successful re-negotiation of water allocation for two IWUGs during a drought in 2010. In interview, one farmer observed that:

"As we are situated at the end of a lateral, we have to share water with both state and tourism agencies and water use issues often arose. However, these issues were largely resolved by our WUA chief. He discussed the problematic issues with these organizations directly. For instance, when the office of Chiang Mai Municipality asked for water from us to support its tourism activities in the dry season, he could negotiate when water should be delivered to the city as he knew the period that farmers needed to use water. We were relieved we had him to take care of our needs" (Author's interview, 09/09/2011).

Another success achieved through WUA negotiation was to increase the maintenance budgets allocated by MTIP for repairing dilapidated irrigation systems in three contiguous IWUGs. A respondent from IWUG Zone 10 described how:

"Being part of WUA means we can control our activities, particularly when we need some budget to repair the irrigation systems and for sludge dredging. Last year [2010] MTIP were unable to provide us with funds for this. We needed to help ourselves. Luckily, the [WUA chief] contacted the Ministry Office and they offered their support" (Author's interview, 10/10/2011).

Among MTIP officials, many were impressed by WUA's performance in reporting water management problems as well as identifying important obstacles to collective management across 'the project'. Importantly, WUA appears to be developing a reputation for reconciling differences between farmers and officials. Thus a MTIP official remarked to me that:

"The WUA comprises local people with much experience of managing water under the previous muang fai *system, so farmers trust and respect their decision-making. We know its strengths, so we employ WUA officials to speak with their members in case MTIP needs to negotiate on water allocation with other organizations"*(Author's interview, 20/10/2011).

However, among IWUG Zone 10 respondents, some members commented that WUA was less successful in getting their members points across, with interviewees raising the issue of MTIP having "the final word" in how water was allocated. On this point, the WUA chief noted:

"Because MTIP is sponsored by government with budgets and irrigation system experts, it retains ultimate responsibility for making decisions in water management. We don't have the final say as we have to depend on their support for repairs and irrigation technology from the officials" (Author's interview, 15/09/2011).

From these comments, it appears WUA's introduction has already established an effective role in representing farmers' opinions and addressing local water management problems within MTIP. It could be said that WUA acts as coordinator between diverse sets of stakeholders, thereby mitigating problems arising from water politics of scale, position and place, particularly through its role as part of the JMC, which I examine in the next section.

II. JMC structure and stakeholder evaluation

The second organizational structure introduced, the JMC, was established by the Chiang Mai Governor's Office in 2010 to improve implementation and planning of MTIP and to broker water stakeholder disputes, with powers to restructure WUGs or to wind up their operations where necessary. Unlike WUA, JMC's remit is to address *all* water users – agricultural and non-agricultural – giving it a wider strategic role in the development of more sustainable water management in Chiang Mai. Indeed, Chiang Mai Office determined that JMC's first task should be to ensure all WUGs, urban, tourism, recreation and amenity interests and government agencies participated in decisionmaking on water planning and infrastructure maintenance. Thus this provincial level organization potentially has the capacity to improve coordination over irrigation management between organizations at regional and local scales, by brokering agreement between farming, amenity and recreation interests. JMC is thus genuinely innovative, as it attempts to resolve for the first time water allocation disputes between stakeholders of all sorts across local and provincial scales (Figure 6.4). There are now 76 JMCs across Thailand, covering the country's entire irrigated area (Kamnerdmanee, 2011, cited in Kumnerdpet, 2011, p.176).

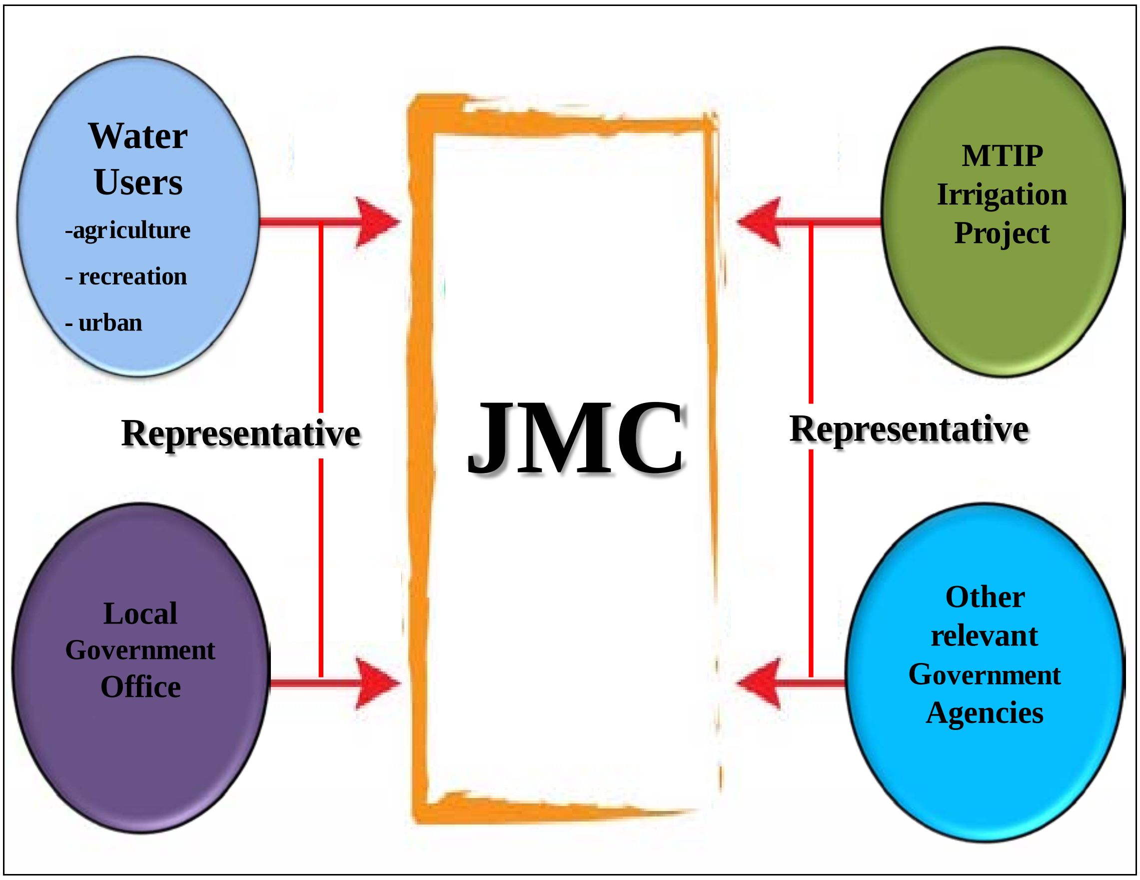

Figure 6.4: Joint Management Committee for Irrigation

Source: Adapted from Water Management Development Group (2003)

JMC's governance is twofold (see Figure 6.5). The first is advisory/consultative, with representatives from the regional (provincial) level including the Chiang Mai

Governor’s office, the Chief Executive of the Provincial Administration, the Directorate of the Regional Irrigation Office 1, and the Directorate of ‘the project’. The second element is participatory – a committee bringing together JMC’s member organizations, 23 in all, including provincial government, farming groups and private agencies. This participatory grouping is charged with advising MTIP on water allocation and maintaining provincial irrigation systems.

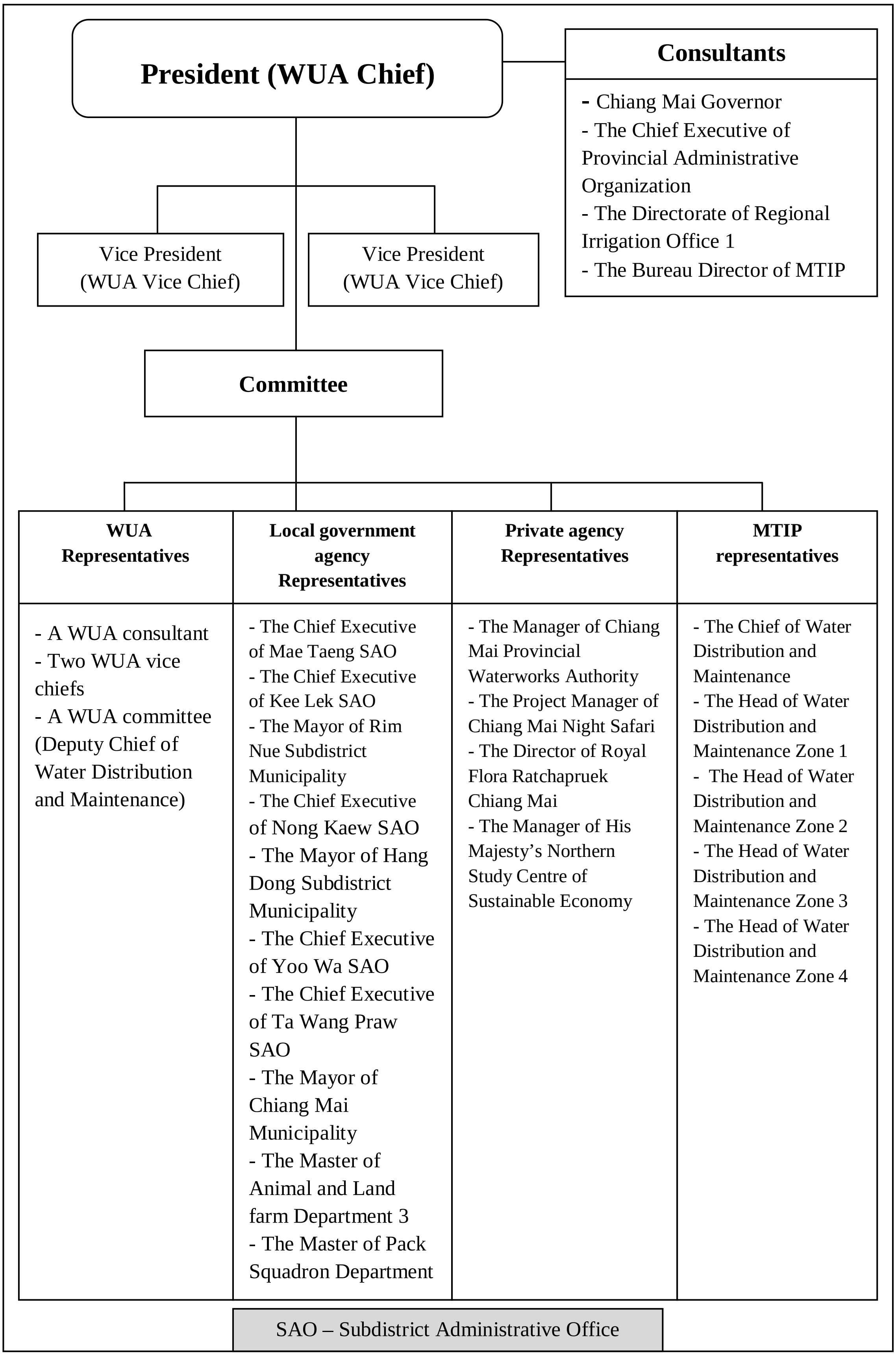

Figure 6.5: JMC's organizational structure

Source: Author's interview

Most water management problems brought to JMC emerge in the dry season, because of insufficient water allocation and increased demand, as a result of all stakeholders needing to use water in order to supply their various activities at the same time. Some 95% of all respondents (19 out of 20 interviewees) stated that the problem they had experienced could be described as a water allocation dispute with other JMC members, and/or between JMC members and farmers. The other 5% of problems related to sediment build-up, and inadequate weir maintenance.

Representatives from the JMC Committee were interviewed in order to gauge their opinion of the Committee's first full year of operation (representative groups are shown in Figure. 6.5). Overall, across all respondents MTIP's policies on water allocation, water planning, problem solving and maintenance of irrigation system infrastructure were ranked "moderate to good", with interviewees commenting that JMC's introduction had improved openness and transparency of decisionmaking, and was beginning to have a beneficial effect on decentralizing decisionmaking. For some respondents, though, these remarks were tempered by their belief that in JMC meetings there was a lack of consideration of alternatives to water modernization; and their strong feeling that, as "non-professionals", they were not qualified to hold opinions on overall provincial water strategy. At one level this confirms the entrenched hierarchy within Thai society generally. But more specifically I would argue that it demonstrates respondents' engrained sense that the Mae Tang water modernization project cannot be challenged. Despite these concerns, 40% of all respondents believed their participation in JMC was already contributing to a more integrated approach to irrigation management; arguably respectable given this was JMC's first year of operation.

Interviews were then conducted with the president of the JMC committee. This respondent commented that the Committee structure afforded opportunities to have "meaningful discussions" on provincial water management planning, water management problem solving, and information dissemination with other stakeholders. He also claimed the JMC committee structure provided a "highly effective" mechanism to resolve water allocation and quota issues, as meetings took place at least twice yearly (members can also call emergency meetings). Typically, the first Committee meeting takes place before the wet season (rice planting), with the second scheduled immediately before the dry season harvest.

Among Committee members, the main outcome of JMC's first year of operation was reckoned to be a clearer, more transparent water allocation policy for irrigation. Farming representatives noted that they now knew and importantly understood how and why water volumes were calculated, why water could not be dispensed equally among all members, and that negotiation was necessary to share water across multiple uses. Moves are now being made to prioritize farm irrigation needs during times of water shortage, while releasing water equally to all stakeholders in the wet season.

Crucially, respondents also commented how the different functional roles of JMC governance appeared to be changing their own individual behaviours and expectations. Thus, when asked what was expected of them as Committee members, 72% of respondents (14 out of 20 interviewees) replied their work required them to address "at least" three new roles in relation to water management. These were: to participate in water allocation planning; to help solve water disputes; and to disseminate information related to water management to the client groups they represented. It could be argued therefore that institutionalization of roles and social learning among members is beginning to take place. Just over 60% of Committee members (more than 12 interviewees) claimed they had introduced new channels of communication with their client groups to circulate JMC decisions, including: setting up websites; writing newsletters; opening telephone help-lines, and running surgeries for face-to-face meetings with stakeholders.

In terms of achieving effective water management, all categories of interviewees commented that they were "very satisfied" with the first twelve months' operation of JMC. JMC committees were helping to make water distribution more equitable and transparent at provincial level. Notwithstanding this, respondents acknowledged that "other factors" might militate against JMC's success in future, such as failure to observe water use regulations during the dry season.

On this basis, I argue that WUA/JMC's creation arises directly from state learning over stakeholders' dissatisfaction with, and failure to interact through, the MTIP. JMC/WUA have thus been introduced to act as key mediators of a 'top-down' system of water management trying to respond to changing 'bottom-up' water challenges. As such, they can be seen plausibly as 'middle ground' organizations, responding to the new national objectives of PIM (participatory irrigation management) identified by the national Government. Hence, in the following section I evaluate JMC and WUA performance in terms of their contribution to water management cooperation across different levels and scales.

6.2 The Joint Management Committee for Irrigation (JMC) and Water User Association (WUA): new ‘middle ground’ organizations for enhancing cross-scale and cross-level interactions?

The previous section examined stakeholders’ opinions on water management outcomes in Nam Bo Luang, at the beginning of what, hopefully, will be a transition to more sustainable water management. Nonetheless, it is possible to make a provisional judgment on WUA and JMC’s likelihood of future success by cross-comparison of interviewees’ responses with the theoretical work on adaptive governance set out in Chapters 2 and 3 as a means of charting possible pathways for future development of the WUA and JMC. Specifically in order to evaluate how the governance and management of WUA and JMC might proceed in north west Thailand, in this section I examine empirical evidence to support or refute Propositions 4 and 5 of Chapter 3. I begin by evaluating evidence to confirm or refute Proposition 4.

6.2.1 JMC and the WUA as empowering institutional mechanisms (Proposition 4)

Proposition 4 focuses on whether JMC/WUA have given non-state actors, such as farmers and other water stakeholders, greater legitimacy to intervene in provincial water management. Specifically, Proposition 4 states:

“Recently introduced organizational mechanisms promoted at the local scale empower non-state actors to have legitimacy in water management comparable with state agencies”.

Recent stakeholder experiences of JMC and WUA were obtained through interview. 'Non-state actors' in the WUA structure are farmers, and the key test here is to what extent WUA has provided new opportunities for them to participate in irrigation water management within 'the project' as part of the move towards PIM. Crucially WUA's establishment as a legal organization has the potential to increase the credibility and legitimacy of PIM among farmers. When asked in interview what he saw the main advantages of WUA were, the WUA chief commented:

"With WUA as an organization with formal legal status, we have more power to negotiate many things with MTIP and with other JMC member organizations, including budget and water allocation and management. For example, in 2009 – a real drought year – we only had enough water left to allocate two cubic metres per person across the five districts over the dry season. Water supply was in crisis. But WUA helped us broker an agreement for water delivery rotation between stakeholders. MTIP allowed us to make a mutually agreed decision. When people knew we had the ability to do this, they started coming to us and asked us as their representatives to help them when they had a problem with irrigation water" (Author's interview, 16/08/2011).

Part of WUA's legitimacy in water management comes from it bringing together people who already know and trust each other from their time in *muang fai* systems and/or the Mae Tang Irrigation Water Management Network. This continuity in values, attitudes, norms, knowledge and practical experience seems to have encouraged members to use the WUA for collaborative purposes. In addition these informal relationships have helped promote WUA's image as an organization that can effectively address members' water management concerns, as the vice chief noted in interview:

"We always ask our members to come and see us anytime they need to. In case of water shortage or irrigation system problems, they can let us know through their group heads or come to see me at home. And, if some of them cannot come to see me, the chief or I will go to see them ourselves" (Author's interview, 25/07/2011).

This was corroborated by the WUA chief as follows:

"When we received some budget from the government, we spent the money to improve not only our agricultural activities, but also used it as an incentive for members to help dredge irrigation canals and to maintain local water delivery systems. So WUA money ends up in farmers' hands" (Author's interview, 27/08/2011).

From the perspective of MTIP, 'project' officials considered WUA a real asset in communicating more effectively with farmers. One official stated:

"WUA is the farmers' representative— they are local people, they've grown up here, they know their areas, know their members, know what farmers really need, know which period they cannot release water to other agencies. Therefore, if MTIP need farmers to reduce their water use so as to manage overall demand, we naturally ask WUA to inform their members. We think farmers understand WUA better than us. They've labeled us as 'the outsiders'" (Author's interview, 1/10/2011).

It could be said that WUA is a 'self-organizing' body for farmers, with the potential to change existing patterns of water management through demonstrating new possibilities for collaboration and cooperation among its membership. Hence in interview, the vice chief reflected:

"As there was evidence showing that farmers as well as other agencies stole water and did not respect existing rules, the WUA committee decided to improve the clarity and understandability of water use regulations among its members. We also set in place a new system of fines in case members abused the regulations – things like not maintaining watercourses, or failing to attend group meetings. In addition, we have asked members to pay a fee according to their drainage areas especially from government and private agencies that use irrigation water from MTIP, including Chiang Mai Night Safari, Royal Flora Ratchapruek Chiang Mai and Chiang Mai Provincial Waterworks" (Author's interview, 20/10/2011).

This demonstrates that WUA can empower farmers to participate in water management with 'the project'. However, to communicate farmers' needs with other stakeholders, WUA needs to be part of a wider organizational and institutional context, which JMC provides.

In 2010, JMC was established to implement the PIM concept by engaging stakeholders in participatory water governance. The WUA chief and vice chiefs act as the JMC administrator groups and, according to one respondent, WUA has "a huge opportunity to make JMC more relevant and legitimate" to farmers. The interviews I undertook revealed a number of ways in which WUA could do so, ranging from improved understanding of farmers' water needs, through to acting as a 'clearing house' for grassroots agricultural ideas on how to improve water allocation and delivery. Thus, the Association has begun to disseminate knowledge of farmers' water needs more widely to domestic and industrial users through the JMC, enabling other agencies to recognize why water is needed, while permitting farmers greater rights and responsibilities in decisionmaking rather than relying on 'the project'. A representative of IWUG Zone 10 commented that:

"I think local administrative organizations and private agencies have never understood us. Now, while WUA has less power than JMC (it cannot request greater water allocation, for example), it can oblige the president of JMC to act. So it has an important role to play in counterbalancing the power of the government and tourism agencies, and the decision-making they propose". (Author's interview, 7/09/2011)

While the WUA chief offered this candid opinion:

"JMC has fewer farmers' representatives than other stakeholders who have power as a result of government back-up and money, including MTIP. In WUA, we do not want to make an enemy of JMC, as they could affect the long-term influence we have. But farmers do not want money or influence as much as water" (Author's interview, 1/06/2011)

The Chief also noted a potentially significant organizational weakness in JMC, in that:

"JMC is not a formal organization in the sense that it has not got any legal powers or competencies. Its roles are largely conciliatory and representational, and there's no financial support for its operation. When compared with WUA, JMC only helps make water allocation planning more transparent. Particularly among farmers, MTIP and local government agencies, I have to say we do not understand each other. We have the office heads on JMC committees, but when I invite them to attend a meeting, they rarely come; they usually send someone instead. JMC is not strong enough to empower farmers to have legitimacy in water management as it is not a legal organization" (Author's interview, 28/08/2011).

This observation was corroborated by a project official:

"JMC is at an early stage. It needs time to develop relationships among its diverse membership and to adjust their understanding to each other. Sometimes I think it's difficult to understand what that really requires. And this might obstruct achieving co-water management". (Author's interview, 04/10/2011)

From these interviewees' comments, therefore, it is apparent that JMC's status is less favourable among farmers than that of WUA, even though both organizations can be viewed as demonstrating the provincial government's intention to directly address the problems inherent in the MTIP. Irrespective of this, the overall aim of JMC and WUA appears to be to stick with the MTIP model of 'command and control' in water governance and management. Nonetheless, there is ample evidence here to support Proposition 4, albeit with some reservations regarding JMC's perception amongst farmers. This point is considered further in Chapters 7 and 8.

6.2.2 Cross-scale and cross-level interactions to facilitate collaborative water management (Proposition 5)

Folke *et al*. (2005) note that a critical feature of adaptive governance is the importance attached to effective cross-scale and cross-level interactions in delivering successful policy outcomes. Hence, Proposition 5 focuses on whether cross-scale and cross-level interactions encouraged local actors to engage with actors at other scales and levels, so facilitating collaborative water management in the study region.

A focus group discussion with a sample group of MTIP, JMC, WUA, and IWUG zone 10 participants enabled me to identify cross-scale and cross-level interactions in practice in the study region. From the farmers' viewpoint, they understood that cross-scale interactions offer a potential solution to their informational needs for PIM, by enabling them to contact/ask for help/share experiences and knowledge with other actors, located across scale boundaries. IWUG Zone 10's head described his understanding of this to me as follows:

"I'd say these 'cross-scale' meetings are a chance for us to receive help and knowledge from others, such as sharing information on when we've plenty of water or when we're short of it with neighbouring muang fai*, or when we asked for help from Subdistrict*

Administrative Organizations (SAOs) for some money to support us with canal dredging" (Author's interview, 17/10/2011)

In interview, the WUA chief offered his understanding of the value of cross-scale and cross level interaction in this way:

"It's of real value to coordinate with others locally or regionally without going through MTIP, since 'the project' cannot respond to all our requests. For instance, I am going to ask the Upper Ping Watershed Committee if we can share its budget to support our irrigation activities – though I'll have to inform MTIP first about this" (Author's interview, 17/10/2011).

While, when asked to clarify their understanding of cross-scale and cross-level interactions, many respondents commented along the lines that it was "*the ability to contact with people at higher level without considering hierarchy"*.

Here, 'cross-scale' and 'cross-level interactions' tend to be defined by interviewees as encounters with other water stakeholders that lead to exchange of information on water management across multiple scales and levels. Farmers agreed that this multi-scaled and leveled governance was a step forward for them, but that it also brought complexity and could not be guaranteed to resolve water dilemmas speedily. As Chapter 5 reported, the outputs of multi-scale water management often demonstrate gaps between actors in levels of knowledge and in administrative competence. This counterbalances assertions made by scholars that cross-scale and cross-level interactions *invariably* enhance local adaptive capacity to deal with disturbance (Folke *et al*., 2005; Termeer *et al*., 2010).

A 'middle ground' organization thus appears essential to trigger interaction of actors across scales and levels to improve prospects for sustainable water management. WUA has the potential to encourage farmers to interact with MTIP, local government organizations and tourism agencies by using the JMC as a forum. This is because WUA is close to farmers, whom trust and respect it as 'reliable agency'. Likewise, JMC is viewed as legitimate and viable by non-agricultural water users. Thus, taken together, JMC/WUA represent a credible water management institution, placing this hybrid organization in a potentially powerful position to legitimate particular local-level procedure, to broker cross-scale interactions, and to facilitate state legitimization of local practice, enabling cultural and political revitalization, capacity building and institutional building. Nonetheless these cross-scale and cross-level interactions need to grapple with often radically different knowledge sets about water among stakeholders, if transitioning to collaborative forms of water management is to come about.

In the study region WUA contains elements both of water modernization and intergenerational water knowledge, and its mode of operation lies in between applying formal rules and informal procedure (Figure 5.7, Chapter 5). This seems to have enhanced the interaction between actors across scales and levels to share their knowledge and experience over water allocation disputes. As the JMC president commented:

"JMC meetings, which take place at least twice a year, is a forum for me to exchange my knowledge and farmers experience from the smallest scale to water management at the project level. At the same time, MTIP and the rest of JMC representatives attend these meetings to offer guidance and advice on technology and financial issues to help us. And it can provide the forum for collective decision-making. This is because it offers a forum where farmers (like me), MTIP, local government organization representatives and tourism agents are at the same level and position, there's no hierarchy in meetings" (Author's interview, 04/04/2012)

However, a representative from IWUG Zone 10 took a more cautionary approach:

"Twice yearly meetings are just not enough to change our understanding, to bring it up to the same level as them [the MTIP]. There should be both more formal and informal opportunities to sit and talk together. That way, we could reach an agreed programme of management of irrigation water much more quickly" (Author's interview, 11/09/2011)

From an adaptive governance perspective, *together* the WUA and JMC have the capacity to reduce widespread problems of 'scale mismatch' and 'level misfit' through increasing collaboration among actors in water management (Young, 2002). Nonetheless it should be emphasised that introducing JMC and WUA has also complicated the already tangled web of provincial water governance, as decisiontaking on water policy remains the responsibility of MTIP. Consequently, stakeholder engagement in JMC does not necessarily equate with these stakeholders being accorded equal weight in ongoing discussions on future water policy options; nor, crucially, does it at this stage include *muang fai* systems. While *muang fai* systems are currently not within JMC/WUA's remit, assuming its activities are successful, the intention is to bring about new collaborations between these two local systems of water governance. As Allen and Gunderson (2011, p.1381) note, "Government agencies often hold sway among stakeholders in complex regional scale adaptive management processes. They are often the legally empowered, technically astute and the primary funders of much of the adaptive management actions". Clearly this is the case with the MTIP. The key issue here, then, will be how WUA/JMC develops as a brokerage/negotiation mechanism over MTIP policy, and the scope it has to grant equal importance to all participants in the development of new approaches to water allocation and delivery, particularly where this goes against MTIP's current operating procedures.

The analysis set out here thus provides evidence to support Proposition 5. It also highlights the need to develop WUA to have the same legitimacy and powers as JMC, so that the Association can properly support cross-scale and cross-level interactions to ensure successful water management.

6.3 JMC/ WUA as 'middle ground' organizations

The previous section demonstrates that the newly introduced water management structures of MTIP (JMC and WUA), acting as farmers' partnerships and collaborative action, have the capacity to overcome the tendency of stakeholders to pursue narrow self-interests in water use (Smith and Porter, 2010). Therefore, these organizations potentially can be expected to encourage the transition to more adaptive and collaborative water governance arrangements (Loorbach and Rotmans, 2006; Pahl-Wostl, 2007; Loorbach, 2010). I examine this aspect further here by testing Propositions 6 and 7 to gauge the ability of JMC/WUA to build social learning and networking among stakeholders, resolve water allocation problems, and enhance transition to more sustainable water management.

6.3.1 Evidence of collaborative water management (Proposition 6)

Proposition 6 states:

“Collaborative water management within the study region offers opportunities for state and non-state actors to engage in social learning and networking”.

In interviews, ‘collaborative water management’ for all stakeholders was defined as active shared responsibility for water allocation and delivery among farmers, MTIP and JMC through collective decision-making and decision-taking and the resolution of water management problems, with farmers having rights and powers equal to the agencies. Of the current situation under the MTIP, one respondent remarked:

“Nowadays, I just want to manage my water needs with the project and with other agencies simply. But it seems that farmers like me are expected to accept the decisions on water they’re given, more than participate in taking those decisions. As a result, water disputes often flare up. And, more importantly, water quantity is unpredictable. Only WUA can, I think, relieve our problems” (Author’s interview, 30/08/2011)

Thus continued reliance on MTIP governance appears to calls into question the emergence of more sustainable patterns of water allocation and delivery. As I have shown, MTIP has demonstrated frailties in handling the water management demands of multiple users locally and provincially. Importantly, rising water demand and recent climate change projections for the river Ping and its catchments suggest that these demands will become substantially more difficult to process and handle in future (Huitema and Meijerink, 2009).

On this issue, the Head of IWUG Zone 10 commented:

"Collaborative water management in our areas could happen if MTIP acted as consultant in terms of informing available water and supporting our water user groups with some budget if we really needed it. The rest of irrigation activities, I think farmers have the capacity to handle, for example devising water delivery rotation with government and private agencies and employing our local knowledge from muang fai *experience to managing water via WUA"* (Author's interview, 20/06/2012)

As discussed earlier, promoting collaborative water management emerged relatively recently nationally with the adoption of PIM. This resulted in WUA and JMC being established to promote collaborative water management. The previous section has shown how JMC's non-agricultural stakeholders and WUA's representation of farming interests now appear to enable local level water stakeholder concerns to be fed through to MTIP through JMC's committee structure. For example, there seems to be genuine efforts being made to create favourable conditions for collaborative water management, according to WUA and IWUG respondents, and to put stakeholder needs ‘centre stage’ in local water allocation and delivery. The intention is that cross-scale and cross-level interactions assist farmers and actors at higher scales and levels to collaborative water management via WUA. Thus a Zone Assistant said:

“Actually when we started to think through how PIM might work in practice, we asked all of our stakeholders to join us in shaping a new approach to irrigation management. WUA has helped address farmers’ issues and enabled us to present them more effectively at JMC meetings. So, now, farmers’ needs often cross scales and levels. We try as much as we can to deliver water for farmers before sharing it with other agencies. And we’re still looking for other ways to involve all parties to increase effectiveness in irrigation” (Author’s interview, 05/08/2011)

While WUA’s chief stated:

“JMC is a good way of gathering many stakeholders to plan for water allocation when water is in crisis. JMC meetings allow us to learn from each other, and to strengthen our relationships. It’s got us to work as a team, and to avoid disagreements over water allocation wherever we can. And, as to what a good relationship means, it’s about being able to ask for help whenever it’s needed” (Author’s interview, 13/09/2011)

These promising developments have recently been further enhanced by policy changes in JMC, which were put into effect in March 2012. First, JMC meetings can now be convened by a vote among members in order to respond to water circumstances – a useful innovation, particularly in dry season. This allows committee members to have more interaction, which, according to Hinde (1981) (cited in Giddens, 1992, p.23-25), could lead to deeper relationships among stakeholders. For example, hierarchical relationships might be lessened between JMC members and MTIP officials, hence offering an opportunity to combine or blend contrasting knowledges on water management. Secondly, stakeholders' increased cross-scale and cross-level interactions have resulted in improved water allocation plans, which has greatly assisted water delivery to farmers in the dry season. The evidence displayed at JMC meetings is that farmers at the end of canal laterals now have water available on at least 57 percent of days in the dry season. Moreover, private and government agencies, such as Chiang Mai Provincial Waterworks Authority and Military Campuses have to contact JMC and MTIP before abstracting water in the dry season. Lastly, JMC and WUA developed a relationship as a social network with village chiefs and community leaders to help them enforce farmers to respect the water use regulations and use water according to the agreed water rotation plans. These local networks are expected to dramatically improve communication on water issues with local people. This confirms how collaborative water management within the study area has developed since JMC and WUA's introduction, and the range of new opportunities for state and non-state actors to engage in social learning and social networking in the study area since 2008.

The findings reported augur well for a collective learning experience, that Bouwen and Taillieu (2004) note could underpin collaborative water management, leading to sustainability and integration benefits. Specifically, cross-scale and cross-level interaction helps deepen networked relationships, permitting 'multiple voices' in water allocation to be heard and different kinds of knowledge (local, scientific) to be mobilised. As Folke *et al.* (2005) and Hahn *et al.* (2006) note, such elements can yield new solutions to water management problems and dilemmas among water users.

Taken together, there is circumstantial evidence here for more collaborative practice starting to emerge; consequently, Proposition 6 is validated. In the penultimate section of this Chapter, I therefore evaluate the prospective capabilities of JMC and WUA to instil a transition to more sustainable water management in Chiang Mai.

6.3.2 Mechanisms to encourage the transition to more sustainable water management (Proposition 7)

The last proposition (Proposition 7) to be tested states: 'Formal and informal institutional mechanisms promoted to actors across scales and levels can resolve water allocation problems and encourage the transition to more sustainable water management'.

The preceding sections identified various mechanisms in water management. The obvious instrumentalities include JMC and WUA as new 'middle ground' mechanisms in the governance of MTIP. JMC and WUA can be categorized as formal institutions, since their water policy and strategy are derived from government actions (Grigg, 2011). On the other hand, my research also identified a plethora of informal institutional mechanisms, such as informal relationships, local water norms, the situated knowledge, culture and customs of *muang fai* that, taken as a whole, constitute 'good water governance'. Equally however, respondents commented on the barriers and obstacles to more sustainable water management practice imposed by the MTIP and its legacy of top-down water management, which interviewees alleged obstructs effective knowledge sharing among and between actors at multiple scales and levels, and hence retards social learning (Pahl-Wostl *et al*., 2007). So, for example, farmers in Nam Bo Luang commented:

"There are many procedures in water management at the project levels. So we have to follow these step- by- step if we need help from MTIP or JMC. They cannot quickly solve the problems like WUA, so often we rely on our own family and kinship relations to deal with the problems instead" (Author's interview, 20/09/2011)

While a WUA respondent commented that:

"Being WUA, we have formal legal rules and regulations to work with our farmers. But more often than not, there is no need to use formal processes to manage our farmers as we are the same local people, have the same knowledge level and norms. I work with them by using informal relationships, knowing that if we do, we can oblige them to respect the rules by using the formal powers at our disposal" (Author's interview, 11/10/2011)

Clearly the new procedures do not allow *all* water allocation problems to be readily resolved. However, section 6.3.1 demonstrated that JMC and WUA are at the beginning stage of offering opportunities for state and non-state actors to collaborative water management. This shows the capacity for combining formal and informal institutional mechanisms to resolve water allocation problems. In particular, both WUA and JMC need more time to establish their institutional presence before challenging the national and provincial heritage of ‘command and control’ water management. Hence at this early stage, it cannot be definitively stated that these organizations have the capability to effect a transition to more sustainable water management in Nam Bo Luang or Chiang Mai. To do so, according to van de Kerkhof and Wieczorek (2005), WUA and JMC must instil four aspects of learning among actors. These are, first, to secure the *commitment of stakeholders* to invest time and effort in the transition process, to actively contribute to collaborative discussion, and to be critical but open to new information, and to learn from each other. The results reported here demonstrate that while WUA and farmers are showing commitment as MTIP and JMC members, MTIP still has to show its long-term intentions regarding water use and management. As a result, transition has not begun. Second, *fairness* is needed to facilitate an open discussion in which minority (farmers) viewpoints are not *a priori* excluded from discussion. Farmers and WUA revealed that while they often received a fair hearing in JMC meetings, the frequency of these meetings was not enough to discuss anything more than day-to-day practicalities of water allocation and management, much less to establish transition targets or aspiration for more sustainable water use. Thirdly, transition needs *transparency* allowing participants to check whether the process is sound, and whether it gives them sufficient opportunity to fulfil their own goals. This aspect is certainly supported by the study results, giving credence to the notion of “middle ground” as ‘the project’ is now more transparent in its water management intentions. Lastly, transition needs *competence*, which can be understood as the ability of the participants to deliberate about different aspects of the transition theme and to make informed choices with regard to both the nature of the water allocation problem and the possible solutions to this problem, given the current information and knowledge available. Again, this aspect needs much further development across Chiang Mai to bring to fruition. On the basis of the many contingencies evident, therefore, Proposition 7 is rejected.

6.4 Conclusions

This Chapter has analysed empirical evidence on whether ‘middle ground’ governance promoted in the study region is sufficient to solve water allocation problems and to encourage sustainable water management. I have done so by evaluating the relevant research propositions (Propositions 4, 5, 6 and 7) presented in Chapter 3 of the thesis.

I conclude that WUA and JMC certainly have the *capability* to encourage cross-scale and cross-level interaction to engage actors at multiple scales and levels to facilitate collaborative water management (Proposition 5), and hence do offer *opportunities* for state-and non-state actors to engage in social learning and social networking (Proposition 6). However, the command and control management of MTIP is the main factor obstructing JMC and WUA’s empowerment of farmers to participate in water management comparable with state agencies (Proposition 4). Much less certain is whether these new intermediary organizations can resolve water allocation problems, and so encourage sustainability transitions (Proposition 7).

In Chapter 7, I address these strengths and weaknesses of JMC and WUA’s operation, and, reflecting on the results of the empirical research in earlier Chapters, consider how the adaptive governance approach employed in this thesis might enable identification of the factors and strategies needed to chart a course towards sustainable water management and water governance in Chiang Mai.

CHAPTER 7: ENHANCING THE EFFECTIVENESS OF 'MIDDLE GROUND' ORGANIZATIONS IN WATER MANAGEMENT IN CHIANG MAI

Building on the preceding research, this Chapter considers the conditions under which the transition to more sustainable water management in north west Thailand can be promoted. First, I do so by reflecting on the findings of Chapters 5 and 6, focusing in particular on the outcome of testing the seven research propositions, and the contribution of my empirical findings to adaptive governance and sociospatial theories. I then reflect on the strengths and weaknesses of establishing 'middle ground' organizations in water management demonstrated by my primary research, and how the shortcomings of JMC/WUA's existing approach to implementing more sustainable patterns of water management in the study area might be addressed. This discussion is structured from the perspective of the informing literatures on adaptive governance and sociospatial relations respectively. Finally, drawing on the thesis's empirical findings, I conclude with an evaluation of the first couple of years' operation of JMC/WUA.

7.1 Empirical findings of the study, and contribution to adaptive governance and sociospatial relations theories

Implementing adaptive governance for water via the introduction of 'middle ground' organizations in developing countries faces manifest challenges, as water governance contexts are still largely state-based, inflexible and often resistant to change (Rogers and Hall, 2003; Bressers and Kuks, 2013; Chambers, 2013). Consequently, redesigning water management institutions and policy frameworks in order to adapt to changing society-environment relationships in ways that encourage sustainable water management is still in its infancy (Dietz *et al*., 2003; Folke *et al*., 2005; Carpenter and Folke, 2006). With reference to the case study, JMC/ WUA and the seven research propositions, here I consider the thesis findings from the perspective of the two informing literatures of Chapter 2, on sociospatial relations and governance. I begin with the findings on sociospatial relations and water management.

7.1.1 Sociospatial relations and water management

Chapter 5 critically examined three research propositions to test whether and how geographical scale, position and place influence actor interactions over water governance and management in the study area. The Chapter's findings demonstrated that politics of space significantly affects water management knowledge and water management interactions in Nam Bo Luang, Chiang Mai by structuring actor relationships, underwriting and reinforcing differences in norms and beliefs concerning water allocation, and determining actor capacity to collaborate on water management, as follows.

I. Scale defines actor relationships in terms of actors accepting or challenging norms and beliefs pertaining to water management and participating in new water management arrangement. (Proposition 1)

The empirical findings disclosed the importance of scaled relationships in water use and allocation, and the multitude of "smaller"/"larger" spatial units within the study area, making up "a multilayered, hierarchically figured geographical scaffolding" (Brenner, 2001, p.600). Hence, different scales of water management means farmers (local scale) and MTIP (provincial scale) have managed water in their own ways, based on different scaled beliefs and norms. This has tended to prevent collaborations of actors across scales and levels, as evidenced in Chapter 5 (Section 5.2.1), leading to complexities in water management and solving water use problems across the study area, particularly in the state-led MTIP irrigation project.

In line with other studies, therefore, my research demonstrates scale crucially affects the efficiency and effectiveness of existing and potential future patterns of water governance (Lebel *et al*., 2005; Cash *et al*., 2006; Dore and Lebel, 2010). These findings foregrounded the potential importance of cross-scale interactions, and highlighted for me the potential of JMC/WUA as a 'middle ground' organization that might enhance a transition to more sustainable water management in the future (see Proposition 5).

II. Differences among actors in water norms and beliefs at local scale gives rise to particular water politics that shape 'solutions' to local water allocation and delivery problems (Proposition 2)

Molle (2007) and Lebel *et al*. (2008) identify the benefit of applying scaled knowledge in water management in terms of easing interventions in water use, and to provide justifications or rationalisations to local stakeholders to participate in decisionmaking. My analysis in Chapter 5 concurs with this position, by demonstrating how, under the state-sponsored system, the centrally coordinated, hierarchical approach is simply too complex and inflexible to facilitate local and provincial water management, with allocation and dispute resolution routinely involving numerous officials and multiple organizations at different scales and actor levels. Evidence in Chapter 5, section 5.2.2 confirmed that this arose because different geographical scales and levels of water management have embedded within them often radically different knowledge and rules sets. These knowledges and rules mean similar – often, the same – water management 'problem' or 'dilemma' is viewed very differently by farmers, other water users, and MTIP policy practitioners.

Therefore, I conclude that not only does this exclude building communities of actors around the concept of "participatory irrigation management", it also greatly complicates developing cross-scale and cross-level water management in practice. In effect, lack of cooperation among stakeholders emerges, instead of enhancing collaboration.

III. Local water politics influence the viability of cross-scale interactions that seek to specify collaborative water management among state and non-state actors, and hence the transition to more sustainable water management (Proposition 3)

I show in Chapter 5 how one of the most critical consequences of scale shaping actor relationships and differentiation of norms and beliefs is that MTIP' s hierarchical [national-local] arrangement brings a heavy administrative burden, exacerbating the day-to-day management of water issues by making problem resolution more complicated. For example MTIP's system of water allocation means 'politics of position' develop where farmers are in a disadvantageous position on canals and laterals, and receive only irregular supplies of dry season water as actors 'higher up' the canal exercise their spatial advantage by abstracting water for their own purposes. This can have a crucial impact upon power relations between actors, both in the sense that some positions tend to be more influential than others in determining water access, and in the sense that emphasizing the situated nature of water knowledge (water stakeholders) challenges that power of those who claim objectivity in water allocation and delivery (MTIP) (Sheppard, 2002).

Again, as shown in Chapter 5, these benefits of position also foster a 'politics of place' where a sense of entitlement to water is bestowed upon a minority group of powerful state-based actors, and 'dispossession' on a far less powerful but much more numerous group locally (farmers). The dangers here are clear; as Yung *et al*. (2003) note, if actors feel that their positions are not understood or heard, they might reject to engage in water management participation processes altogether.

In brief, the empirical examination of Propositions 1-3 confirm that scale, position and place issues are often mobilised in local territorial politics by actors to promote their often radically different perspectives on interest water use and water management across scales. Competition between these different positions often allows the water management pattern of the MTIP to dominate other groups. The resulting complexity and inflexibility has prevented new forms of collaboration and coordination becoming established among stakeholders across scales and levels, reinforcing the Thai state's dominance of water management from local to national scale. Hence, no matter what the intentions of 'scaling up' or 'down' in resolving water management are (c.f. Gupta, 2011, Chapter 2), the disparity in actors' beliefs, norms, and relationships arising from politics of space has prevented instilling new forms of learning, and the inculcation of new water management behaviours favouring sustainability. There is, therefore, a need to create an appropriate governance space where actors across scales and levels can work together and define new water management territories and responsibilities, which I addressed through critical examination of the other four research propositions.

7.1.2 Governance and water management

The empirical findings from the previous section pointed out the difficulty of achieving collaborative water management, resulting from the influences of politics of scale, position and place. Consequently, in Chapter 6 I examined the introduction of new organizational mechanisms that potentially facilitate cross-scale and cross-level interactions in water management. There are JMC and WUA. Based on the governance and adaptive governance literatures, I distilled four research propositions in Chapter 3 that I employed in Chapter 6 to evaluate the ‘middle ground’ adaptive governance capabilities of these two new organizations. This analysis revealed that JMC and WUA have great promise in balancing power between state and non-state actors, and in encouraging new cross-scale and cross-level interactions to facilitate collaborative water management. There are, however, important provisos in my assessment, which I identify and discuss here.

I. Recently introduced organizational mechanisms promoted at the local scale can empower non-state actors to have legitimacy in water management comparable with state agencies (Proposition 4)

Evidence was found that JMC and WUA can address farmers’ water management problems and present them to MTIP more effectively than current arrangements, in effect by – passing the hierarchical procedures of decisionmaking and decisiontaking on water management (see Chapter 4). These organizations give actors opportunities to compare the merits of alternative governance arrangements and to challenge and/or support other stakeholders' interest, causes, and effects, as Young (2002) noted in other situations.

Specifically, WUA's structure is based on farmers communal water management needs and responsibilities, and, by being set within the institutional structure of the RID, provides new opportunities for them to participate in irrigation water management and to develop this management according to PIM principles. As important, WUA has a formal legal organizational basis, so it has the potential to increase the credibility and legitimacy of PIM among farmers. Through the status this confers, WUA can empower farmers to participate in water management with 'the project'. JMC, by contrast, is a forum that allows WUA to communicate farmers' needs with other water stakeholders since WUA's constituent groups are represented on the JMC administrative Board. As a result, WUA has "a huge opportunity to make JMC more relevant and legitimate" to farmers (see Chapter 6, section 6.2.1).

Following adaptive governance literatures, JMC and WUA can be viewed as 'middle ground' organizations, designed to mediate actor relationships across scales and levels over water use (Dietz *et al.*, 2003; Folke *et al.*, 2005; Carpenter and Folke, 2006) by brokering agreement on water rights, responsibilities, and power between multiple levels and sectors of government and civil society; a role that, according to governance scholars, is regarded as essential for effective water management (Fabricius *et al.*, 2007; Armitage *et al.*, 2008; Berkes, 2009). Consequently, through my analysis of the four propositions, I sought to evaluate whether and how JMC and WUA offer opportunities to encourage greater participation by water users in decisionmaking arrangements in future.

II. Cross-scale and cross-level interactions encourage local actors to engage with actors at other scales and levels, so facilitating collaborative water management in the study area (Proposition 5)

Chapter 6's analysis of Proposition 4 showed the growing reliance by actors on JMC and WUA for contact/ask for help/ share experiences and knowledge with actors, located across scale boundaries and level management. From this analysis, it appears JMC and WUA are consolidating their position to provide legitimization for particular local-level water procedure, to broker cross-scale water management interactions, and to facilitate state legitimization of local practices, thereby enabling capacity building on water governance. Crucially these organizations also provide a forum for exchanging knowledge and technologies applying to water management across the study area (c.f. Berkes, 2004). Thus, WUA has the potential to encourage farmers to interact with MTIP, local government organizations and tourism agencies by using the JMC as a forum, because WUA has already earned the trust and respect of agricultural community as a 'reliable agency'. Likewise, JMC is viewed as legitimate and viable by non-agricultural water users. In effect, therefore, from the adaptive governance perspective, JMC and WUA have the capability to reduce widespread problems of 'scale mismatch' and 'level misfit' through increasing collaboration among actors in water management (Young, 2002).

III. Collaborative water management within the study region offers opportunities for state and non-state actors to engage in social learning and social networking (Proposition 6)

As JMC and WUA have empowered non-state actors (especially farmers) to have greater legitimacy in water management (Proposition 4), these actors have begun to engage with actors at other scales and levels through cross-scale and cross-level interactions (Proposition 5). Chapter 6 showed that more collaborative water management is beginning to emerge in the study area. Furthermore, this Chapter also provides some evidence to suggest JMC and WUA are contributing to social learning and networking. Examples demonstrated in Chapter 6 include adjusting water rotation plans, providing times for canal dredging and maintenance, and building relationships with village heads and community leaders. WUA's introduction, crucially, enables water management problems at the local scale to be 'scaled up' to the provincial and national scale of resolution through JMC's fora. Importantly, these developments may represent turning points in beginning to increase effectiveness, sustainability and integration and enhancing inclusive governance and self-governing capacities, according to Bouwen and Taillieu (2004). By doing so, these two organizations could help build trust, access much needed resources for improving physical infrastructures such as weirs and dams, and promote common 'vision' and shared management goals in the longer term (c.f. Berkes, 2009).

IV. Formal and informal institutional mechanisms promoted to actors across scales and levels can resolve water allocation problems and encourage the transition to more sustainable water management (Proposition 7)

Clearly JMC and WUA are formal institutions since their water policy and strategy are derived from government actions (Grigg, 2011). Significantly, though, their success depends on integrating informal institutions, such as relationships, local water norms, and the situated knowledge, culture and customs of *muang fai* in order to develop ‘good water governance’ for Nam Bo Luang. There is evidence in Chapter 6 that JMC and WUA have capitalised quite effectively on these informal institutional mechanisms in their decisionmaking and decisiontaking, so embedding social learning and social networking in the resolution of water allocation problems. Notwithstanding, the continued ‘top-down’ water management of MTIP is retarding the transition to more sustainable water management. Typically, such transition needs several impetuses, including incentives (Vincent, 2007), leadership (Folke *et al*., 2005; Biggs *et al*., 2010), mobilizing extant informal networks (Folke *et al*., 2005), and, according to van de Kerkhof and Wieczorek (2005), stakeholders’ commitment, fairness, transparency and competence. Unquestionably, therefore, JMC and WUA need more time to begin the transition to process in Nam Bo Luang.

These empirical findings under lenses of governance and adaptive governance approaches thus confirmed the status of JMC and WUA as ‘middle ground’ organizations, mediating water uncertainties and the legacy of the top-down approach that has dominated water management locally, provincially and nationally. However, the operation of both these organization is not by any means perfect. In the following section, therefore, I review the strengths and challenges to this experiment in adaptive water governance in terms of its capacity to deliver sustainable water management in the medium to long term.

7.2 Strengths and weaknesses of JMC/WUA

Chapter 2 showed that water governance plays an important role in agricultural water management in developing countries, particularly in Thailand, as the normative notion of 'good' water governance in irrigation foresees the full range of water users participating actively in all water management activities. However, Young (2010) and Bakker *et al*. (2008) point out that governance of natural and social systems is complex, meaning, for example, 'misfit' often arises between political-administrative and hydrological systems, the outcome of which can be characterized as 'governance failure', increasing the occurrence of water crises. Hence, Biermann *et al*. (2012, p.51) reflection that often "the current institutional framework for sustainable development is deeply inadequate to bring about the swift transformatic progress that is needed" for water management.

I have argued that, when it is appropriately implemented, adaptive governance might offer potential solutions to these failures in water management in developing countries, where political-administrative contexts are still largely state-based and relatively rigid and resistant to changing and/or increasingly unpredictable water management demands (see Chapter 6). The research findings on JMC and WUA, discussed above, suggest these organizations are playing a broadly positive role in linking stakeholders across scales and levels to influence water governance within the MTIP's organizational setting. Nonetheless, the balance sheet of these organizations presents a mixed picture, with much still to do if genuinely sustainable water management is to become a reality. I first outline JMC/ WUA strengths in water management.

7.2.1 Benefits arising from JMC/WUA as 'middle ground' organizations

In Chapter 2, I noted how proponents of adaptive governance advocate so-called 'co-management' of diverse sets of stakeholders, operating at different levels and cooperating by sharing rights, responsibilities, and power between multiple levels and sectors of government and civil society as essential for effective water management (Armitage *et al*., 2008; Berkes, 2009; Fabricius *et al*., 2007). JMC and WUA can be seen to substantively advance co-management in four ways, as follows.

I. Empowering farmers and rural communities to have legitimacy in water management

Folke *et al*. (2005, p.460) state an adaptive governance approach emphasizes 'cross-scale and cross-level interactions' as a means of dealing with external perturbations, uncertainty, and surprise. The findings in Chapter 6 identify how WUA, with its formal legal status, has the power to negotiate on policy issues with MTIP and with JMC member organizations, including budget and water allocation and management. This is a direct consequence of what I described in Chapter 4 as WUA's standing as a legal organization, set within the institutional structure of the RID, which provides numerous opportunities to establish irrigation water management within 'the project' along PIM principles, as well as increasing the credibility and legitimacy of PIM among farmers.

Additionally, part of WUA's legitimacy in water management comes from it bringing together people who already know and trust each other from their time in *muang fai* systems and/or the Mae Tang Irrigation Water Management Network. Thus in Chapter 6, the evidence pointed to WUA helping farmers improve their water allocation and raising the maintenance budgets available for repairing dilapidated irrigation systems. These informal relationships have also helped promote WUA's image as an organization that can effectively address members' water management concerns, as one respondent commented that "WUA helps poor farmers to have rights to speak at the higher level, to let the project know that they are here" (Chapter 6, Section 6.3.1). This statement demonstrates the role WUA is beginning to play in articulating farmers' views and opinions.

For JMC, the results in Chapter 6 show how it has improved implementation and planning of MTIP and brokered water stakeholder disputes, through its restructuring powers. JMC's holistic focus (addressing all water users – agricultural and non-agricultural) also gives it a wider strategic role in developing more sustainable water management in Chiang Mai. Respondents also commented, variously, that JMC afforded opportunities to have "meaningful discussions" on provincial water management planning, water management problem solving, and information dissemination with other stakeholders. These aspects show how water management is now more transparent and accountable, and is beginning to have beneficial effects on decentralizing decisionmaking away from the legacy of top-down government control of water management.

II. Encouraging stakeholder interaction across scales and levels

Gregory *et al*. (2011) believe that societal engagement and stakeholders participation are pillars of sustainable water management. Therefore, they argue that 'middle ground' approaches are needed to reconcile differences of value and norms in water management between top-down and bottom-up approaches. The findings from Chapter 6 prove that WUA has the potential to encourage farmers to interact with MTIP, local government organizations and tourism agencies by using the JMC as a forum. From the evidence, I would argue this is because WUA contains elements both of water modernization and intergenerational water knowledge, and its mode of operation lies in between applying formal rules and informal procedure. As a result, it seems to have enhanced the interaction between actors across scales and levels to share their knowledge and experience over water allocation disputes. Likewise, JMC is viewed as legitimate and viable by non-agricultural water users.

In interview, the JMC president also pointed out that JMC meetings acted as a forum to exchange farmers knowledge and experience from smallest scale to water management at the project level. At the same time, MTIP and the rest of JMC representatives attend these meetings to offer guidance and advice on technology and financial issues to help farmers as well as the forum for collective decision-making. This is because JMC is viewed as 'neutral ground', where farmers, MTIP, local government organization representatives and tourism agents are at the same 'level' and 'position', so helping to broker agreement on water politics.

Thus JMC/WUA represent a credible water management institution, placing it in a powerful position to legitimate particular local-level procedure, to broker cross-scale interactions, and to facilitate state legitimization of local practice, enabling cultural and political revitalization, capacity building and institutional building. In this way, the committee could act as a multi-levelled mechanism (WUA at farm level, JMC at provincial level) for translating sustainable water policy into management practice, bringing new configurations of actors into engagement, and creating new ‘opportunity structures’ for social learning. From an adaptive governance perspective, therefore, certainly together the WUA and JMC have capacity to act as ‘middle ground’ governance structures.

III. Creating opportunities for social learning and networking about collaborative water management among stakeholders

Chapter 5’s findings confirmed that different geographical scales and levels of water management have embedded specific knowledge and rule sets on water (Proposition 2). Local government and private agencies claimed little knowledge of irrigation water management, or, as Chapter 6 respondents commented, that they believed as “non-professionals” they were not qualified to hold opinions on overall provincial water strategy (section 6.1.2).

Farmers also had this impression, as among rural communities understandings of water are derived from less formalized tacit intergenerational knowledges, shared among all participants through communal management practices. This “local wisdom” isn’t in line with science-based knowledge which MTIP engineers have. It is exactly this dissonance between different sets of water beliefs and norms that JMC will need to overcome to place irrigation management on a more sustainable footing, and to overcome misunderstandings between parties over the allocation and delivery of water, particularly in the dry season.

Nonetheless, evidence in Chapter 6, section 6.3.1 proved that there is already some progress in developing social learning and networking to address problems of water scarcity and water allocation among JMC's stakeholders at different scales and geographical positions. It could be said that this is the beginning of a process to develop JMC as a 'self-organizing' and adaptable organization, creating the appropriate conditions for greater cooperation and collaboration among water stakeholders.

IV. Counterbalancing farming's role in water governance relative to the state and state agencies

Chapter 5 confirms that irrigation management is controlled at a higher organizational scale than WUG or IWUG, tending to place 'remote', overly formalized conditions on daily water management. This situation is often found in developing countries, as Wittfogel (1957) famously observed. Political practice and power within developing country contexts is intimately bound up with the workings of the state and, by inference and more contemporaneously, with the evolution of water governance in these countries.

State-led water management obliges farmer groups to act in a sense as 'rule followers', rather than participants, by requiring them to follow step-by-step procedure and to try to avoid disagreements with officials if they are to ensure long-term continuity of water supply through the growing season. Not only does this exclude farmers from participatory water management: it also greatly complicates the implementation of cross-scale management practice. Typically, IWUG respondents felt disempowered compared to their old ways of working, particularly from the participatory forms of water management typical of *muang fai*.

Chapter 6 noted that WUA could balance water management power between MTIP, local and tourism agencies, and farmers by employing JMC as a forum for negotiation. Results in section 6.2.2 further reported that JMC meetings can provide valuable opportunities for collective decision-making as it is the place where farmers, MTIP and other JMC representatives are at the 'same level', lessening hierarchical relations between individuals and different organizational groupings. Accordingly, JMC offers WUA opportunities to communicate with actors at different scales which may serve to strengthen collaborative working relationships (Adger *et al*., 2003).

Taken together, this suggests that JMC, with the assistance of WUA, is vital to the promulgation of adaptive water governance, linking both horizontally and vertically to structure the processes by which Chiang Mai stakeholders share power, balance interests, and shape individual and collective actions on water supply and distribution (c.f. Lebel *et al*., 2006; Toonen, 2011).

Nonetheless, despite these four steps towards delivering more equitable and effective water management and water governance in the study area, JMC/WUA's status as a ‘middle ground’ organization has not run completely smoothly, with obstacles found in Chapters 5 and 6. It is to these limitations that I now turn.

7.2.2 Obstacles to applying ‘middle ground’ organization in water management

In synthesizing the results from Chapters 4, 5 and 6 it is possible to identify obstacles blocking the development of ‘middle ground’ approaches to water governance. This is also in line with the analysis of the specific claims made by water stakeholders, and comparison of the attributes of the JMC against recent accounts of pathologies of difficulty and failure of adaptive water management (for example Allen and Gunderson, 2011).

I. Adherence to the ‘command and control’ model of water governance

It is important to recall that JMC and WUA are part of MTIP’s policy architecture, and so are reliant upon its centralization of provincial decisionmaking and decisiontaking, and the pervasive effect of the ideology of water modernization. It could therefore be argued that JMC/WUA’s establishment exacerbates water management difficulties by introducing another administrative level into the province’s already complex system of water policy and administration (Chapter 4).

Chapter 4 revealed the national aim of water management policies: to expand agricultural production with the aim of boosting national income. As a result, Thai agricultural water management has created multiple scales and levels of political activity to make irrigation activities easier to administer and to assess performance of responsible agencies in irrigation development from the national to local level. Indeed, explicit elaboration of these distinct scales and levels of water management were an aim of Thai governments as part of successive National Economic and Social Development Plans.

This is supported in Chapter 5, where data confirmed multiple scales and levels of administration and responsibility separating policy officials from farmer respondents. Thus interviewees emphasized their daily experience of 'the project' being too complex and inflexible to address their production needs. Similarly in Chapter 6, responses from IWUG Zone 10 and WUA members emphasised their lack of success in getting their members points across, with some interviewees noting that MTIP invariably had the final word in how water was allocated (Section 6.1.1). This hierarchical approach makes it difficult to resolve water disputes transparency and accountably.

Moreover, it should not be forgotten that water use as well as water regulation continues to be largely determined by central government without popular participation. 'The project' has, in effect, absolute authority to control all form of water user organization. This reinforces the argument made earlier that JMC and WUA's introduction has simply complicated the already tangled web of provincial water governance, as decisiontaking on water policy remains the responsibility of MTIP. Stakeholder engagement in JMC does not necessarily equate with these stakeholders being accorded equal weight in ongoing discussions on future water policy options, or at this stage include *muang fai* systems. From the empirical evidence, therefore, the central importance of the state in water management significantly affects the efficiency and effectiveness of water governance practice in Chiang Mai (Proposition 1).

II. Lack of clear direction and incentives for transitioning

Transitioning processes to more sustainable water management require appropriate governance structures to deal with crisis and changing state policies on water management. However, there exists no template for determining *how* transitions should unfold (Herrfahrdt-Pähle, 2012) or what incentives (Dietz *et al*., 2003; Akamani and Wilson, 2011) are needed for more sustainable water management to emerge.

In Chapter 6, some evidence was adduced to show that the introduction of JMC and WUA had enabled farmers to participate more fully in water management. However, there was insufficient evidence to validate Proposition 7 on these organizations' ability to encourage the transition to more sustainable water management. This lack of evidence reflects uncertainty over the precise activities JMC and WUA need to undertake in order to establish new forms of collaboration and coordination, as Pahl-Wostl *et al*. (2011) note that effecting transitions requires knowledge sharing and collective learning of actors at all scales and levels.

Moreover, JMC lacks a repertoire of incentives which as Folke *et al*. (2005) and Olsson *et al*. (2006) comment is vital to instilling collaboration learning and raising public awareness. Most importantly, leadership is one of the non-economic incentives that can provide trust-building, vision, and meaning among actors at different geographical scales of water management (Bouwen and Taillieu, 2004; Folke *et al*., 2005; Biggs *et al*., 2010). Vincent (2007) also notes that economic incentives are necessary when rapid changes in human behaviour are desired. For JMC, it is still too early to judge whether leadership of the change processes needed to create sustainable patterns of irrigation will emerge. So the decision to create JMC and WUA may be seen either as potentially innovative and an instance of bold leadership, or as a pragmatic act to raise farmer participation in a water modernization project that looks set to face increasing problems as water demands escalate over forthcoming years (Clark and Semmahasak, 2013).

The weaknesses in JMC and WUA I have identified could be seen as impeding transitioning to more sustainable water management. Consequently, in the final Chapter, I consider how JMC/WUA's activities might be enhanced in practical terms to facilitate behavioural adaptation favouring greater cooperation and collaboration.

7.3 Conclusions

Based on the informing literatures reviewed in Chapter 2, and the empirical findings of Chapters 4, 5 and 6, I conclude that in developing country contexts, such as Thailand, politics of scale, position and place significantly affect water management, knowledge and actor interactions in terms of differences of norms and beliefs in water allocation, and the capacity of actors to collaborate on water management. In order to mitigate influences of the politics of space, the study examined the need for 'middle ground' organizations (JMC and WUA) to furnish formal and informal institutional mechanisms for achieving good water governance, so facilitating transition to more sustainable water management.

This Chapter has argued that, potentially, WUA and JMC have a substantial role to play as mechanisms of adaptive governance. First, they have the ability to confer upon non-state actors, especially farmers, greater legitimacy in water management policymaking and day to day activities. Secondly, these new organizations can encourage stakeholders across scales and levels to interact in order to facilitate collaborative water management. Thirdly, WUA/JMC offer new opportunities to encourage social learning and networking to disseminate innovative norms and beliefs about water management among stakeholders. Lastly, they can help counterbalance the ‘top-down’ legacy of state involvement in water policy and irrigation management. Nonetheless, undoubtedly there remain manifest shortcomings in JMC’s organizational structure, arising from continued reliance on a model of ‘command and control’ in water governance and management, some disunity among its constituent membership, and its lack of overall strategic direction.

In the final Chapter, policy specific recommendations are set out for provincial and local authorities to improve JMC/WUA’s operation; and to make the organizational context of their operation more favourable.

CHAPTER 8: TRANSITIONING TO MORE SUSTAINABLE WATER MANAGEMENT IN NORTH WEST THAILAND: CONCLUSIONS

This study has demonstrated that implementing adaptive governance for water management in NW Thailand via the introduction of ‘middle ground’ organizations still faces major challenges, chiefly because water governance remains largely state-based and relatively rigid and resistant to change. As such, it confirms recent research findings that re-designing institutions and political frameworks to encourage more sustainable patterns of water management is still in its infancy (see for example Dietz *et al*., 2003; Folke *et al*., 2005; Carpenter and Folke, 2006). Nevertheless, empirical findings in Chapter 7 confirmed that JMC and WUA have begun to reshape water governance arrangements in the study area. With reference to the case study context, JMC/WUA, and the study’s two informing literatures, this Chapter sets out policy recommendations that might not only help this reorganization and recalibration of stakeholder relationships, but also balance the right to water access for actors at different scales and levels.

In the first section of the Chapter, I propose strategies for the provincial authorities to enhance JMC’s capability as the pre-eminent ‘middle ground’ organization in water management and governance in Chiang Mai. Then policy recommendations are set out to support WUA’s role as a representative organization for farmers at the local scale. In the third section I present final reflections on the study, and its principal findings.

8.1 Policy recommendations at the provincial scale (Chiang Mai Province and Mae Tang Irrigation Project)

My study of irrigated farming in Nam Bo Luang, Chiang Mai province demonstrates that water is under ever-increasing demand from a variety of users. Thus, future water governance arrangements need to take account of competing water demands and conflicting visions for water use, that is water as a consumption good and a "common-pool resource" (Ostrom and Gardner, 1993; Ostrom, 2002; Ostrom, 2008; Delmas and Young, 2009; Dukhovny and Ziganshina, 2011).

Building upon this, the empirical findings in Chapters 5, 6 and 7 revealed that the major barrier in developing an effective 'middle ground' approach to more sustainable water use is political practice and power within Thailand; as I demonstrated in Chapter 4, water management is intimately bound up with the workings of the state (Wittfogel, 1957). Latterly (since 1997), the state has applied the principles of 'good governance' and PIM (Participatory Irrigation Management) to encourage more public participation at all levels, with the aim of achieving sustainable water management. Even though JMC and WUA now have officially sanctioned national backup to develop as 'powerful governance spaces' for water stakeholders, the legacy of 'command and control' in water governance and management (Chapter 7) is a major obstacle to these newly introduced 'middle ground' organizations. Consequently, I have three policy recommendations to assist JMC to implement good water governance at the provincial scale.

8.1.1 Develop JMC as a focus for 'self-organization' in provincial water management

The aim here would be to delegate to JMC full authority over all water management activities in the way advocated by Coward (1980) (see Chapter 2) that is over water usage, water allocation, irrigation system maintenance, labour and resource mobilization and conflict management. In effect, JMC could adapt to create or change the appropriate conditions for greater cooperation and collaboration over water use (Imada, 2008), without needing to defer in decisionmaking and decisiontaking to MTIP.

This policy change would oblige JMC to broker traditional-scientific knowledge conflict to facilitate change in water governance (Folke *et al*., 2005; Olsson *et al*., 2006). As Meijerink and Huitema (2010, p.35) comment: "A combination of bottom-up and top-down strategies makes most transitions happen, and their relative importance depends largely on the particular institutional context or opportunity structure". This recommendation is based on the "actor-centered perspective", as it focuses on the types of actors, their character, and their water management strategies (Haufler, 2009). In particular, it seeks to develop the capacity for 'self-organization' in water management provincially.

For 'self-organization' in water management to materialise, it is crucial to apply monitoring and evaluation to existing water management and governance in practice. As Swanson *et al*. (2010, p.936) mention: "If there is no monitoring of policy implementation in comparison to intended objectives, adaptive policy mechanisms cannot function". So evaluation and monitoring water management of JMC/WUA must be done by all stakeholders giving their feedback about the successes and problems found by implementing adaptive management solutions, providing a valid empirical basis on which to assess whether there is a need to adapt JMC/WUA operation. Oakley and Clayton (2000, p.14) caution that monitoring must be an in-built project activity, constantly assessing whether water management activities are “going to plan”; thus JMC members, including president and vice-presidents, MTIP representatives, representatives from local government and private agencies should be encouraged to critically reflect upon their water allocation and management activities, as they are an integral part of day-to- day management (Casley and Kumar, 1987, cited in Oakley and Clayton, 2000, p.14). For JMC’s water management evaluation, bringing monitoring and evaluation together would support sound governance as critical reflection can provide valuable input for refining existing decisionmaking and prioritization, so contributing to accountability mechanisms (Schacter, 2009). Smith and Porter (2010) also note that these should be integrated in an adaptive water management cycle to improve management by learning from the outcomes of policies and practices that have already been implemented (Figure 8.1).

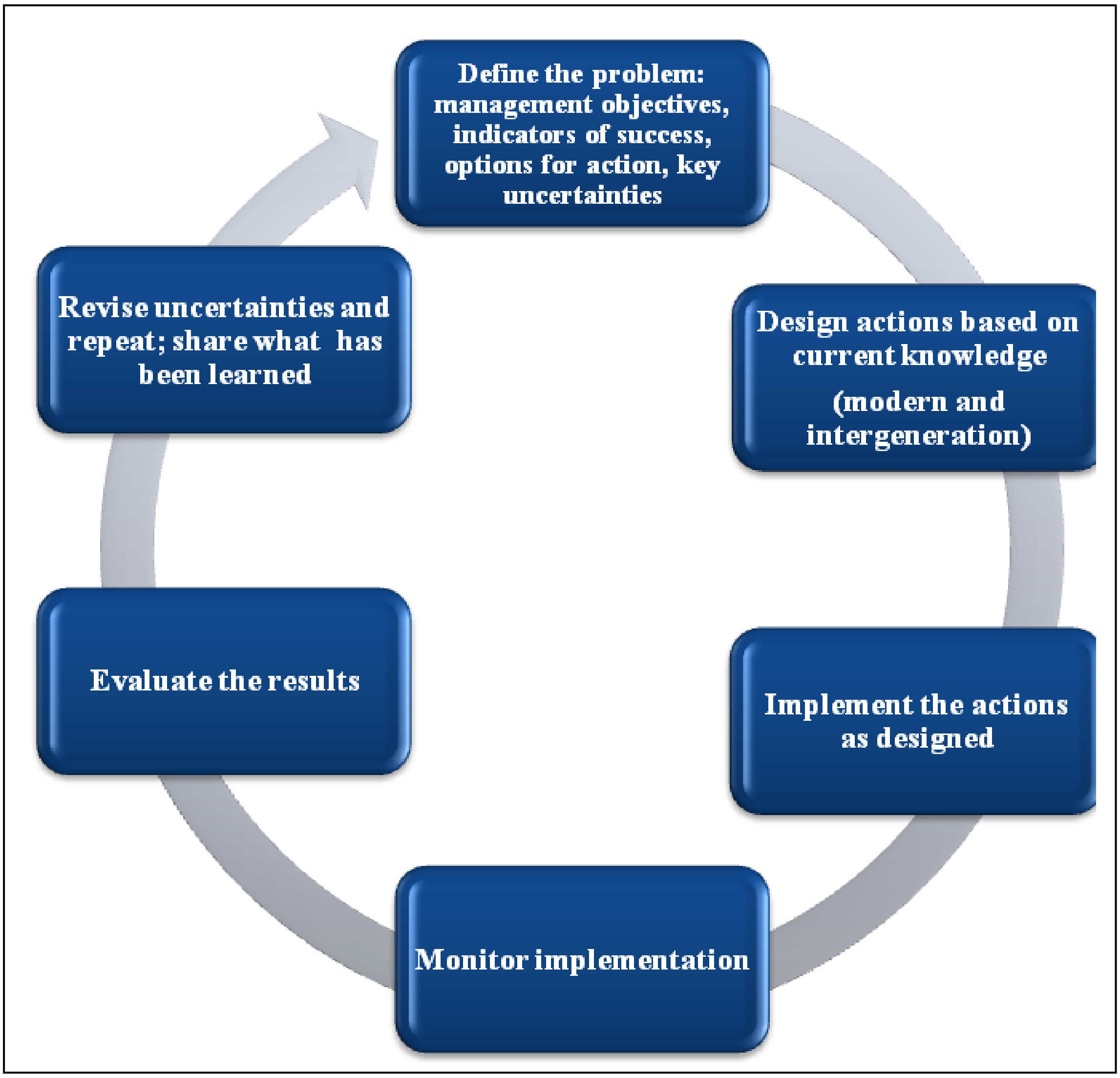

Figure 8.1: The adaptive water management cycle of JMC

Source: Adapted from Murray and Marmorek (2004)

Moreover, under the adaptive governance approach, promoting JMC's capacity for 'self-organization' can, according to Folke *et al*. (2005), help identify common water beliefs and norms and the dynamics of water resources and ecosystems, translate water knowledge into specific management practices, and support the emergence of cross-level and cross-scale interactions to deal with external perturbations and uncertainty over water management.

Lastly, promoting JMC as a form of ‘self-organization’ could drive forward transitions in water governance as it could bring together water users from the local to provincial scales to actively participate in the whole range of water management activities. So, stakeholders at all levels develop their competency by learning from open discussion (as evidenced in Chapter 6, JMC respondents commented that, currently, meetings lack consideration of alternatives to water modernization; and that their strong feeling was, as “non-professionals”, they were not qualified to hold opinions on overall provincial water strategy). This could also provide opportunities for actors to make concrete commitments to invest time and effort in the transition process, with the JMC providing transparency and accountability in these discussions.

This recommendation, then, seeks to make water management policy decisions more inclusive and relevant to stakeholders, while facilitating the level of communication among actors. To make this possible, there is a need from MTIP to improve its organizational roles as a water information provider and to enhance JMC’s existing role. Other changes to MTIP are, I think, also needed, which I identify next.

8.1.2 Recast MTIP's role to facilitate JMC's activities

This recommendation is I think not only vital for supporting JMC as a focus for self-organization in provincial water policy among stakeholders, but also in developing competency of participants to deliberate about different aspects of the transition process, and to make informed choices with regard to both the nature of the water management problems, and the possible solutions to these problems. Evidence in Chapters 4, 5, and 6 shows some benefits arising from the existing hierarchical pattern in irrigation management in the study area. Significantly, stakeholders, especially farmers, still need MTIP's resources to support their water usage and solve water management problems.

To increase JMC's capacity as a focus for 'self-organization' in water management and governance, as set out above, MTIP must position itself as an effective supporter of this organization. This includes consolidating its role as 'water expert' in providing data on water availability, appropriate technology that support irrigation systems maintenance with its abilities of having knowledgeable officials, and providing an operational budget. MTIP's advice in facilitating JMC's decisionmaking in water delivery planning would be equally important. Fitzpatrick (2011, p.162) calls this important role "information disclosure", noting that it improves the flow and transparency of communication between state and non-state actors. Indeed, it should be a new organizational requirement for MTIP officials to promote the necessary cooperative behaviour that is critical for 'self-organization' of JMC to emerge (Dietz *et al*., 2003; Akamani and Wilson, 2011). This new mandate for MTIP will need to be assessed and verified by JMC members. At the same time, information on water availability should be delivered on a daily basis to stakeholders through telephoning, websites, or face-to-face meetings.

Given implementation of this recommendation, there should be a corresponding new responsibility for JMC and its committees to identify ‘good governance’ of irrigation systems provincially and locally, and, crucially, to set up a clear direction for transition to more sustainable water management in Chiang Mai.

8.1.3 Develop a civil society forum to enhance participatory learning and tighten social networking on water management

Although Chapter 6 offered evidence of JMC offering some opportunities for state and non-state actors to engage in social learning and networking, this is still in its infancy and it is not enough to effect more sustainable water management in Chiang Mai. It is therefore important to see cross-scale and cross-level interactions as dynamically embedded in the contexts where they take place (Ransom, 2010) and to seek to instill more collective learning and social networking within the study area.

Hence, the aim of this recommendation is to set up for JMC members a dedicated public space to enhance the quality of actor interactions across scales and levels, as it is an essential ingredient of social learning. Establishing a bespoke public meeting place would create conditions where stakeholders can become better informed about the possible beneficial effects of more sustainable water management, and how sustainability can benefit to their own interests (Mostert *et al*., 2007; Pahl-Wostl *et al*., 2007). Public meeting would bring together science and local knowledge, offering an opportunity for stakeholders across-scales and levels to discuss, recognise and understand water management issues and make suggestions to adjust water allocation plans. Results of these meetings would be compiled and synthesized as a basis for being put into a more formal regulatory form by MTIP. Local knowledge could then be validated through formal water management and governance. Then, the formal water management regulations could be further adjusted and developed according to the result of day-to-day practice.

Actor interactions in the forum would also help strengthen and deepen network relationships between JMC members and farmers. Such interactions would support the group to review its addressed problems, and hence the aims of its water management practices as well as the methods (Bodin *et al*., 2011).

Improving the quality of actor interactions in this way via public support is considered central to enable transitions toward sustainable water management (Gunderson and Light, 2006). This is because all significant perceptions of the problem would be heard and acknowledged to ensure the problem is fully understood and shared, so public debate would progress from current problems to scenarios that meet the collective values of rural communities (Smith and Porter, 2010). Moreover, by enhancing actor interactions through public participation, it becomes more likely that members with leadership potential emerge who can recognise or create ‘windows of opportunity’ to shape existing patterns of water use, encourage novelty, and make sense of emerging events for others (Olsson *et al*., 2006; Rijke *et al*., 2012).

These three provincial-scale policy recommendations would, I think, improve JMC's operation, and instill the conditions for a decisive shift away from the 'command and control' mode of water management associated with MTIP, by embedding local needs within its water management frameworks and allowing devolution of water allocation and delivery to lower levels of organization (Gregory *et al.*, 2011). However, there is a need to improve the condition locally, too, so they connect more effectively with provincial. The following section tackles this issue.

8.2 Policy recommendations at the local scale (Nam Bo Luang, San Pa Tong District)

Local water management is critically important, particularly for farmers. Evidence from Chapters 6 and 7 reveals that WUA has become the "farmers' representative" and, with its legal status, it has a formal mandate to negotiate on policy issues with MTIP and JMC's member organizations.

Policy recommendations at the local scale I would like to propose, then, focus on improving WUA's capacity to enhance transition to more sustainable water management. The results of policy implementation are also expected to assist JMC's operation at the provincial level to achieve effective governance in water management.

8.2.1 Strengthen cooperation between farmers, local government agencies and community leaders in order to enhance social learning and networking

As discussed above, promoting adaptive management of water in Chiang Mai needs more knowledge integration and actor interactions in future. As most actors are reliant on their informal relationships and networks, these provide a potent means for improving unity among water users if they can be tapped.

Therefore, I suggest building cooperation between farmers and other local actors by promoting regular informal meetings, such as setting a local public space or a public forum, which focuses on irrigation water use issues with WUA and relevant local governmental organizations acting as facilitators for these meetings. Such meetings would enhance interactions among local stakeholders, so increasing their commitment to invest time and effort in the transition process, to actively contribute to collaborative discussion, and to learn from each other. van de Kerkhof and Wieczorek (2005) note that participants in transitions must have sufficient opportunities for learning, or by giving them sufficient opportunity and freedom to initiate transition experiments.

In this way, social networks can be used as a basis for discussion, enabling detailed consideration among participants of sustainability ‘visions’ for water use, and how to establish and organize local transitions. Such visions are considered essential to identifying a workable transition agenda, and deriving necessary transition pathways (van de Kerkhof and Wieczorek, 2005). Shared norms and beliefs would facilitate information flows, and help identify knowledge gaps. So, it offers an anchorage for participants that is ‘out of the fray’ of regulation and implementation, where formal networks and many planning processes often fail (Folke *et al.*, 2005).

This new public forum might offer an opportunity to reconnect *muang fai* water users in the development of mutuality in water management after it was separated by MTIP's introduction of the water modernization paradigm.

Strengthening deliberation between local water users, local government organizations and community leaders could lead to better organized and more coordinated transition processes at the territorial and societal levels, so helping to steer water management in a sustainable direction.

8.2.2 Empower water user groups to participate in evaluating JMC's actions

Once social learning and networking among actors is embedded locally, water management data (including water usage, water allocation, irrigation system maintenance, labour and resource mobilization, and conflict management) of JMC should be reviewed. I recommend local actors should take part in this evaluation of JMC's activities.

Any adaptive management process requires evaluation (Douverse and Ehler, 2011). In particular, evaluation is needed to demonstrate the effectiveness of adaptive management through evidence of results. Such evaluation should be a periodic assessment and, importantly, requires information from outside the evaluated project (Oakely and Clayton, 2000). The results of evaluation would serve several purposes, including enabling more transparent linkages between management objectives and management actions, identifying gaps that may be consequently rectified, providing for more informed decisionmaking and improvements in water allocation planning and field management for decision makes, and promoting openness and accountability (Day, 2008).

Key indicators with which to evaluate formal water management regulations include water usage, water allocation, level of irrigation systems maintenance, labour and resource mobility, and the degree of water conflict management. Within farmer groups, respondents could report through their heads of WUGs and IWUGs after each water allocation plans are announced, as well as to the WUA president. WUA could then submit feedback to be discussed in a JMC meeting.

For the evaluation, I would suggest dividing into three periods according to water availability and cropping seasons. The evaluation results could help adapt current water governance arrangements to resolve water disputes.

The results of evaluation should systematically recorded and collected in order to assist managers at the provincial scale. Hence, developing a local water management database is critically important and this, then, is my final policy recommendation at the local scale.

8.2.3 Establish local water management database

The water management database I recommend developing would be a simple process, but very helpful in assisting farmers to have empirical evidence to inform WUA and JMC's solutions to water management problems and dilemmas. To create the data, leaders of the water user groups would take responsibility to acts as data recorders, collating information from local meetings (daily, weekly, monthly, and annually). The minutes of these meetings would be retained in an easy-to-use form so that they can be immediately retrieved and used.

As such when JMC needs any supporting evidence from farmers to monitor its organizational operations, the up-to-date information can be applied to improve coherence between policies. Such information would enhance 'joined-up' decisionmaking by institutions at different scales within Thailand's complex public administrative system. Thus, the information can help the provincial water management policy be more inclusive and relevant to stakeholders. At the same time, equity between and among the various interest groups and stakeholders is more easily monitored throughout the process of policy development and implementation (Rogers and Hall, 2003) by applying these supporting database.

My intention with the provincial and local policy recommendations I have outlined here is to improve the overall organizational context within which JMC and WUA operate, with the aim of achieving a more rapid transition to more sustainable water management in Nam Bo Luang, Chiang Mai. Improving JMC/WUA's operation is, I believe, the only substantive means to facilitate cross-scale and cross-level interactions water management, to offset the traditional state focus upon command and control.

8.3 Final reflections on the study and its principal findings

This final section reflects on the overall aims and objectives of the thesis, in light of the empirical findings from the preceding seven Chapters. I begin answering the first research objective below.

8.3.1 Current interactions in the study area between water user groups and communities at the local scale with relevant actors (state and private organizations) at other scales

I demonstrated in Chapter 4 how the Thai state developed an effective national and provincial form of management and governance for the water sector, but that this had been very much at the expense of popular participation. Results in Chapter 5 substantiated that actor interactions in the study area were shaped by a resulting *politics of scale*.

The multiple scales and levels of irrigation management introduced by the Thai state have sought to make irrigation easier to administer nationally and to assess performance of responsible agencies in irrigation development from the national to local scale. This has been predicated on the state-sponsored system claim that centrally coordinated water policy can ensure a secure water supply and fair allocation.

Consequently, the Thai state's construction of scale has tended to delimit actors to specific territories, with 'water management' defined in terms of actors' roles in water management tied to particular scales. Therefore there are significant opportunities for actors to cooperate or collaborate through new cross-level and cross-scale interactions.

Such interactions can significantly affect the efficiency and effectiveness of water policy nationally.

Furthermore, geographical scale not only defines relationships between the state and water stakeholders, and between water stakeholders and other water users; it also defines administrative areas, hydrological units, and particular norms and beliefs of water governance, as Cash *et al*. (2006) identify. I concluded that, under the existing arrangements, local water politics largely prevent solutions emerging to water allocation and delivery issues and influence in collaborative governance, became of their conflicting nature.

8.3.2 Mechanisms to facilitate collaboration, resolve coordination problems and reinforce trust among local actors that are sensitive to their socio-economic needs

Building on the preceding analysis, in Chapters 6 and 7 my empirical findings demonstrated the potential role of the 'middle ground' organizations in restructuring water management among and between actors, such as between MTIP, farmers and other stakeholders in Chiang Mai, based on adaptive governance approach analysis.

The crucial 'middle ground' organizations I identified through my fieldwork was the Joint Management Committee for irrigation (JMC), and its supporting structure, the Water User Association (WUA). Both have been established by central government according to the National Policy of 'good governance' and Participatory Irrigation Management (PIM) in irrigation water management. Findings in Chapters 6 and 7 confirmed that JMC (the provincial organization) and WUA (the local organization) can facilitate collaboration, resolve coordination problems and reinforce trust among local actors. They have done so, first, by empowering local and provincial stakeholders in water management decisionmaking. In particular, WUA offers a new representative structure for farmers, set within the institutional structure of the Royal Irrigation Department (RID), thus providing new opportunities for local agricultural communities to participate in irrigation water management within the MTIP according to the newly ratified PIM principles. Thus WUA approximates to a self-organizing body for farmers, with the potential to change existing patterns of water management through demonstrating new possibilities for collaboration and cooperation among stakeholders.

Secondly, a "middle ground organization" is very much essential to trigger interaction of actors across scales and levels to improve prospects for sustainable water management. JMC is a forum that allows agricultural interests to interact with MTIP, local government organizations and other water stakeholders. Thus, taken together, JMC/WUA represents a credible hybrid water management institution, placing it in a powerful position to legitimate particular local-level procedure, to broker cross-scale interactions, and to facilitate state legitimization of local practice, potentially enabling cultural and political revitalization, capacity-building and institutional building.

Lastly, WUA and JMC can promote collaborative water management within the study area by offering opportunities for state and non-state actors to engage in social learning and social networking. Results from testing Proposition 6 confirmed that JMC' s non-agricultural stakeholders and WUA's representation of farming interests do now appear to enable grassroots concerns to be fed through to MTIP through JMC's committee structure. The evidence demonstrated that water rotation plans are now being changed to address the supply and allocation problems faced by farmers at the end of canal laterals, with increased funds being allocated for canal maintenance and dredging. Increasingly, JMC meetings are bringing together representatives from local governmental organizations, local authorities and tourism interests, and community leaders with farmers to settle agreed water use regulations and use water according to the agreed water rotation plans.

8.3.3 Recommendations to encourage the transition to more sustainable water management in the study area

Chapters 4 and 5 identified the importance of politics of space in water management and governance in practice in the study area, and the continuing hegemony of a command and control approach to water policy. This results not only in constraining actor interactions across scales and levels, but also obstructs the emergence of more collaborative water management in the study area.

Consequently I advocated enhancing the putative 'middle ground' governance approach of JMC and WUA, as this hybrid organization has, as I demonstrated in Chapter 7, several benefits when applied at the provincial and local scales. Specifically, it offers the opportunity to bring state and non-state actors to work together without hierarchical considerations in order to mitigate the manifest complexity and inflexibility of existing water management and governance practices.

To do so, I proceeded to identify two obstructions limiting JMC/WUA's capacity to encourage transitioning to more sustainable water management: (1) sticking with the model of command and control, and (2) the transitioning process lacks clear direction and incentives. I therefore devised policy specific recommendations for provincial and local authorities to improve JMC/WUA's operation, with the aim of developing their organizational functions and powers at local and provincial scales to counterbalance MTIP's hierarchical approach to water management. I also noted that there is a need to develop a civil society forum to enhance participatory learning and to provide a focus for network activities, as it is important to involve local communities directly in policy and to ensure policy makers keep informed about local water management problems. In this way, water management resolutions can be matched with the needs of stakeholders.

At local scale, first, I suggest strengthening cooperation between farmers, local government agencies and community leaders in order to enhance social learning and networking between these actors. Once this process has gained momentum, actors at local scales could begin to act as evaluators, assessing JMC/WUA's water management and governance operations. Secondly, the information received from the group discussions foreseen here should be recorded and collated as a local water management database by local governmental organizations, enabling the establishment of a systematic database on water management issues in Chiang Mai.

APPENDICES

APPENDIX 1: QUESTIONNAIRE FOR JMC

Part 1: Organization details

[1] Name of organization ____

[2] Address ____

[3] What is your organization role in general? ______________________________

Part 2: Water allocation from the Mae Tang Irrigation Project

[4] Do you know how the project is managed including its rules and regulation for water use? ( ) 1. Yes ( ) 2. No (please give reasons)______________________

[5] Please indicate what are your purposes of using water from the project?__________

[6] Please clarify how you receive water from the project_________________________

[7] How often do you receive water from the Mae Taeng Irrigation Project?

( ) 1. Daily ( ) 2. Weekly ( ) 3. Monthly ( ) 4. Other (please specify)

[8] Have project managers asked you how much water you need? ( ) 1. Yes ( ) 2. No

[9] Did you receive enough water from the Mae Taeng Irrigation Project to use?

( ) 1. Yes ( ) 2. No

[10] If you answer ***"YES"* in [9]**, how much water do you often receive from the project?_________________m^3/ day/ week/ month/ season/year.

[11] If you answer ***"NO"* in [9]**, please explain__________________________________

Part 3: Water governance of the Mae Tang Irrigation Project

<u>Section 1 Governance Style</u>

[12] How often do project managers contact you about water management and/or the state of repair of irrigation structures?

( ) 1. Every day ( ) 2. Once a week ( ) 3. Once a month

( ) 4. Once a year ( ) 5. Other (please specify)____________________

[13] In your opinion, are project managers clear in explaining water allocation decisions? If not, why not? ____

[14] Has the project's system of water management helped you? If so how/ in what ways ____

Please answer the following questions about water management problems

Questions	**(1) Wet Season**	**(2) Dry Season**
[15] Which season for you is the most problematic for obtaining water?		
What kind of problems do you regularly encounter? [16] Water shortage		
[17] Flood		
[18] Sedimentation		
[19] Inadequate weir maintenance		
[20] Theft of water		
[21] Water pollution		
[22] Water allocation disputes with other members		
[23] Water allocation disputes between members and other organizations in the same irrigated area		

Questions	(1) Wet Season	(2) Dry Season
[24] Water allocation disputes between members and other organizations in different areas		
[25] Water disputes with project management		
[26] Delays in resolving water management disputes		
[27] Other (please specify)______________________________		

[28] On average, how often do these problems occur in the wet season?

( ) 1. Every day ( ) 2. Every week ( ) 3. Every month

( ) 4. Every year ( ) 5. Other (please specify)____________________

[29] On average, how often do these problems occur in the dry season?

( ) 1. Every day ( ) 2. Every week ( ) 3. Every month

( ) 4. Every year ( ) 5. Other (please specify)____________________

Please rate the degree of decentralization in decision-making on the themes indicated in the table.

List of activities	Degree of decentralize in decision-making				
	(1) NONE	(2) LITTLE	(3) MODERATE	(4) SIGNIFICANT	(5) ALL
[30] Water allocation					
[31] Water management planning					
[32] Water dispute resolution					
[33]Maintaining water infrastructure					

Section 2 Membership participation

[34] In which of these activities does the project encourage your active participation?

( ) 1. Ditch maintenance ( ) 2. Water management planning

( ) 3. Decision-taking on water allocation ( ) 4. Information dissemination

( ) 5. Water management problem solving ( ) 6. Other (please specify)______

[35] How often do you participate in these management activities?

( ) 1. Every day ( ) 2. Once a week ( ) 3. Once a month

( ) 4. Once a year ( ) 5. Other (please specify)___________________

Section 3 Information dissemination

[36] How do you access information on water management from the project?

( ) 1. By speaking directly

( ) 2. By uploading from the project website

( ) 3. Through an official letter or other publication

( ) 4. Other (please specify) ______________________

[37] How do project managers let you know about your water quota/ available water volume?

( ) 1. By telephoning ( ) 2. By speaking directly

( ) 3. Other (please specify)____

Please answer questions about the project's information management as follows

Questions	(1) Yes	(2) No
[38] Has the project facilitated your access to information on water management?		
[39] Has the project promoted the sharing of water information among members?		
[40] Has the project helped you to develop new sources of information on water availability?		

Part 4: Social learning and networking

[41] If you have experienced water shortages, please describe how the project sought to solve it?

( ) 1. Managing available water more efficiently

( ) 2. Asking for more water from the project

( ) 3. Negotiated more water from other agencies

( ) 4. Negotiation for water from water user groups

( ) 5. Use pumped water from the canal

( ) 6. Others (please specify)____

[42] Apart from the JMC members, do you have experience of managing water problems with any of the following groups?

( ) 1. None ( ) 2. Farmers

( ) 3. Water user groups ( ) 4. NGOs

( ) 5. Scholars ( ) 6. Other agencies (please specify)____

[43] How did you resolve your differences?

( ) 1. Group discussion ( ) 2. Group meeting

( ) 3. Learning-by-doing ( ) 4. Other (please specify)____________

[44] How often did you meet together?

( ) 1. One a week ( ) 2. Once a month

( ) 3. Once a year ( ) 4. Once a cropping season

( ) 5. Other (please specify)____

[45] Please indicate the relative importance of the following stakeholders to your own water management needs.

_____( ) 1. The water user groups in the project

_____( ) 2. WUA

_____( ) 3. The project

_____( ) 4. SAOs

_____( ) 5. NGOs

_____( ) 6. Scholars

_____( ) 7. Other agencies (please specify)______________________________

Part 5: Sociospatial relations

[46] Are you aware of the water allocation needs of other agencies?

( ) 1. Yes ( ) 2. No

[47] If you answered ***"YES"*** in **[46]**, please specify name of the agencies and their location

1____

2____

[48] Have you ever been in conflict with these agencies for water?

( ) 1. Yes ( ) 2. No

[49] If you answered ***"YES"* in [48]**, please explain when this dispute arose? ________

[50] How were the problems resolved? ____

[51] Were these resolved satisfactory from your point of view?

( ) 1. Yes ( ) 2. No

[52] What are your preferred solutions for water management? ____________________

Part 6: The role in water management as a member of JMC

[53] What are your roles as a member of JMC (*can be more than one answer, and please priorities)*

____( ) 1. Ditch maintenance

____( ) 2. Water management planning

____( ) 3. Decision-making on water allocation

____( ) 4. Information dissemination/awareness-raising

____( ) 5. Water management dispute resolution

____( ) 6. Other (please specify)_____________________________________

[54] How often do the JMC meetings occur?

( ) 1. Once a week ( ) 2. Once a month

( ) 3. Once a year ( ) 4. Once a cropping season

( ) 5. Other (please specify)____

[55] How often do you attend JMC meetings?

( ) 1. One a week　　( ) 2. Once a month

( ) 3. Once a year　　( ) 4. Once a cropping season

( ) 5. Other (please specify)____

[56] What are the aims of JMC meeting? (*Can be more than one answer, and please prioritise)*

____( ) 1. Ditch maintenance

____( ) 2. Water management planning

____( ) 3. Decision-making on water allocation

____( ) 4. Water management dispute resolution (please specify)

( ) 1. Water shortage

( ) 2. Flood

( ) 3. Sedimentation

( ) 4. Theft of water

( ) 5. Water pollution

( ) 6. Conflicts in water use among members

( ) 7. Other (please specify)________________________________

[57] In allocating water and managing water allocation, please indicate the most important of the following

( ) 1. Water quantity

( ) 2. Water needs farmers or for agriculture

( ) 3. Water needs of other agencies

( ) 4. Other (please specify)______________________________________

[58] How do you communicate your decision-making to other water user groups? (c*an be more than one answer)*

( ) 1. Telephoning

( ) 2. Speaking directly

( ) 3. Uploading on to the project website

( ) 4. Posting on the project's discussion forum

( ) 5. Other (please specify)____

[59] In your opinion, do you think JMC has an important role in water management or not? ( ) 1. Yes ( ) 2. No (please specify why)_______________________

[60] In your opinion, do you think JMC has succeeded in providing effective water management or not?

( ) 1. Yes ( ) 2. No (please specify why)_______________________

[61] What are the major factors that might obstruct the success of JMC?______________

Part 7: Suggestions

[62] Suggestions for improving MTIP's governance of water management____________

[63] Suggestions for improving the JMC's governance of water management__________

APPENDIX 2: IN-DEPTH INTERVIEW QUESTIONS FOR MTIP OFFICIALS

[1] Please clarify how you deliver water to farmers in wet season and dry season.

[2] In your opinion, is the project transparent regarding water allocation decision? If not, why not?

[3]. What are the water management problems?

[4] Has water management of the project helped farmers? If so how/ in what ways.

[5] Please clarify the water dispute resolution process of the farmers.

[6] Please rate the degree of decentralization in decision-making on water allocation, water allocation planning, water problems solving, and maintaining water structure.

[7]. What are your responsibilities as a project official?

[8] Which activities does the project encourage farmers participation?

[9] Has the project allowed farmers to access its water information?

[10] Has the project clearly shared water information?

[11] How frequently do water management disputes arise? What kind of disputes have you experienced?

[12] Do you know WUA, JMC, SAOs and their role in water management? Please clarify.

[13] Are there any other organizations outside the group, help the project solve water disputes?

[14] Which organizations help you most in solving water disputes?

[15] Suggestions for improving water governance

APPENDIX 3: IN-DEPTH INTERVIEW QUESTIONS FOR FARMERS FROM IWUG ZONE 10, MRRW AND KMTW

[1] Type of crops grown.

[2] How many km^2 is it possible to irrigate?

[3] Please clarify how you receive water from the project in wet season and dry season.

[4] In your opinion, is the project transparent regarding water allocation decision? If not, why not?

[5] What are the water management problems?

[6] Has water management of the project helped you? If so how/ in what ways.

[7] Please clarify the water dispute resolution process of the project.

[8] Please rate the degree of decentralization in decision-making on water allocation, water allocation planning, water problems solving, and maintaining water structure.

[9] What are your responsibilities as a water user member of the project?

[10] Which activities does the project encourage you participation?

[11] Has the project allowed you to access its water information?

[12] Has the project clearly shared water information?

[13] Please specify how your leader and committee allocate water to you.

[14] In your opinion, are your leader and committee transparent in the ways in which they have allocated water to you?

[15] How frequently do water management disputes arise? What kind of disputes have you experienced?

[16] Please clarify the water dispute resolution process of the group.

[17] Do you know WUA, JMC, SAOs and their role in water management? Please clarify.

[18] Are there any other organizations outside the group, help you solve water disputes?

[19] Which organizations help you most in solving water disputes?

[20] Suggestions for improving water governance.

APPENDIX 4: IN-DEPTH INTERVIEW QUESTIONS FOR IWUG ZONE 10 AND WUA ADMINISTRATORS

[1] How long have you been the administrator of the group?

[2] Please let me know the organization history.

[3] Please clarify how you receive water from the project in wet season and dry season.

[4] Has water management of the project helped you? If so how/ in what ways.

[5] In your opinion, is the project transparent regarding water allocation decision? If not, why not?

[6] How you allocate the water to your members?

[7] What are the water management problems?

[8] How frequently do water management disputes arise? What kind of disputes have you experienced?

[9] Please clarify the water dispute resolution process of the group.

[10] Please clarify the water dispute resolution process of the project.

[11] Please rate the degree of decentralization in decision-making on water allocation, water allocation planning, water problems solving, and maintaining water structure.

[12] What are your responsibilities as an administrator group?

[13] Which activities does the project encourage you participation?

[14] Has the project allowed you to access its water information?

[15] Has the project clearly shared water information?

[16] Do you know JMC and SAOs and their role in water management? Please clarify.

[17] Are there any other organizations outside the group, help you solve water disputes?

[18] Which organizations help you most in solving water disputes?

[19] Suggestions for improving water governance.

APPENDIX 5: IN-DEPTH INTERVIEW QUESTIONS FOR *MUANG FAI* ADMINISTRATORS

[1] How long have you been the administrator of the group?

[2] Please let me know the organization history.

[3] Please clarify how you receive water from Mae Khan River in wet season and dry season.

[4] In your opinion, has you receive enough from this water source.

[5] How you allocate the water to your members?

[6] What are the water management problems?

[7] How frequently do water management disputes arise? What kind of disputes have you experienced?

[8] Please clarify the water dispute resolution process of the group.

[9] What are your responsibilities as an administrator group?

[10] Which activities do you encourage your members participation?

[11] Have you allowed your members to access your water information?

[12] Have you ever received any contact from Mae Tang Irrigation Project and its water user groups?

[13] Are there any other organizations outside the group, help you solve water disputes?

[14] Suggestions for improving water governance.

APPENDIX 6: IN-DEPTH INTERVIEW QUESTIONS FOR JMC ADMINISTRATORS

[1] How long have you been the administrator of the group?

[2] Please let me know the organization history.

[3] Please clarify how you receive water from the project in wet season and dry season.

[4] Has water management of the project helped you? If so how/ in what ways.

[5] In your opinion, is the project transparent regarding water allocation decision? If not, why not?

[6] How you allocate the water to your members?

[7] What are the water management problems?

[8] How frequently do water management disputes arise? What kind of disputes have you experienced?

[9] Please clarify the water dispute resolution process of the group.

[10] Please clarify the water dispute resolution process of the project.

[11] Please rate the degree of decentralization in decision-making on water allocation, water allocation planning, water problems solving, and maintaining water structure.

[12] What are your responsibilities as an administrator group?

[13] Which activities do you encourage your member to participate?

[14] Has the project allowed you to access its water information?

[15] Has the project clearly shared water information?

[16] Are there any other organizations outside the group, help you solve water disputes?

[17] Which organizations help you most in solving water disputes?

[18] Suggestions for improving water governance.

APPENDIX 7: GROUP DISCUSSION QUESTIONS FOR ADMINISTRATORS FROM IWUG ZONE 10, WUA, JMC AND MTIP

Themes for discussion

[1] How might the efficiency and sustainability of water governance be improved through group activities?

[2] How can the group maintain and build its networks in water management?

[3] In the group's opinion what are the main difficulties arising from the Mae Tang Irrigation Project?

[4] What factors might promote a flexible and suitable water governance regime locally scale, i.e. in ways sensitive to local socio-economic and environmental characteristics, based on principles of multiple- stakeholder involvement?

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