Ecosystems & Development Journal 6(2): 35-51
October 2016 ISSN 2012-3612

Development of a Protocol on Adaptive Collaborative Water Governance for Improved Santa Cruz Watershed Management in the Philippines

Myra E. David*[1], Agnes C. Rola[2] and Juan M. Pulhin[3]

ABSTRACT

The study aimed to address the problem on the absence of formal mechanisms to govern water resources at the local level by developing a protocol on adaptive collaborative water governance (ACWG) to produce better outcomes in watershed management using a case study approach. The ACWG protocol underwent conceptualization and design processes. The conceptualization process began with the online search using a single, mixed or combination of key terms, such as, "natural resource management," "adaptive," "governance," and "collaboration," which consequently resulted to the evaluation of four models proposed by institutions based on some criteria. A model was reviewed on the bases: a) that it can be used as a tool to explore and explain factors and forces underpinning the development of a local specific water governance platform; b) of available descriptive activities per phase that can serve as guide in the conduct of a participatory action research; and c) that can be applied in a natural resource management setting. The processes involved in designing the ACWG are: a) review of the model structure and the elements or variables of the four models; b) categorization into four phases of similar-in-nature elements having the same purposes; and c) definition of protocol according to purposes, procedure, and some guidelines or recommendations. The guidelines are results of the implementation of the ACWG protocol in the Santa Cruz Watershed, Philippines. Some recommendations are elaborated to stress the importance of specific protocol processes in addressing the issue of absence of formal mechanisms in water resource governance.

Key words: *adaptive collaborative water governance protocol, protocol definitions, protocol implementation, Santa Cruz Watershed, watershed management*

INTRODUCTION

Water governance may be defined as "the manner in which authority is acquired and exercised on behalf of the public in developing, utilizing, and protecting a nation's water resources" (Stefano *et al*. 2014). The definition explains water governance as more of decision-making rather than a system or a structure. Decision-making in the water sector is complex as it is part of broader social, political, and economic developments and thus is also affected by outside decisions (Global Water Partnership 2002). This position of the water sector may lead to its weak governance manifested in different ways: a) fragmented institutional structures; b) lack of clarity of roles and responsibilities; c) questionable resource allocation; d) patchy financial management; e) low capacity of implementing organizations; f) weak accountability of politicians, policy-makers, and implementing agencies; g) unclear or non-existent regulatory environments; and h) unpredictability in the investment climate for private sector actors (Plummer & Slaymaker 2007 citing United Nations World Water Development 2006).

In the Philippines, governance of water resources involves many decision makers at the national level (Elazegui 2004; Senate Economic Planning Office 2011). Table 1 shows the major decision-making institutions over the state of water resources in the country. Functioning at the regional level but evoking national policies in carrying out its mandates, the Laguna Lake Development Authority (LLDA) manages the largest known inland water body in the northern part of the country – the Laguna de Bay Basin – and the surrounding river systems. Republic Act 4850 of 1966 created LLDA.

A Philippine policy making body, however, has recognized the need to propose policy measures that seek to address the "weak regulatory institutions and the absence of a clear and organized framework for water resource governance" (Senate Economic Planning Office 2011). Otherwise, cases of conflict will continue which will put the country's water resource in peril. Although the country has national water laws, these statutes are not fully implemented and mechanisms for implementation are absent (Contreras 2002). Contreras adds that from a national level, there is a need to implement water governance at the watershed level, and empower stakeholders for them to participate in policy decision-making processes. Some research programs have been supporting governance of water resources at the watershed level, for example, Polis Project on Ecological Governance (http://poliswaterproject.org/), Global Water Forum (2012) and Program on Water Governance (https://watergovernance.ca/).

[1,2]Institute for Governance and Rural Development, College of Public Affairs and Development, UPLB, Los Baños, Laguna
[3]College of Forestry and Natural Resources, UPLB, Los Baños Laguna
Corresponding Author:* medavid1@up.edu.ph

Cases of Water Conflicts

Over the last two to three decades, water conflicts have increased sharply among sectors involving the households, industries, agriculture, fisheries, and within a sector like the allocation of irrigation water between upstream and downstream farms (Tabios & David 2004). For instance, Gomez (2014) reported the difficulty faced by the local executives of the municipality of Santa Rosa, Laguna in regulating land use by private landowners in the upstream of the Santa Rosa Sub-Watershed. The local executives' tasks include protecting the *Matangtubig Spring* which is located in the upstream of the watershed. The spring is the main source of water for the residents and industries of the swiftly urbanizing areas of Cabuyao, Biñan and Santa Rosa in Laguna and Silang in Cavite – the areas covered by the watershed. If land use in the upstream will not be regulated and private landowners continue not to cooperate with the local authorities, water scarcity is anticipated to happen in the near future.

An urban area such as Iloilo City is also sourcing its domestic water from the Tigum-Aganan Watershed. Conflict in Iloilo City, however, is not solely among water users but also between the water delivery service providers and local government. In the north of the Philippines, like Baguio City, water shortage is also experienced due to increasing population growth and regular influx of tourists. Water scarcity in the area had caught the attention of the local news media in many cases (Rillorta 2014; Philippine News Agency 2015). Resolution of water conflicts at the local level, therefore, necessitates an effective water governance framework that will guide policy makers in decision-making. But how do we implement effective water governance at the local level where mechanisms are absent, and existing models or a known framework, for example, the integrated water resources management, "demands a new framework within which there may be a need for significant changes in existing interactions between politics, laws, regulations, institutions, civil society, and the consumer-voter"? (Roger & Hall 2003).

The study sought to answer the following questions:

a) How can existing water governance models inform the current research undertaking to come up with its own protocol more suited to the local conditions?
b) What analytical process should be undertaken to develop a protocol?
c) What specific procedural activities adaptable on the ground can address local water governance issues?

This paper aims to present a protocol designed at a local level that stakeholders of a watershed can use as a platform for collaboration in the absence of formal water governance mechanisms. The paper has two main parts: firstly, it discusses the conceptualization of adaptive collaborative water governance (ACWG) drawn from reviews of literature and secondly, it explains the design process of the proposed protocol on ACWG. The protocol was implemented in the Santa Cruz Watershed, Philippines from which, experiences and insights were drawn and used in designing the protocol. Lastly, the paper provides some conclusions.

Protocol: A Search for a New Framework on Water Governance

A protocol refers to the "continuum between a policy and a guideline or practice." Here, policy is defined as a statement that establishes definitive parameters for program operation. A procedure is a method for acting in a particular situation, while a guideline is a recommendation for how to proceed in a situation (Curtis 1999). A protocol in research is described as simply a recipe or a written design for performing the experiment consisting of the components, *i.e*., purpose (hypothesis one wishes to test); materials; methods (set-up, experimental groups, duration, measure of impact); controls; data interpretation (data organization and analysis); and references (PennState Lehigh Valley) (http://www2.lv.psu.edu/jxm57/irp/prot.htm.). In a research, a protocol was used as guide in carrying out an adaptive management approach in Australia. The protocol served as a framework to monitor uncertainties, and monitor and evaluate project performance (Eberhard *et al*. 2009).

Some water policies have referred to protocols as treaties or agreements or products of negotiations. One example is the Columbia River Treaty wherein the United States and Canada share benefits from its flood control and hydropower generation provisions (Bankes & Cosens 2014). Another example is the South African Development Community Protocol on Shared Watercourse Systems (SADC 2000). The overall objective of the protocol is to "foster closer cooperation for judicious, sustainable and coordinated management, protection and utilization of shared water courses." Said protocol defines a watercourse as a system of surface and ground waters consisting by virtue of their physical relationship a unitary whole normally flowing into a common terminus such as sea, lake or aquifer – a definition similar to how a watershed is defined.

At this point, it can be deduced that a protocol may be described according to its purpose, procedure, and guideline (recommendation). Also, protocols may serve as guide in the search for new framework for effective water governance.

Search for Models to Develop a Protocol

The search for models aimed to guide the authors in developing a protocol on ACWG. A model can be described by its three roles: "making correct predictions about the world, rigorously demonstrating that something is possible, and exploring and explaining, each of which is validated by the cogency and relevance of the ideas it produces" (Prabhu *et al*. 2007). The search for models also led to review of proposed concepts and approaches drawn out of several studies conducted to address the issues of conflict and weak governance.

The literature proposes the concept of "collaborative governance". Collaborative means "to co-labor, to cooperate to achieve common goals working across boundaries in multi-sector relationships". Governance is meant "to steer the process that influences decisions and actions within the private, public, and civic sectors" (The William and Flora Hewett Foundation 2005). Collaborative governance can be described as "a group of interdependent stakeholders, usually from multiple sectors, who work together to develop and implement policies to address a complex, multi-faceted problem or situation" (Choi & Robertson 2014). Ansell and Gash (2007) defined collaborative

Table 1. Major Philippine institutions governing water resources.

Institutional		Enabling Law	Mandate
National Economic and Development Authority (NEDA)		Executive Order (EO) No. 230 of 1987	Coordinates the preparation of national/regional/ sectoral development policies and investment programs.
National Water Resources Board (NWRB)		EO No. 124-A Presidential Decree (PD) 1067 of 1976 (Water Code of the Philippines)	Coordinates and integrates water resource development activities Administers/enforcers the Water Code and serves as the lead coordinator for water resources management programs.
Department of Environment and Natural Resources (DENR)	Forest Management Bureau (FMB)	EO No.192 of 1987	Formulates/implements policies and programs for the protection, development, and management of forest lands and watershed areas.
	Environmental Management Bureau (EMB)	Republic Act (RA) No. 9275 of 2004 (Clean Water Act)	Sets and enforces water quality and effluent standards, criteria, and guidelines for all aspects of water quality management.
National Irrigation Administration (NIA)		RA No. 3601 of 1963	Undertakes water resource projects for agricultural irrigation and other purposes, such as flood control and drainage, hydropower development, etc
Department of Agriculture (DA)	Bureau of Soil and Water Management (BSWM)	EO No. 116 of 1987	Formulates and implements policies on development and generation of water resources utilization and conservation technologies
	Bureau of Fisheries and Aquatic Resources (BFAR)	RA No. 8550 of 1998 (Fisheries Code)	Establishes plans for the proper protection and management of the country's fisheries and aquatic resources.
Department of Health (DOH)	Environmental Health Service (EHS)	EO No. 489	Leads in the implementation of sanitation program and strategies to forestall the spread of water-borne diseases.
Department of Interior and Local Government (DILG)		RA No. 7160 of 1991 (Local Government Code)	Discharges functions and responsibilities related to basic services related to water supply systems, hygiene and sanitation, and environmental protection.
National Power Corporation (NPC)		RA No. 6395 (Revised NPC Charter)	Develops and manages electric generation facilities including but not limited to hydroelectric dams and undertakes other activities related to water management.
Metropolitan Waterworks and Sewerage System (MWSS)		RA No. 6234	Regulates water concessionaires' rates and service standards in Metro Manila and maintains existing assets and infrastructure.
Local Water Utilities Administration (LWUA)		PD No. 198	Promotes/finances/regulates the construction and operation of local water utilities outside Metro Manila.

governance as "a governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process that is formal, consensus-oriented as an outcome of a model, and deliberative and that aims to make or implement public policy or manage public programs or assets." It highlights consensus-based decision making process out of models (Ansell & Gash 2007; Emerson *et al*. 2012; Robertson & Choi 2012; Choi & Robertson 2014) and negotiation using communication modes (Plotnikof 2015). Successful undertakings of collaborative governance revealed reduced river pollution, improved living conditions, and promoted sustainable management of natural resources among collaborating municipalities in Mexico (Montero *et al*. 2006). Its application may offer another way of understanding governance design and implementation, for example, in the promotion of quality management in daycare services by the local governments in the Netherlands (Plotnikof 2015).

Factors of successful and sustainable collaborative governance include: people's commitment to legitimacy, change (fostering common interests), flexible leadership and shared authority, authentic face-to-face dialogues, culture of learning, identified common ground (O'Brien 2012), and policy support (Montero *et al*. 2006). The complexities of citizen participation posed as a challenge to collaborative governance (Ghose 2005). Collaborative governance is an emerging concept which has lots to offer in terms of practical application (Plotnikof 2015).

The earlier cited AM concept is also proposed. It is defined as "the process of planning a response to circumstances or events that may not be fully predictable or expected." Here, actions are identified in advance to respond appropriately to unpredictable circumstances (Department of Environment Yukon Canada 2002). The AM concept came about in the later part of the 1960s when it found value in learning through experimentation on the operations of complex systems of natural resources (Holling 1978). Its process is characterized as being "flexible, encouraging public input, monitoring the results of actions for the purpose of adjusting plans, and trying new or revised approaches" (Oregon State University 2002). Examples of successes out of AM studies are the environmental impact assessment and management introduced by Holling (1978) and flexibility in management (Gunderson 1999). Such successes may have hailed AM as one of the best approaches when facing complexity problems of the resource being managed. It is best to look at its long term impact rather than the expense it may incur now (Johnson 1999). Lee's (1999) study has these conclusions:

> "(1) Adaptive management has been more influential, so far, as an idea than as a practical means of gaining insight into the behavior of ecosystems utilized and inhabited by humans. (2) Adaptive management should be used only after disputing parties have agreed to an agenda of questions to be answered using the adaptive approach; this is not how the approach has been used. (3) Efficient, effective social learning, of the kind facilitated by adaptive management, is likely to be of strategic importance in governing ecosystems as humanity searches for a sustainable economy."

Pahl-Wostl *et al*. (2007) used the term "adaptive water management" in managing change in the complexities of all natural resources. Specifically, Mensah and Gibbon (2012) used adaptive co-management to label their participatory institutional framework, which found restricting broad participation as undercutting embedded collective decision making processes in informal regimes. Catacutan *et al*. (2001) studied local government units' participation in managing natural resource and concluded that socio-political and technical factors have influence on the success and sustainability of local natural resource management. To Schreiber *et al*. (2004), AM can be achieved through 'learning by doing,' and learning is both experiential and experimental (Armitage *et al.* 2008). Schreiber *et al*.'s (2004) review of AM studies concludes that the best outcomes require rigorous and formalized approaches to planning, collaboration, modelling, and evaluation. Lal *et al*.'s (2001) adaptive approach is guided by decision-making processes in economic, non-economic, and behavioral change. Rist *et al*. (2013) presented a new framework for deciding when AM is appropriate, feasible, and subsequently successful. Accordingly, AM has no categorical limitations to its appropriate use, the boundaries of application being defined by problem conception and the resources available to managers. A more recent review by Fabricus and Cundill (2014) revealed that AM approach is in its "evolutionary process and in most instances is still in an early pioneering stage, possibly held back by participants' capacity for learning." Hence, they suggest, it is a reason for few reports about learning in AM studies.

AM is also applied in relation to protocols. Protocols are described as "adaptive" wherein water managers make recommendations regarding goal of balancing flood control, public safety, navigation, water supply, and ecological health (South Florida Water Management District 2010). A specific title, "Protocol No. 13: Adaptive Management," given by the Department of Environment Yukon of Canada (2002) refers to "adaptive management" as protocol. Eberhard *et al*. (2009) also regarded AM approach as a protocol for the purpose of managing the water quality in Australia. And that all protocols require continuous evaluation and revision for effective outcomes.

Another introduced concept is "adaptive water governance," which appears in the literature as having link to "flexibility and adaptive capacity to water management" (Bankes & Cosens 2014). The concept was applied in managing floods by having both formal (*e.g.* river basin organizations) and informal mechanisms complementing each other (Rouilland 2013). AM was also tried with the concept of integrated water resource management – both characterized as polycentric, redundant, and flexible governance structures, and found that outcomes may have better preparation for unseen events (Herrfahrdt-Pähle 2013). Meantime, while the concept of polycentric leads to distribution of power, yet, "effective coordination structures have higher performance" (Pahl-Wostl *et al*. 2012). Bark *et al*.'s (2012) study found greatest promise for overcoming resistance to recognition of indigenous water claims in mix of adaptive governance mechanisms. While the approach of adaptive governance fosters social-ecological resilience, there could be other factors that will address institutional change crises (Cosens & Williams 2012). Akamani and Wilson's (2011) study cited that adaptive governance should satisfy the requirement for good governance of transboundary water resources, among other things. Similar to the findings from using collaborative governance, the complexities associated with participation and collaboration in adaptive governance is also a concern (Huitema *et al*. 2009).

Collaborative adaptive management (CAM) is another concept. It is a promising approach to use, but its application necessitates establishment of clear goals and concrete objectives to be able to measure progress, and provide tools and incentives to encourage participation and foster collaboration, and finally, delineate clear roles (Susskind *et al*., 2012). Scarlett's (2013) study explained collaboration and adaptive management of CAM as responses to challenges of uncertainties, complexities, and interconnectedness. Scarlett asserts that managing resources may yield questions that are technical and complex. When it comes to policy and decision -making, oftentimes it would involve trade-offs.

Another related concept is adaptive collaborative management (ACM) which is applied in managing forests (Prabhu *et al*. 2007). CIFOR (2008, p.2) defines ACM as:

> "…value-adding approach whereby people who have interests in a forest agree to act together to plan, observe and learn from the implementation of their plans while recognising that plans often fail to achieve their stated objectives. ACM is characterised by conscious efforts among such groups to communicate, collaborate, negotiate, and seek out opportunities to learn collectively about the impacts of their actions."

METHODOLOGY

The study used the case study approach. The development of the ACWG protocol was done in two-part analytical processes: conceptualization and design process. The protocol was later applied in the Santa Cruz Watershed from which specific recommendations were drawn.

The conceptualization process followed Ansell and Gash's (2007) "key word electronic searches" to search for models using the key terms: "natural resource management," "governance," "collaboration," and "adaptive," in single word or mixed or combination. The search for models was done using own set of criteria, such as:

1) model which can be used as a tool to explore and explain factors and forces underpinning the development of a local specific water governance platform;
2) availability of descriptive activities per phase that can serve as guide in the conduct of a participatory action research; and
3) a model that can be applied in a natural resource management setting.

Criterion 1 is simply the description of a model. Related to criterion 1, criterion 2 should provide for the phases and more detailed explanation of the variables or key elements. Criterion 3 is essentially the applicability of a model in a watershed environment.

In designing the ACWG protocol, an initial review of the model structure and the corresponding elements or variables of the four models was conducted. Given the description of the elements, it was understood that many were similar in nature or have the same purposes. With such a process, the authors were able to group elements according to a particular purpose. The elements were organized in tables according to models for better review and improvement of categorization. The categorization resulted to a four-phase protocol on ACWG designed based on the present research program objectives and duration (i.e. four-year period). The authors took note of all the key terms, but in the actual setting, some were not applied in the ACWG process because they were not in accordance with the program objectives.

Finally, the design process involved defining the ACWG protocol process. For analysis, we are guided by the earlier discussed definitions of a protocol as their bases in defining the ACWG protocol. At the end, the protocol on ACWG was defined according to its purposes, procedure, and some guidelines or recommendations. The concept of ACWG was tested through participatory action research (Wesselink *et al.* 2011) with some stakeholders in the Santa Cruz Watershed in the Philippines, objectively, to develop an ACWG platform that can be used to address environmental issues. The guidelines, thus, were distilled from experiences in the application of ACWG in the Santa Cruz Watershed. Some of the guidelines/ recommendations were elaborated to stress the importance of specific processes of the ACWG protocol in addressing the issue of the absence of formal mechanisms in governing water resources at the watershed level.

RESULTS AND DISCUSSION

Conceptualization of Adaptive Collaborative Water Governance Protocol from Models

The electronic search using key terms resulted to various concepts as discussed previously. Concepts that emerged are "collaborative governance," "adaptive management," "adaptive water governance," "collaborative adaptive management" and "adaptive collaborative management." The literature encapsulates various concepts that are related with each other in terms of inclusivity of participation and the importance of collaborative learning to understand the complexity of resources being served.

In the search process, four particular models, namely, Adaptive Decision-Making Process (ADMP), Local Natural Resource Management (LNRM), Collaborative Governance (CG), and Adaptive Collaborative Management (ACM) were selected for further evaluation of the model structure and variables. Table 2 provides the list of models. This is followed by the authors' description of the model.

Table 2. Selected references for designing a protocol.

Model	Research Institution
The Model of Adaptive Decision-Making Process or ADMP (Box 1; Figure 1)	Australian Centre for International Agricultural Research (Lal *et al*. 2001)
The Model of Ten Initial Steps for Local Governments to Prepare and Mobilize the Local Natural Resource Management Program or LNRM (Box 2; Figure 2)	International Center for Research in Agroforestry and International Fund for Agricultural Development (2001, pp.41)
The Model of Collaborative Governance or CG (Box 3; Figure 3)	University of California (Ansell and Gash, 2007, p. 550)
The Model of Adaptive Collaborative Management or ACM (Box 4; Figure 4)	CIFOR (Prabhu *et al*. 2007, p. 25)

Box 1. The Model of Adaptive Decision-Making Process

The model has four phases described as follows:

"**Phase 1** or subsystem identification involves: a) stakeholder assessment (key resource owners, users, managers, existing patterns of decision making, contexts in which stakeholders interact), b) institutional assessment of the rules and regulations that govern activities and relevant traditions and c) resource assessment of the biophysical aspect and natural processes.

Phase 2 is reflection aimed at to identify priority problems, establish common vision, select the overall management approach and assessment frameworks to be adopted, and determine research needs. Here, researchers and stakeholders work together whereby the former use their skills to help the latter understand the effects of human activities on natural dynamics.

Phase 3 is the action. The stakeholders agree on the management strategies or instruments (e.g. legislation, agreements, market-based strategies, institutional changes, and/or education) they will use to resolve the resource problem based on their knowledge of what motivates and influences the actions of individual decision makers. The instruments may meet a specific target and/or self-regulate. The strategies identified by the ADMP should always incorporate incentive mechanisms for change. This allows the stakeholders to adopt strategies for which the benefits outweigh the costs and the risks remain within agreed-upon safe, minimum environmental and social constraints. To guide the stakeholders, a decision support system is built, and the researchers use it to help develop scenario analyses.

Phase 4 is adaptive learning where the process of examining prospective management strategies is treated as a series of management policy experiments. The management strategies selected in the action phase are now implemented and monitored in an iterative manner. The results of these experiments indicate the extent to which these problems are manageable, and which strategies are useful. Regardless of how the results are interpreted, this phase becomes one of adaptive (or experimental) learning."

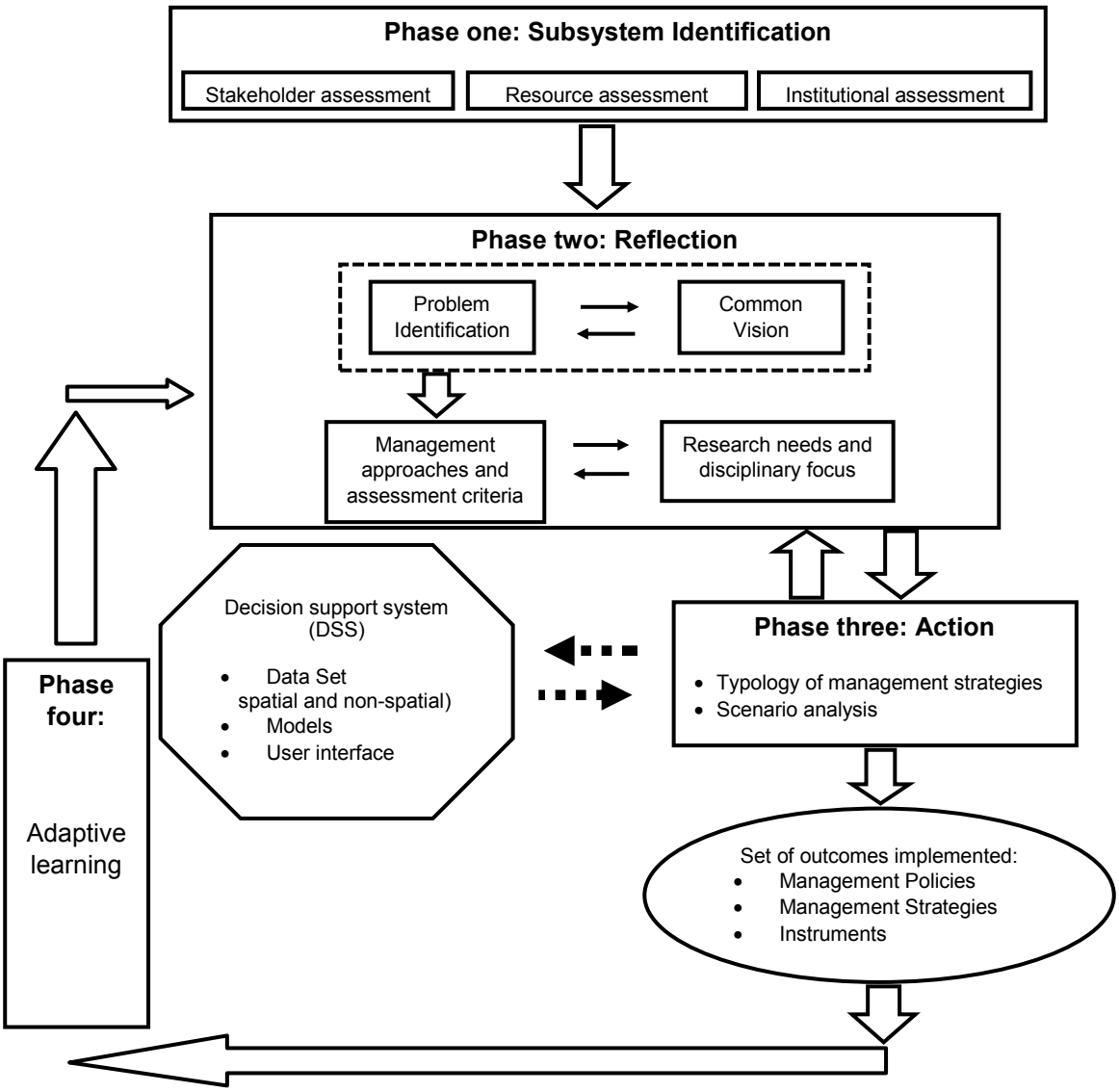

Figure 1. Model of Adaptive Decision-Making Process (Source: Lal *et al*. 2001)

Box 2. The Model of Ten Steps for Local Governments to Prepare and Mobilize the Local Natural Resource Management Program

"1. Organize an ad-hoc multi-sectoral planning team
2. Determine the area of responsibility
3. Know the natural resources situation
4. Know the rules in resource use that apply in the area
5. Determine what motivates or discourages the people from managing the local resources more soundly
6. Know the good local management practices: What works? What doesn't?
7. Conduct consensus building sessions among all stakeholders
8. Prepare an action program document to guide annual planning and budgeting
9. Provide policy support to enforce the program
10. Organize the local manpower and partners"

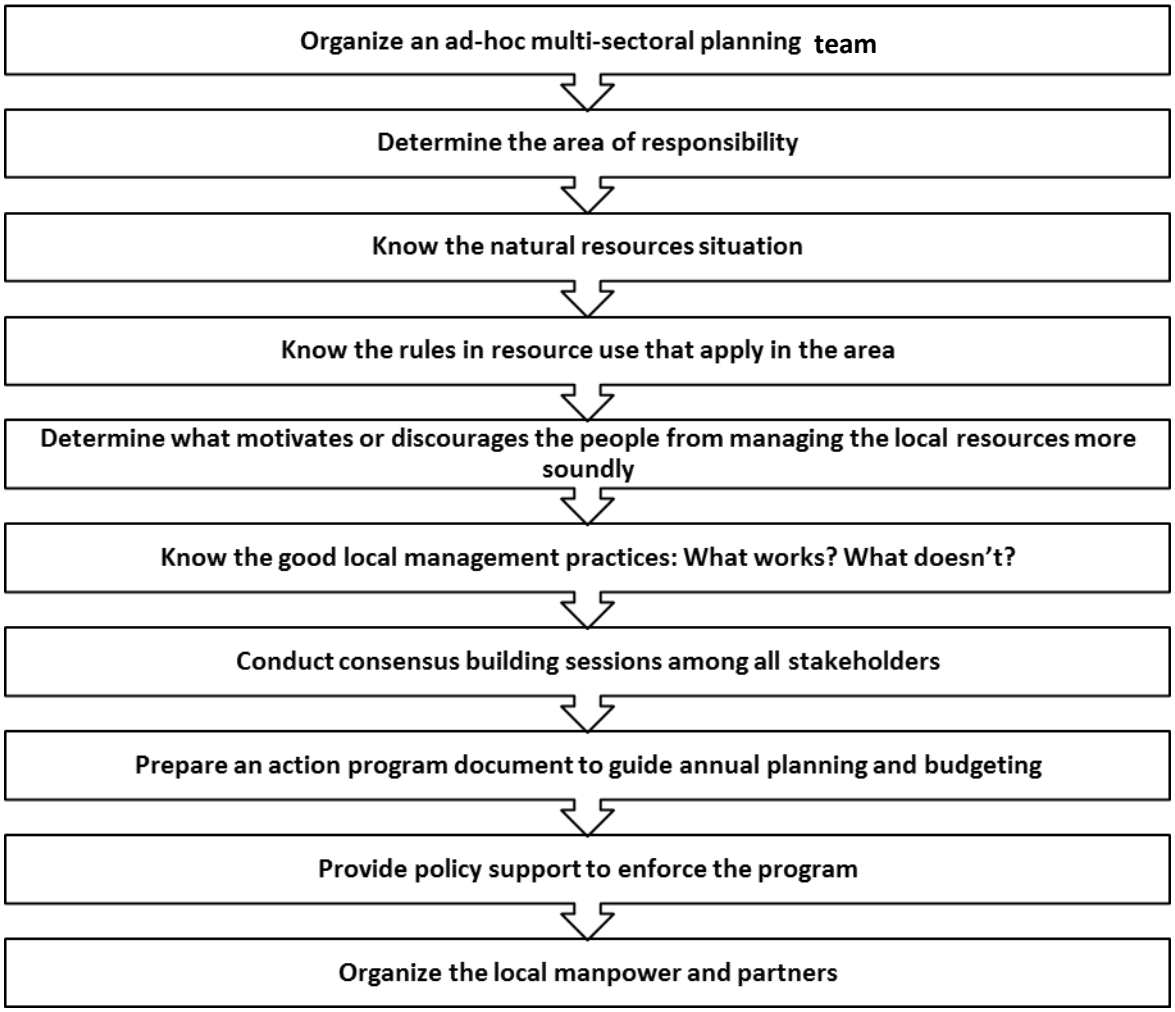

Figure 2. Model of Local Natural Resource Management (Source: International Center for Research in Agroforestry and International Fund for Agricultural Development 2001); presentation in figure by the authors.

Box 3. The Model of Collaborative Governance

"The model has four broad variables—starting conditions, institutional design, leadership, and collaborative process. Each of these broad variables can be disaggregated into more fine-grained variables. Collaborative process variables are treated as the core of our model, with starting conditions, institutional design, and leadership variables represented as either critical contributions to or context for the collaborative process. Starting conditions set the basic level of trust, conflict, and social capital that become resources or liabilities during collaboration. Institutional design sets the basic ground rules under which collaboration takes place. And, leadership provides essential mediation and facilitation for the collaborative process. The collaborative process itself is highly iterative and nonlinear, and thus, we represent it (with considerable simplification) as a cycle."

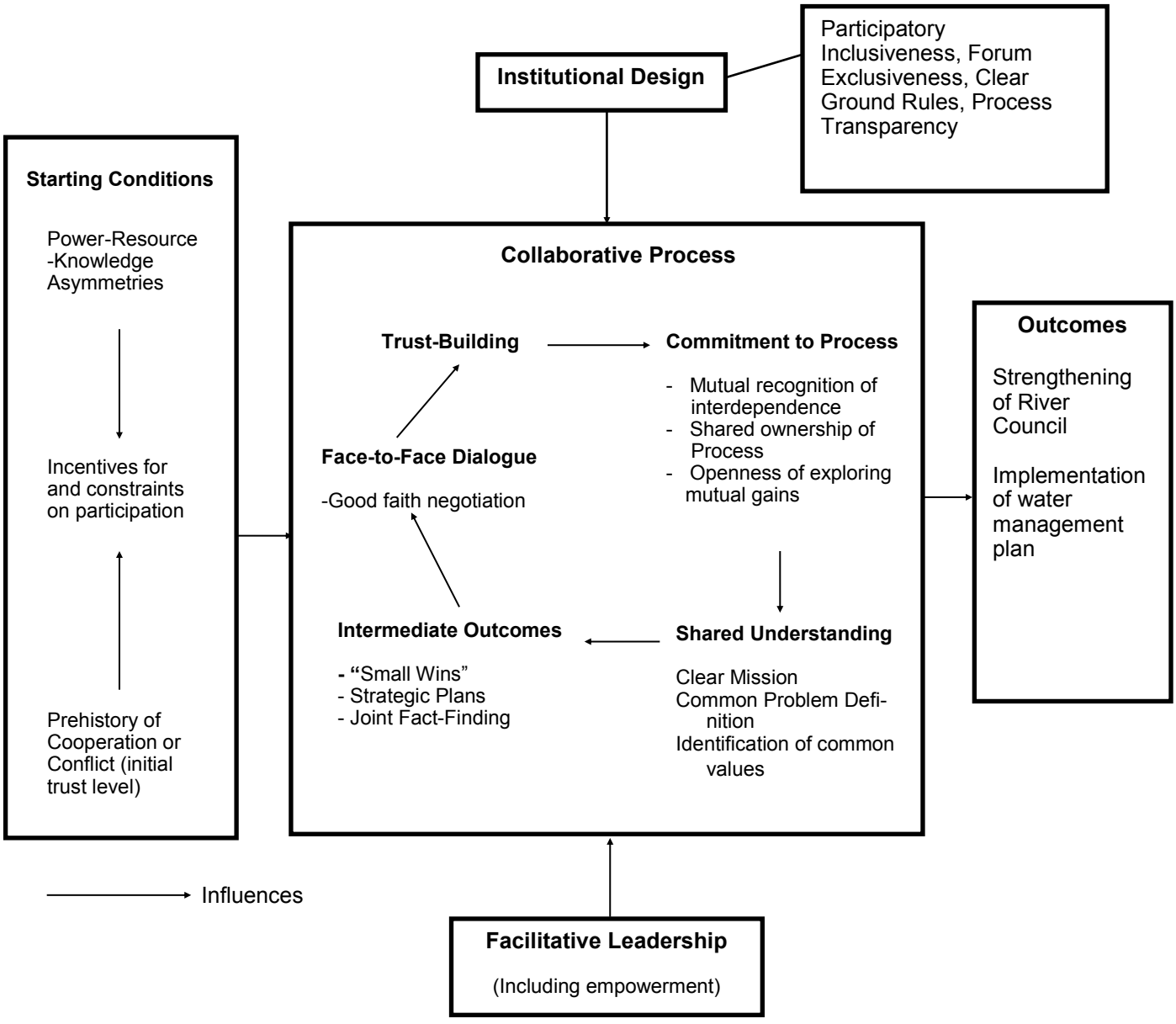

Figure 3. Model of Collaborative Governance (Source: Ansell and Gash 2007)

Box 4. The Model of Adaptive Collaborative Management

"Phase 1. Communicative action: emergence of shared vision

It involves three sets of processes: a) leadership and facilitation; b) exploration of attitudes, beliefs and perceptions (mental models) of stakeholders relevant to resource management; and c) communication among the stakeholders.

Phase 2. Strategic action: self-organization

Self-organization is accomplished by three processes: a) the emergence of communities of practice; b) the creation and maintenance of connectivity; and c) the nature and structures of social learning that these communities undertake.

Phase 3. Material and instrumental action: achieving material gains

Instead of processes, phase 3 involves three concepts or conditions that help bound the space for material change, namely: a) the level of complexity of the context; b) the enabling environment of the group; and c) the capacity of the group."

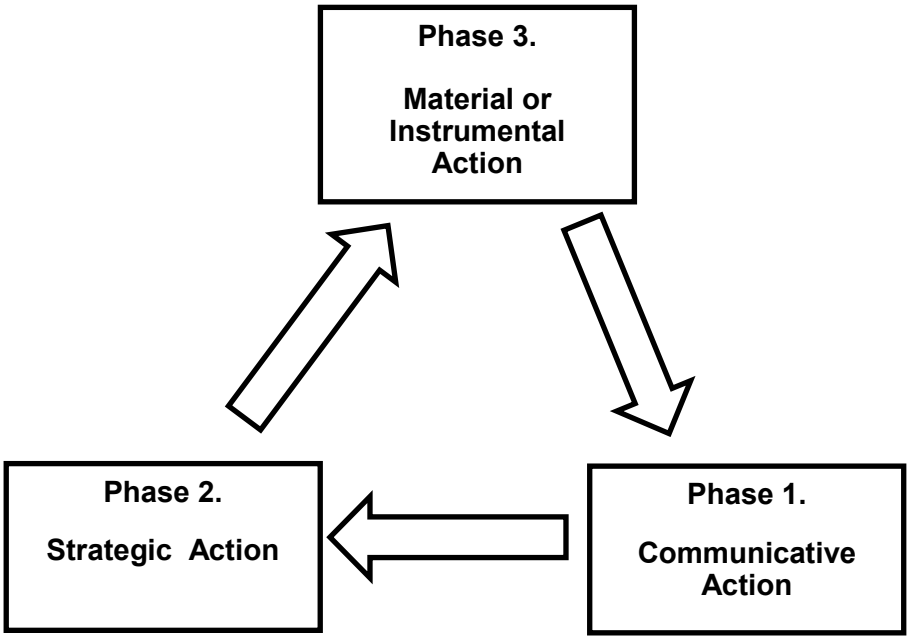

Figure 4. Model of Adaptive Collaborative Management perspective
On Habermas' three forms of action (Source: Prabhu *et al.* 2007)

In the end, as the authors found value in the discussed concepts and models, another concept referred to as Adaptive Collaborative Water Governance or ACWG is adopted in the present study.

Designing a Protocol for Adaptive Collaborative Water Governance

The study adopted a by-phase protocol similar to most of the selected models. The elements were reviewed to draw a system of categorization.

Design elements of the protocol

Phase 1: Assessment of water management undertakings and building partnerships with stakeholder groups. The initial phase and activities of the four models consisted of elements namely: a) subsystem identification, i.e., stakeholder, institutional and resource assessment (i.e. Adaptive Decision-Making Process); b) starting conditions such as understanding of prehistory of cooperation or conflict of stakeholders, explore the incentives to participate, and analyze the power, resource, and knowledge imbalances (i.e., CG); and c) communicative action, essentially includes the entry of facilitator in the community and mental models of the stakeholders (i.e., Adaptive Collaborative Management). The first few steps of the Local Natural Resource Management: a) organize an ad-hoc multi-sectoral planning team, b) determine the area of responsibility, c) know the natural resources situation, and d) know the rules in resource use that apply in the area, are also included in this phase. We found out that the elements are similar in two respects: assessment of water management undertakings and building partnerships. Selected elements for phase 1 are shown in Table 3.

Phase 2: Strategic action planning. The essentials of strategic action were adopted as suggested by ACM as the next phase because they propose the creation of substantive outcomes in governing water resources. In the same way, the authors agreed on ADMP's phase 2 about "reflection." It consists of identifying priority problems, establishing common vision, and selecting a management approach, among others. Framed as strategic action planning, ACWG phase 2 aims to identify an appropriate management approach and establish the group's (created group of stakeholders in phase 1) mission, vision, and priorities.

Suggested core social processes may start at this phase like participatory action research and dialectic decision-making (i.e., Adaptive Decision-Making Process); consensus building (i.e., Local Natural Resource Management); facilitative leadership (i.e., Collaborative Governance, Adaptive Collaborative Management), and shared repertoire of routines, etc. In this phase, rules and regulations refer to the ground rules for collaboration – an element of CG's institutional design. Table 4 shows the list of selected key terms used in designing phase 2 of the ACWG protocol.

Phase 3. Water resource management plan development and investment planning. Phase 3 is the action part as suggested by the ADMP model wherein the stakeholders develop a water management plan as a management strategy. The stakeholders may opt to decide which management instrument to use as stated in Lal *et al*. (2001) to include legislation, agreements, market-based strategies, institutional changes, education. Specific LNRM elements refer to developing a natural resource management plan, for instance, problem tree analysis, annual plan, objectives, time frame, and budget.

CG's elements under "intermediate outcomes" may be categorized under phase 3 of the ACWG protocol. As suggested, the stakeholders should be able to envision some concrete outcomes (e.g., water management plan and investment plan) out of the collaborative process. Having the same components of a water management plan, an investment plan intends to provide a more focused approach in addressing a prioritized problem. Social processes in phase 2 that are suggested by the ACM model are also adopted in this phase. Table 5 shows the list of selected elements for phase 3.

Table 3. Summary of selected key terms guiding the design of Phase 1 of ACWG protocol .

ADMP	LNRM	CG	ACM
• Key water owners, users, and managers • Existing patterns of • decision making • Contexts in which • stakeholders interact • Rules and regulations affecting ecosystem management • Existing management instruments • Natural processes that contributed to the current status of the environment • Functional processes and interactions between key components of the natural system	• Ad-hoc multi-sectoral planning team • Responsible leaders of sectors (GO, NGOs, farmer groups, academe and • religious) in LNRM • Knowledge of rules in resource use, e.g. rules that • encourage co-management • Functional devolution in forest management • Shared responsibility and • mapping following the river system • Situation of natural resources	• Bringing stakeholders together and getting them to engage each other • Prehistory of cooperation or conflict • Incentives to participate • Power-resource-knowledge imbalances • Participatory inclusiveness including potentially "troublesome" • stakeholders • Forum exclusiveness • Building trust	• Entry of external facilitator • Attitudes, perception and beliefs in manag-ing natural resources

Table 4. Summary of selected key terms guiding the design of Phase 2 of ACWG protocol.

ADMP	LNRM	CG	ACM
• Reflection on prioritizing problems and agreeing on a common vision • Incentive mechanisms • Participatory action research (working with stakeholders to help them understand the effects of human activities) • Dialectic decision-making • Overall management approach (frameworks and criteria) • Management strategies to resolve resource problem	• Forest occupants' key concerns • Good local management practices • Consensus building	• Clear mission • Common problem definition • Identification of common values • Ground rules • Face-to-face dialogue • Facilitative leadership • Trust-building • Commitment to process	• Strategic action or self-organization • Processes of leadership and facilitation • Mutual engagement of members

Table 5. Summary of selected key terms guiding the design of Phase 3 of ACWG protocol.

ADMP	LNRM	CG	ACM
• Management strategy adoption	• Problem tree analysis • Consensus building sessions • Annual planning • Objectives and priority actions in the next 5 years • Clusters of priority activities • Timeframe (3-5 years) • Budget	• Intermediate outcomes (small wins, strategic plans, joint fact-finding	• Capability and available resources of local actors • Processes of leadership and facilitation • Mutual engagement of members • Joint enterprise

Table 6. Summary of selected key terms guiding the design of Phase 4 of ACWG protocol.

ADMP	LNRM	CG	ACM
• Series of management policy experiments • Instrumental policy learning • Social policy learning • Political policy learning • Policy process and negotiating skills • Users of resources as key learners • Analyzing cause-and-effect relationships based on their newly acquired knowledge	• Policy support to enforce the program • Local manpower and partners organization to ensure program is implemented on a sustained basis • Progress monitoring • Feedback • Dialogue • Assigning of functions	• Highly iterative and nonlinear collaborative process • Face-to-face dialogue • Trust building • Commitment to the process • Shared understanding • Outcomes	• Social learning • Innovation and continuous reconstruction of plans, relationships, knowledge and worldviews • Learning individually and by groups • Collaborative monitoring

Phase 4: Implementing investment plans using social learning approaches. Phase 4 is about addressing a prioritized problem through the implementation of an investment plan but in so doing stakeholders learn from the process. ADMP's adaptive learning is taken as similar to ACM's social learning. Adaptive learning is about "treating the process of examining prospective management strategies as a series of management policy experiments," such as, instrumental policy, social policy, and political learning. On one hand, social learning "enables innovation and continuous reconstruction of plans, relationships, knowledge, and world views." The learning process is described as highly iterative and nonlinear in ADMP, CG, and ACM models. Selected key terms for phase 3 are summarized in Table 6.

Adaptive Collaborative Water Governance protocol

The protocol on ACWG is described according to its purpose, procedure, and guideline (recommendation) of each of the four phases (Figure 5). The guidelines are distilled from the experiences in the application of ACWG in Santa Cruz Watershed, Philippines (Figure 6).

ACWG protocol

The ACWG protocol is described according to its purpose (i.e., phases), procedure and guideline (recommendation) of each of the four phases. The guidelines are distilled from experiences in the application of ACWG in the Santa Cruz Watershed, Philippines.

Phase 1: Building partnerships with stakeholder groups and assessment of water management undertakings

Procedure

- Identification of key water-user and water decision-making groups
- Assessment of water user groups' pattern of decision making and contexts of interaction or how decisions pertaining to water use are agreed upon

Figure 5. Four-Phase Protocol on Adaptive Collaborative Water Governance

- Review of local policies or rules and regulations related to water governance; assessment of how local policies affect institutions' management functions
- Review existing management instruments/plans e.g., watershed management plan, comprehensive land use plan
- Assessment of current status of resources and their functional processes
- Characterization of a watershed's physical features
- Creation of a technical working group (TWG) representing government, nongovernment, and private institutions

Some guidelines

- Building partnerships and assessing water management undertakings (using secondary data gathering) in a watershed are two major processes which may be applied simultaneously.
- Primary data may be gathered in the course of building partnerships with stakeholder groups to better understand how water is managed by water users and water decision-making groups.
- Tapping an existing river council, active or not active, of a watershed for any ACWG project ventures will be helpful to assist in smooth building of partnerships. ACWG process endeavors to build up inactive river councils.
- Conduct of a stakeholders' forum may be an initial means to build partnership among stakeholders.
- TWG membership should be inclusive, but inclusion of any groups or individuals, should be agreed upon by the core members (original member-institutions) depending on the identified needs to address a particular concern. As the TWG meets regularly, various concerns may surface, e.g., meeting hosting, funds, etc.

Phase 2: Strategic action planning

Procedure

- Identification of appropriate management approach to undertake to address environmental issues of a watershed
- Establishment of shared vision, mission and objectives of the TWG
- Establishment of some ground rules
- Application of social processes, among others, participatory action research, facilitative leadership and mediation skills, consensus building, dialectic decision-making, to discuss mutual gains and incentives out of the ACWG process

Some guidelines

- Identification of a management approach to undertake should be agreed within a TWG. The TWG in Santa Cruz Watershed opted to develop a water resource management plan to rehabilitate the watershed's river system – a common priority among stakeholder groups. As discussed earlier, other management approaches include legislation, agreements, market-based strategies, institutional changes, and education.
- The TWG's vision and mission may be established during this phase when environmental problems had been discussed.
- Some ground rules have to be instituted within the TWG membership. Sometimes, ground rules are not necessarily initially agreed, but practiced and modelled out by those

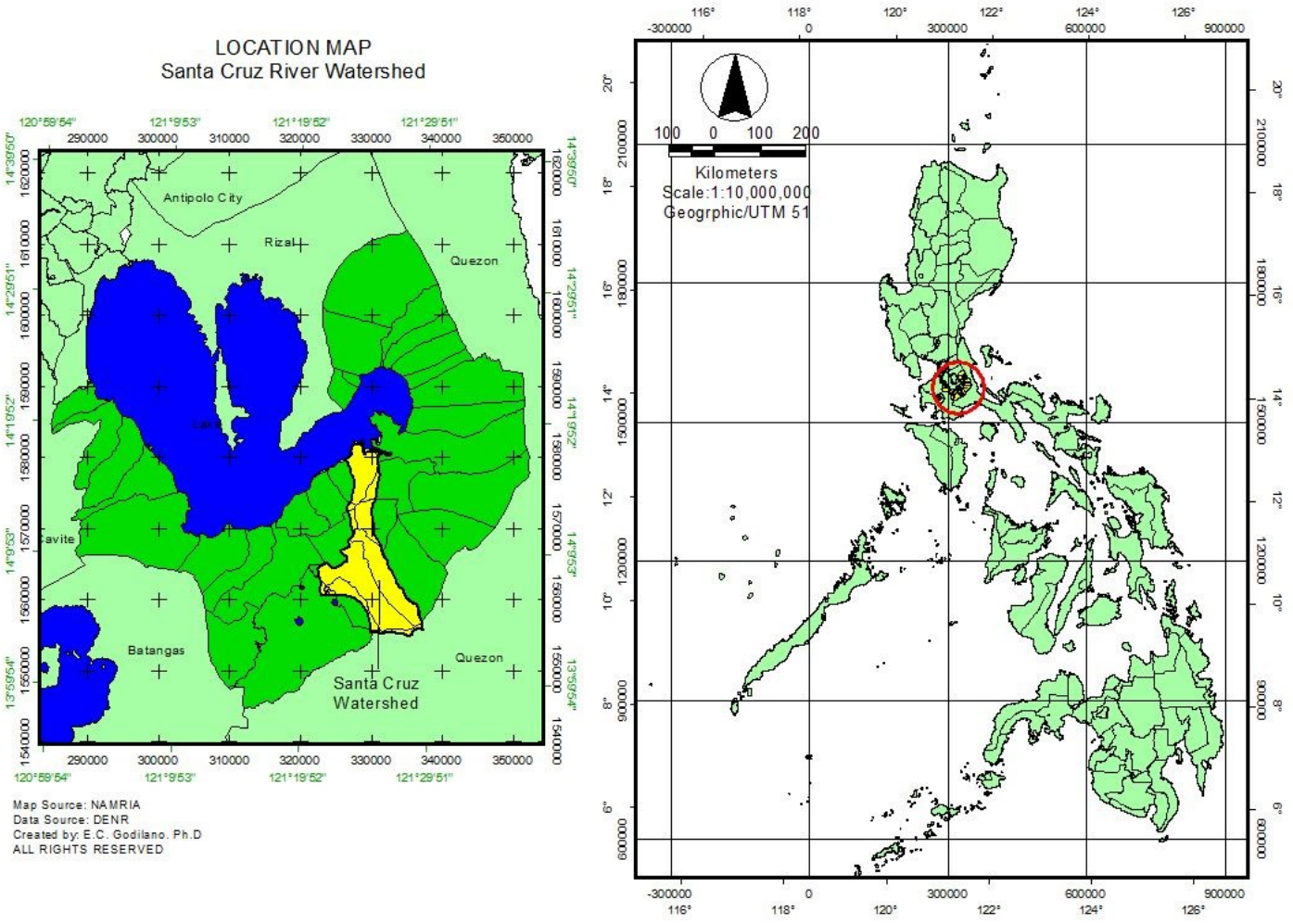

Figure 6. The Santa Cruz Watershed, Laguna

people espousing ACWG, for instance is the rule on tardiness and documentation of the meetings.

- As ACWG process is participatory in nature, it is important to determine at this point of the ACWG process the capability needs of the TWG members and others involved in preparation for undertaking an identified management approach. For instance, the Santa Cruz Watershed TWG members identified their need for a training on water management plan preparation.
- An outline of water management plan may already be discussed in meetings in preparation for the development process of a water resource plan. The TWG members coming from different municipalities of Santa Cruz Watershed tried to accomplish a municipal-based water resource plan prior to the development of a watershed-based water management plan.

Phase 3: Water resource management plan development and investment planning

Procedure

- Development of a water resource management plan by putting together the individual municipalities' prepared plans
- Validation of data in the draft water resource plan by the TWG members
- Preparation of an investment plan based on prioritized common problem among municipalities

Some guidelines

- The outputs of earlier review of water management undertakings are important inputs to the development of a water management plan.
- An investment plan out of a drafted water management plan may be pursued as an intermediate outcome out of ACWG collaborative platform. An investment plan may be treated as project plan in which institutions are involved particularly in the implementation process.

Phase 4: Implementing an investment plan using social learning approaches

Procedure

- Implementation of the water management plan through a developed investment plan
- TWG members learn while implementing the investment plan

- Enactment of local laws to support the water management plan and investment plans

Some guidelines

- An inflexible implementation of a water resource plan may take years for the TWG members to see concrete accomplishments. But by experiencing and learning in the process as an investment plan is being implemented, it enables accomplishing the bigger plan through small collaborative efforts, little-by-little. Learning together takes time as it is done in an iterative process of social experimentation, but seeing things happen through collaborative means, connotes accomplishments by itself.
- The ACWG process follows a continuous engagement of stakeholders.
- The strategy not only provides a focused approach to addressing an environmental concern, but also addresses the limitation of funds by implementing an investment plan.

ACWG Protocol Implementation in Santa Cruz Watershed

This section briefly discusses the implementation of the ACWG protocol highlighting the benefits of: a) partnering with existing stakeholder groups, i.e., river council and local government units sector; b) agreeing to a particular management approach to address problems and issues; c) setting of ground rules; and d) preparing and implementing an investment plan (project proposal).

The Santa Cruz Watershed is one of the 24 sub-watersheds of the Laguna de Bay Basin. To lead in the rehabilitation of river systems in the sub-watersheds, a Federation of the River Council Basins was established by LLDA (LLDA 2011). The ACWG protocol was implemented in Santa Cruz Watershed as there had been no platform tasked to govern water resources at the watershed level. The municipalities, however, had their individual plans and programs of managing water resources within their political jurisdiction with the assistance of LIMAS MARINA, the river council in Santa Cruz Watershed. LIMAS MARINA is named after the six municipalities, namely, Liliw, Magdalena, Santa Cruz, Majayjay, Rizal and Nagcarlan.

After a stakeholders' forum in 2014, a TWG was created to address the worsening environmental condition in the watershed. The TWG partnership included LIMAS MARINA, the six municipalities, LLDA, Provincial Environment and Natural Resources Office of Laguna, Laguna's Provincial Government Environment and Natural Resources Office, and the University of the Philippines Los Baños (as facilitator). The membership to the TWG had never been exclusive. Individuals or groups were invited depending on faced needs and difficulties in planning related to, for example, hosting of meetings, technical knowledge, and funding source for possible projects. To facilitate the planning process, setting some managerial grounds on the conduct of meetings (i.e., documenting/ transcribing discussions, making orderly meetings, and coming on time) was helpful. This resulted to shortened duration of and orderly meetings.

The TWG agreed to develop a water resource management plan as a management approach purposely to address the waste pollution problem – the identified top priority concern common to the six municipalities. In drafting the water resource management plan, the training on watershed and water resource planning attended by the TWG members was beneficial. Part of the plan was an investment plan on solid waste management, which the members had agreed to prioritize as a common pressing issue among the six municipalities. A solid waste management project proposal is yet to be prepared by the TWG. As the process would benefit from learning together and social experimentation, it was expected that the preparation of the proposal would take a slow process. The participation of the stakeholders in the planning process was a paramount consideration. The completion of the ACWG protocol phases would be the achieved improvement on the environmental quality of the river systems from the implementation of the project on waste management.

CONCLUSION

In search for a new framework that is suited to the local conditions, a protocol on ACWG was conceptualized and designed for improved management of the Santa Cruz Watershed. The analytical processes involved the conceptualization of ACWG and the design of a protocol.

The conceptualization process dealt with the online search for concepts and models from which to frame the protocol on ACWG. In the end, the literature encapsulated various concepts that are related with each other in terms of inclusivity of participation and the importance of collaborative learning to understand the complexity of resources being served. The search of models had resulted to four models which were evaluated based on their applicability in a natural resource management setting and availability of the description of a model particularly in terms of the phases and activities it proposes. This guided the authors in providing specific procedural activities that can be adaptable in the Santa Cruz Watershed.

Meantime, the design of the protocol for ACWG followed a by-phase execution with the corresponding elements or variables proposed by the models. The four phases of the ACWG are labelled:

a) Phase 1: Assessment of Water Management Undertakings and Building Partnerships with Stakeholder Groups;
b) Phase 2: Strategic Action Planning;
c) Water Resource Management Plan Development and Investment Planning; and lastly,
d) Phase 4: Implementing Investment Plans Using Social Learning Approaches.

Following a review of literature, the protocol on ACWG had been described according to the purposes of each of the phases, procedure, and guideline or recommendation. The guidelines were distilled from the experiences as the ACWG protocol as applied in the Santa Cruz Watershed. Noted beneficial was recommendations include: a) partnering with existing stakeholder groups, i.e., river council, and local government units sector; b) agreeing to a particular management approach; c) setting of ground rules; and d) preparing and implementing an investment plan (project proposal).

Finally, the ACWG protocol served as a guide in the search for new framework for effective water governance in the absence of formal mechanisms in the Santa Cruz Watershed. However, water governance at the watershed level is not as simple as it sounds. The features of natural resources as complex, multi-layered decision-makings, and uncertain remain, hence, the

social learning approach has been proposed by some models, which the ACWG protocol also proposes. As it may apply, the protocol can serve as a general listing of initial activities that can be applied by researchers in a participatory action research and field practitioners involved in the management of watersheds.

ACKNOWLEDGMENT

The authors would like to thank the Emerging Interdisciplinary Research Program (EIDR) of the University of the Philippines System for the generous support in the research and writing of this article (OVPAA–EIDR Code 2-003-121010). The final manuscript benefitted from research assistance of Ms. Maria Cristina A. Alvarez of the University of the Philippines Los Baños.

LITERATURE CITED

Akamani, K. & P.I. Wilson. 2011. Toward the adaptive governance of transboundary water resources. Conservation Letters. http://onlinelibrary.wiley.com/doi/10.1111/j.1755-263X.2011.00188.x/full . Retrieved on 2 May 2016.

Ansell, C. & A. Gash. 2007. 'Collaborative Governance in Theory and Practice', *Journal of Public Administration Research and Theory,* pp. 543-571 Oxford University Press.

Armitage, D.R., R. Plummer, F. Berkes, R.I. Arthur, A. T. Charles, I.J. Davidson-Hunt, A.P. Diduck, N.C. Doubleday, D.S. Johnson, M. Marschke, P. McConney, E.W. Pinkerton, & E.K Wollenberg. 2008. Adaptive co-management for social–ecological complexity. *Frontiers in Ecology and the Environment,* Vol. 7, no. 2, pp. 95-102..

Bankes, N. & B. Cosens. 2014. Protocol for Adaptive Water Governance: The Future of the Columbia River Treaty. University of Toronto.

Bark, R. H., D. E. Garrick, C. J. Robinson & S. Jackson. 2012. Adaptive basin governance and the prospects for meeting Indigenous water claims. *Environmental Science & Policy*, 19, 169-177.

Catacutan, D.C., D.P. Garrity & C.E. Duque. 2001. Governance and Natural Resources Management: Emerging Lessons from ICRAF-SANREM Collaboration in the Philippines. Paper presented to the SANREM-CRSP Research Synthesis Conference, 28-30 November 2001, Athens, GA.

Choi, T. & P. J. Robertson. 2014. Caucuses in Collaborative Governance: Modeling the Effects of Structure, Power, and Problem Complexity, *International Public Management Journal*, 17:2, 224-254, DOI: 10.1080/10967494.2014.905398

CIFOR (Center for International Forestry Research).2008. Adaptive Collaborative Management Can Help Us Cope with Climate Change. Infobrief. July 2008. No. 13.

Contreras, A.C. 2002. Water Policy Agenda for the Philippines. Philippine Institute for Development Studies. Vol. XX. No. 4. July-August 2002.

Cosens, B. A. & M. K. Williams. 2012. Resilience and water governance: adaptive governance in the Columbia River basin. *Ecology and Society* 17(4): 3. http://dx.doi.org/10.5751/ES-04986-170403

Curtis, Rick. 1999. Outdoor Action Guide to Building Program Protocols. Princeton University. Retrieved from http://www.princeton.edu/~oa/safety/protocol.shtml.

Department of Environment, Yukon of Canada. 2002. Protocol for The Contaminated Sites Regulation Under The Environment Act Protocol No. 13: Adaptive Management. Retrieved from http://www.env.gov.yk.ca/air-water-waste/documents/Protocol13-AdaptiveManagement_Sep-15.pdf

Eberhard, R., C. J. Robinson, J. Waterhouse, J. Parslow, B. Hart, R. Grayson & B. Taylor. 2009. Adaptive management for water quality planning – from theory to practice. *Marine and Freshwater Research*, 2009, 60, 1189–1195.

Elazegui, D. D. 2004. Water resource governance: Realities and challenges in the Philippines In: A.C. Rola, H. A. Francisco and J.P.T. Liguton. Winning the Water War: Watersheds, water policies and water institutions.

Emerson, K., Nabatchi, T.,and Balogh, S. 2012. An integrative framework for collaborative governance. *Journal of Public Administration Research and Theory*, 22(1), 1-29.

Fabricus, C. & G. Cundill. 2014. Learning in adaptive management: insights from published practice. *Ecology and Society* 19(1): 29.

Ghose, R. 2005. The complexities of citizen participation through collaborative governance, Space and Polity, 9:1, 61-75. DOI: 10.1080/13562570500078733

Gomez, J.E.A. Jr. 2014. Urbanizing at the Lake's Edge: Watershed Planning and Governance Lessons from the Laguna de Bay Region, Philippines. *Journal in Urban and Regional Planning.* UP School of Urban and Regional Planning.

Global Water Forum: http://www.globalwaterforum.org/2012/12/02/understanding-the-implications-of-rescaled-water-governance-from-jurisdictional-to-watershed-boundaries/

Global Water Partnership. 2002. Risk and Integrated Water Management. Global Water Partnership. IWA, Water Wiki.

Gunderson, L. 1999. Resilience, flexibility and adaptive management - - antidotes for spurious certitude? Conservation Ecology (1): 7. http://www.consecol.org/vol3/iss1/art7/ Retrieved on 20 February 2016.

Herrfahrdt-Pähle, E. 2013. Integrated and adaptive governance of water resources: the case of South Africa. *E Reg Environ Change* (2013) 13:551–561 DOI 10.1007/s10113-012-0322-5.

Holling C.S. 1978. Adaptive environmental assessment and management. New York, NY: Wiley.

Huitema, D., E. Mostert, W. Egas, S. Moellenkamp, C. Pahl-Wostl & R. Yalcin. 2009. Adaptive water governance: assessing the institutional prescriptions of adaptive (co-) management from a governance perspective and defining a research agenda. *Ecology and Society* 14(1): 26.

Johnson, B. L. 1999. The role of adaptive management as an operational approach for resource management agencies. *Conservation Ecology* 3(2): 8.

Lal, P., H. Lim-Applegate & M. Scoccimarro. 2001. The adaptive decision-making process as a tool for integrated natural resource management: focus, attitudes, and approach. *Conservation Ecology* 5(2): 11.

Lee, K. N. 1999. Appraising adaptive management. Conservation Ecology **3**(2): 3. http://www.consecol.org/vol3/iss2/art3/ . Retrieved on 5 May 2016.

LLDA (Laguna Lake Development Authority). 2011. Annual Report. http://www.llda.gov.ph/dox/ar/ar11.pdf. retrieved on 5 May 2016.

Mensah, K. & J. F. Gibbon. 2012. Tasty water of the good samaritan: collaborative governance and rural capacity enhancement for adapting water sources to climate change, *African Geographical Review*, 31:2, 163-182, DOI: 10.1080/19376812.2012.728481. Retrieved on 3 July 2016.

Montero, S.G., E.S. Castellon, L.M.M. Rivera, S.G. Ruvalcaba & J.J. Llamas. 2006. Collaborative governance for sustainable water resources management: the experience of the Inter-municipal Initiative for the Integrated Management of the Ayuquila River Basin, Mexico. *Environment & Urbanization*. 297 Vol 18(2): 297–313.

National Water Resources Board . 2004. Water Resources Management in the Philippines. Country/Organizational Report. Integrated Water Resource Management (IWRM) Training Course. July 26-August 6, 2004. Bangkok, Thailand. http://www.narbo.jp/data/01_events/materials/tc01_cr_philippines02.pdf. Retrieved on 7 March 2016.

O'Brien. M. 2012. Review of Collaborative Governance: Factors crucial to the internal workings of the collaborative process. https://www.mfe.govt.nz/sites/default/files/review-of-collaborative-governance.pdf. Retrieved on 10 January 2016.

Oregon State University. 2002. Adaptive Management. http://oregonstate.edu/instruct/anth481/ectop/ecadm.html. Retrieved on 6 May 2016.

Pahl-Wostl,C. L. Lebel, C. Knieper, & E.Nikitina. 2012. From applying panaceas to mastering complexity: Toward adaptive water governance in river basins. *Environmental and Policy Science* 23, 24-34.

Pahl-Wostl, C., J. Sendzimir, P. Jeffrey, J. Aerts, G. Berkamp, & K. Cross. 2007. Managing change toward adaptive water management through social learning. *Ecology and Society* 12(2): 30. http://www.ecologyandsociety.org/vol12/iss2/art30 /. Retrieved on 20 January 2016.

PennState Lehigh Valley. n.d. Write a protocol. http://www2.lv.psu.edu/jxm57/irp/prot.htm . Retrieved on 3 July 2016.

Philippine News Agency. 2015. Mayor anticipates water scarcity in Baguio City. Interaksiyon.com. January 22, 2015.

Plotnikof, M. 2015. Negotiating Collaborative Governance Designs: A Discursive Approach. *The Innovation Journal: The Public Sector Innovation Journal*, Volume 20(3), 2015, article 2.

Plummer, J. & T. Slaymaker. 2007. Rethinking Governance in Water Services. Working Paper 284. Overseas Development Institute. London.

Polis Project on Ecological Governance: http://poliswaterproject.org/. Retrieved on 9 September 2016.

Prabhu, R., C. McDougall & R. Fisher. 2007. Adaptive Collaborative Management: A Conceptual Model. In Adaptive Collaborative Management of Community Forests in Asia. Experiences from Nepal, Indonesia and the Philippines. Center for International Forestry Research.

Program on Water Governance. https://watergovernance.ca/ . Retrieved on 20 September 2016.

Queblatin, E.E., D.C. Catacutan, & D.P. Garrity. 2001. Managing Natural Resources Locally: An Overview of Innovations and Ten Initial steps for Local Governments. International Centre for Research in Agroforestry and the International Fund for Agricultural Development. 44p.

Republic Act 4850 of 1966. An act creating the Laguna Lake Development Authority.

Rillorta, P. 2014. Baguio officials air concern about water supply. SunStar. February 24, 2014.

Robertson, P.J. & T. Choi. 2012. Deliberation, Consensus, and Stakeholder Satisfaction. *Public Management Review*, 14:1, 83-103, DOI: 10.1080/14719037.2011.589619

Rogers, P. & A. W. Hall. 2003. Effective Water Governance. TEC Background Paper No. 7 https://dlc.dlib.indiana.edu/dlc/bitstream/handle/10535/4995/TEC+7.pdf?sequence=1 . Retrieved on 20 January 2016.

Rouillard, J.J., K.V. Heal, T. Ball, & A.D. Reeves. 2013. Policy integration for adaptive water governance: Learning from Scotland's experience. *Environmental Science and Policy*. 33 (2013) 3 7 8 – 3 8 7.

SADC (South African Development Community).2000. Revised Protocol on Shared Watercourses in the Southern African Development Community. http://www.internationalwaterlaw.org/documents/regionaldocs/Revised-SADC-SharedWatercourse-Protocol-2000.pdf. Retrieved on 6 February 2016.

Scarlett, L. 2013. Collaborative adaptive management: challenges and opportunities. *Ecology and Society* 18(3):26. http://dx.doi.org/10.5751/ES-05762-180326. Retrieved on 6 February 2016.

Schreiber, S., A.R. Bearlin, S.J. Nicol and C.R. Todd. 2004. Adaptive management: a synthesis of current understanding and effective application. *Ecological Management and Restoration*. Vol. 5 No. 3.

Senate Economic Policy Office. 2011. Turning the tide: Improving water resource management in the Philippines. Policy Brief. p.4.

Stefano, L.D., M. Svendsen, M. Giodano., B.S. Steel, B. Brown & A.T. Wolf. 2014. Water governance benchmarking: concepts and approach framework as applied to Middle East and North Africa countries. *Water Policy* 16 (2014) 1121–1139

South Florida Water Management District. 2010. Adaptive Protocols for Okeechobee Operations. http://www.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/ap_lo_final_20100916.pdf . Retrieved on 16 June 2016.

Susskind, L., A.E. Camacho & T. Schenk. A critical assessment of collaborative adaptive management in practice. *Journal of Applied Ecology* 2012, 49, 47–51.

Tabios, G and C David. 2004. Competing uses of water: Cases of Angat reservoir, Laguna Lake and groundwater systems of Batangas City and Cebu City. In: Rola, A, H Francisco and J Liguton (Eds.) Winning the water war: Watersheds, water policies and water institutions. Makati City, Philippines: PIDS and PCARRD.

The William and Flora Hewlett Foundation.2005. Collaborative Governance. A Guide for Grantmakers. http://www.hewlett.org/uploads/files/HewlettCollaborativeGovernance.pdf . Retrieved on 20 January 2016.

United Nations. 2006. Water: A Shared Responsibility. The United Nations World Water Development Report 2. World Water Assessment Programme. unesdoc.unesco.org/images/0014/001444/144409E.pdf. Retrieved on 5 May 2016.

Water Environment Partnership in Asia. http://www.wepa-db.net/policies/measures/currentsystem/philippines.htm . Retrieved on 4 March 2016.

Wesselink, A, J. Paavola, O. Fritsch, and O. Renn. 2011. Rationales for public participation in environmental policy and governance: practitioners' perspectives. *Environment and Planning A*. Vol 43 (11), 2688-2704. doi: 10.1068/a44161. Retrieved on 5 June 2012.