

# Reforming Watershed Management Institutions for Inclusive and Sustainable Growth: Role of Institutional Interaction and Participative Decision Making

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## Abstract

The rainfed areas of rural India often lack the services of able water management institutions. Thus, management of water in such areas is not a stand-alone activity but is significant for the overall development of the area, which also takes into account natural resource management, productivity enhancement and livelihood supporting activities. This is commonly referred to as watershed development (WSD). These WSD programmes are run on a massive scale and have been dovetailed with the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). But, even after massive investment, these programmes or the institutions did not generate effective performance. There is an urgent need of good institutional arrangement that reduces transaction costs and favours co-operative solutions. In this context, the literature on new institutional economics identifies good interaction as one of the most important features of effective institutions. This article uses new institutional economics, theories of governance, management and organizational design to develop a conceptual framework for understanding the role of institutional interaction and participative decision-making in generating enhanced performance and sustainable outcome. *Conceptually*, the demand for interaction depends upon generic and specific drivers, and the supply of good interaction would come through structures, processes and governance features of institutions and also through consideration of different rationalities (e.g., technical and social). This article involved an exploratory research followed by an in-depth survey of 30 local watershed institutions in three districts of Andhra Pradesh. The findings indicate that the quantity of interaction alone is not sufficient in generating effective institutional performance. Quality of institutional interaction based on various rationalities is equally important. The study may help in designing the institutions involved in WSD in a better way for inclusive and sustainable outcomes.

## Keywords

Natural resources, rural, social, poverty, institutions, rationalities, transaction costs.

## Introduction

Management of natural resources is increasingly becoming a major necessity for agricultural growth in developing countries such as India. It is becoming clear over time that technology alone cannot support the agricultural growth on a continuous basis and there is a need to effectively manage natural resources, particularly water, land and land/soil fertility. This is particularly important for rainfed

areas that have much potential in terms of productivity but are often faced with scarcity, adversity and poverty. Watershed<sup>1</sup> development (WSD) programmes are a major national initiative through which management of natural resources has been pursued.

Presently, WSD activities in India have three components, namely: (a) natural resource management (NRM), (b) productivity enhancement (PE) and (c) enterprise promotion (EP). NRM focuses on the lands of the poor.

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Activities under PE include soil fertility management, micro-nutrient management based on soil analysis and seed production/seed banks by involving research institutes and village organizations. Activities under EP involve identification of the poor, followed by preparation of EP plan for both farm-based and non-farm activities.

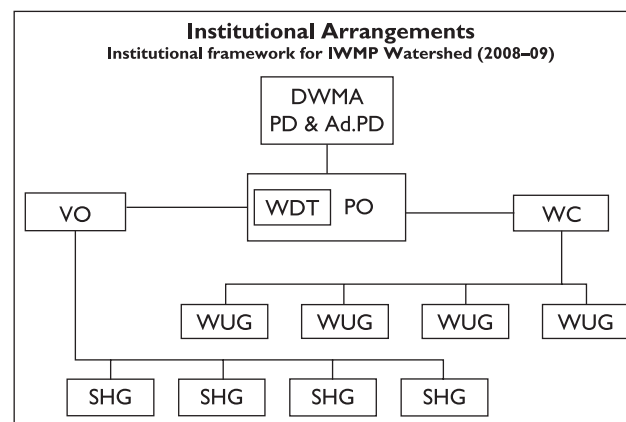
WSD programmes have assumed enormous importance over the years in India and received massive government funding. This is particularly because they have a huge potential for raising production and incomes, improving livelihoods and alleviating poverty in backward, water-scarce areas. Between the years 1995–1996 and 2007–2008, Indian Rupees (INR) 7,700 crore were spent on WSD programmes. Given the importance of WSD, the World Bank has provided US\$ 1.73 billion for WSD during 1990–2004 (Darghouth et al., 2008), while Government of India has spent over US\$ 6 billion during the period 1996–2004 (World Resources Institute, 2005). In the recent years, the MGNREGA, having an annual budget of INR 40,000 crore (400 billion), is being dovetailed with the WSD programmes in most states of India. This is to synergize and enhance their contribution to development, and it has tremendously enhanced the importance and support of WSD programmes in India.

Over the years, the Department of Land Resources in the Ministry of Rural Development, Government of India, administered three area-based WSD programmes, namely Desert Development Programme (DDP), Drought Prone Areas Programme (DPAP) and Integrated Wastelands Development Programme (IWDP). DDP programme was focused on mitigating the drought impact and reducing the vulnerability in desert areas. DPAP and IWDP programmes were focused on drought-prone areas and wastelands, respectively. It is noteworthy that most of the sanctioned projects have been of DPAP type and have incurred an investment of about INR 36 billion, which is about 40 per cent of the total expenditure on watershed programmes. Similarly, the desert-focused DDP programme has an overall coverage of over 100 million hectare area (which is 25.4% of the total area covered under watershed programmes) and with an expenditure of INR 29.91 billion (27.8% expenditure).

Government of India constituted the Hanumantha Rao Committee in 1993 for reviewing the performance of the WSD programmes. The committee found that these programmes were performing badly on many counts. It suggested that the programmes should be made more participative in order to achieve sustainable outcomes. This followed a change in approach, and programmes like DDAP and DDP were transformed into the Hariyali programme where the power of implementation at the local

level was given to Panchayati Raj Institutions (PRIs). At the state level, there have been some initiatives like Andhra Pradesh Rural Livelihood Project (APRLP) which focused on involving women self-help groups (SHGs) in the process of implementation and had EP as a key component of watershed programmes. Both Hariyali and APRLP gave the power of implementation to grassroots institutions and emphasized on community involvement at every step to bring in sustainability and performance outcomes. There were good outcomes which led to the emergence of the Integrated Watershed Management Programme (IWMP), with all other programmes merged into it. But substantial challenges still remain with WSD programmes, especially at the institutional level.

The existing institutional arrangements for WSD programmes are hierarchical in nature. They include higher-level entities, which are engaged in planning, coordination and control, and grassroots-level entities, which operate closer to the farming community. The higher-level entities include the National Watershed Programme Implementation and Review Committee, the State Watershed Programme Implementation and Review Committee, the Department of Rural Development, Zila Parishads (under the Panchayati Raj) or the District Rural Development Authority (DRDA), the District Water Management Agency (DWMA) and the District Watershed Development Advisory Committee. The grassroots-level entities include project implementation agencies (PIAs), voluntary agencies, (MDTs), watershed development teams (WDTs), PRIs, the managing committee (MC), the Watershed Association, the Watershed Committee (WC), the village organization, user groups (UGs), SHGs, Watershed Secretary and staff and volunteers. A typical institutional arrangement at the watershed level is shown in Figure 1.



**Figure 1.** Institutional Arrangement for Watershed Development in India

**Source:** Authors' own creation.

At the national level, there is a steering committee under the chairmanship of Secretary (Land Resources) and with other members, while at the state level, there is a state-level nodal agency (SLNA). At the district level, the Watershed Cell-cum-Data Centre at DRDA/Zila Parishad supervises and coordinates various projects in all programme districts. At the project level, either the government or non-government agencies act as PIAs and supervise the project. Each PIA has a WDT that comprises three to four technical experts (technical officers or TOs). At the village level, a WC constituted by the Gram Sabha takes care of the field-level implementation of the project. This comprises at least 10 members and it is ensured that half of the committee members belong to SHGs and UGs, SC/ST communities, women and the landless class. It is also necessary to elect a separate secretary of the WC through a Gram Sabha meeting. Also, the implementation of watershed programme in each district is overseen by a separate Watershed Cell-cum-Data Centre (WCC) that needs to have separate independent accounts for this purpose. A major institutional constraint facing the adoption and impact of WSD is the difficulty of moving from the state-governed delivery of required WSD infrastructure/technologies to community management and ownership. There is a need of new institutional framework based on the conceptual understanding of elements of new institutional economics literature.

Procedurally, in the existing system, government funding for the WSD activities is available, on the basis of which WSD activities are implemented, followed by withdrawing and handing over of the function of management of assets, structures and initiatives to communities. But, it has been found that NRM structures built under various programmes, which generate substantial benefit, have suffered due to the lack of proper maintenance. Institutions that have been created under these watershed programmes are not sustainable and they cease to exist once the programmes are completed. One of the primary reasons, as cited by various practitioners and researchers, is poor institutional arrangements that have not improved due to disconnect between planners and policy-makers, PIAs and the local community or beneficiaries (Dash, 2011; Johnson, Ravnborg, Westermann & Probst, 2002; Rhoades & Elliot, 2000). Primarily, in order to achieve sustainability and success, it is essential for institutions to effectively interact with each other and also to ensure that there is effective interaction among various stakeholders. Such a need becomes more crucial in a resource-constrained country like India and even more in a complex, internal and external environment that surrounds NRM, watershed management, in particular. This necessitates new institutional

framework that allows for more local participation, decentralization of power, delegation of power to local bodies and improving connect between different stakeholders (Brewer et al., 1999; Vaidyanathan, 1999).

Pertinent questions that this study aims to explore have come up from the literature reviewed and the gaps identified thereof. New institutional economics, theories of governance and management, and organizational design concepts have been used in this article to develop a new conceptual framework for understanding the role of institutional interaction and participative decision-making in generating enhanced performance and sustainable outcome. The study involved an exploratory research followed by an in-depth survey of 30 local watershed institutions in three districts of Andhra Pradesh. The findings are analyzed on the basis of the new conceptual framework that has been developed. We first provide the review of literature on institutional performance, institutional frameworks, WSD and elements of effective institutions, including good interaction, followed by a description of the study approach and methods. The 'Results and Discussion' section highlights the findings that have been arrived at through the new conceptual framework having several policy implications. The conclusions highlight such policy implications.

### **Institutional Performance and New Institutional Economics**

The institutional approach to study economic problem originates from the works of R.T. Ely (1914) and John R. Commons (1924, 1934). Their approach was different from Classical and neo-Classical approaches which were based on utility and voluntary exchange from interactions of independent and utility maximizing individuals (Marothia & Phillips, 1985). Commons visualized the conflict as an economic phenomenon based on elements of human motivation and social organization and hypothesized that humans act according to their environment and struggle to survive by producing and consuming goods and services. According to Commons, a man in a society cannot act rationally without fulfilling three fundamental social conditions for self-realization—security, liberty and equality (Commons, 1934). For ensuring three fundamental social conditions for self-realization, Commons (1934) called for institutions and defined institutions as 'collective actions in control, liberalisation and expansion of individual actions'. These institutions may include 'laws, constitutions, traditions, moral and ethical structures, and customary and acceptable means of doing things' (Commons, 1924). Factors like scarcity, efficiency, futurity

and working rules of collective actions are applicable to both organized and unorganized customs as well as to organized going concerns (Commons, 1934).

### *Institutions*

The ‘working rules’ or in other words ‘institutions’ decide the course of collective action and order the relationship among individuals within society. There are provisions of collective sanction (moral or profit-related) in case there is deviation from working rules. The organized going concerns can induce human behaviour, whereas unorganized institutions do not exert sufficiently strong sanctions to determine human behaviour. With the establishment and enforcement of working rules, the institutional framework makes transactions feasible by making the parties expect profit. By the enforcement of working rules, in which institutions limit and control human self-interest, human beings create institutions, which in return influence patterns, behaviours and expectations of human beings. In dealing with the concept of working rules, Commons (1934) recognized that the institutional approach must make an analysis of the behaviour of individuals while they are participating in the transactions.

New institutional economics uses various approaches to justify and understand institutions (Drobak & Nye, 1997; North, 1997). Property rights and transaction costs are two very well-recognized approaches. While property rights approach argues for allocation of rights to a property or a common pool resource to internalize conflict externalities (Coase, 1937, 1960), transaction costs approach opines for reducing costs of exchanges or transactions. Thus, the comparative institutional analysis coming out of such assignments is required to provide directions about efficient internalization of externalities and institutional design. Coase (1960) argued that excessive government involvement might prove inefficient if property rights are well-established. He also argued that in the absence of transaction costs, private property rights seem to be the most efficient system for governing land use. In other cases, however, the transaction costs approach is suggested.

Transaction costs refer to all costs associated with the creation, use and change of an institution. Transaction cost can further be divided on the basis of operating within a particular institutional environment (static transaction costs) or during or due to changes in institutional environment (dynamic transaction costs). Transaction costs can further be divided into transition cost (current transaction cost with changing institutional environment) and transformation costs (costs that chosen institutional structures can force in the future). The link between current and future

transaction cost is due to path dependencies (North, 1990). Similarly, the transformation cost can be divided into static and dynamic transformation costs. Static transformations costs include costs involved in production technology and processes while inter-temporal transformation costs are the cost of technology due to future institutional (or related technological) changes (Marshall, 2003).

According to North (1997), an important challenge is to evolve institutions that minimize transaction costs and create incentives that favour collaborative solutions, which can utilize cumulative experiences and collective learning. Williamson (2000) classifies the institutions into two groups—‘micro’ and ‘macro’. The macro institutions are considered as the rules of the game or the humanly devised limitations that model political, economic and social interactions. It includes informal constraints (i.e., customs, traditions, taboos, sanctions and codes of conduct) and formal rules (i.e., constitutions, laws, property rights). The micro institutions are the institutions of governance—market, quasi-market and hierarchical modes of contracting, or of managing transactions, and overseeing through activities such as economic activities.

### *Institutional Analysis and Development Frameworks*

Polski and Ostrom (1999) have developed an institutional framework to undertake robust institutional analysis. The framework is based on ‘soft systems approach’ that transforms the complex analytical task of understanding how institutions operate and take into consideration their influence on people’s behaviour and resulting outcomes into simple steps. The framework tries to include a broad range of contextual factors that determine and constrain the natural resource or environmental issue to be studied. These contextual factors may include *Attributes of the Community*, the *Rules-in-use* and the *Attributes or characteristics of the Natural Resource*. These factors provide the context within which the *Action Situation* element is considered. The Action Situation factor may include the ‘social space’ in which a few individual or group of people, faced with a set of potential actions, come together to generate performance.

The framework suggests that the nature of the community, the rules they practice and the natural resource itself create opportunities and limitations or constraints that influence the actions of people, their type of interaction (represented by the *Pattern of Interaction* element), and result in social as well as environmental outcomes. The resulting *Outcomes* can be assessed through various evaluation criteria (*Evaluation*). In the framework, the attributes



of natural resources include the size of the natural resource, its carrying capacity, its regenerative potential, the goods and services produced by the natural resource, and the level of excludability and/or subtract ability of the goods and services produced. The *Attributes of the Community* factor includes the people involved, the norms people follow, the level of common understanding of the community, the level of homogeneity amongst their preferences and the distribution of resources among the people who are involved, including additional factors that capture other relevant political and socio-economic factors. The *Rules-in-use* factor includes the rules that are prevalent in the community of people, the interaction of people with each other as well as the natural resource. Additionally, this factor also captures the level of rule formality, the level of enforcement of rules and the extent to which the rules-in-use make sense from the perspective of the different people involved.

Thomson and Freudenberger (1997) proposed an amended framework by replacing *Action Situation and Patterns of Interaction* factors with *Incentives and Behaviours*, respectively, thereby capturing the impact of institutions as a guide to people's actions and interactions. Fischer, Petersen, Feldkotter, and Huppert (2007) extended the above framework and proposed a more detailed 'Institutional Analysis and Development Framework' that makes processes of institutional change more explicit and ensures involvement of all people in the management of natural resources part of the analysis. The framework suggested by Fischer et al. (2007) consists of two diverse components—*Situation Analysis* and *Analysis of Change*. The Situation Analysis component captures almost all the components of Institutional Analysis and Development Framework with a few modifications. The major modification is the explicit emphasis on incentives and people's collective behaviour. The other modification includes the *Attributes of All People* factor to make all people, who are involved in the use and management of the natural resource, a part of the analysis. The second component, *Analysis of Change*, bears a dynamic policy perspective and includes the innovation of focusing explicitly on incentive changes from policy interventions. Additionally, this component also distinguishes two factors of policy intervention. Factor 1 deals with 'the character and type of incentive measures to be considered' (e.g., markets), while Factor 2 addresses 'the actual mechanisms and level (e.g., constitutional-level) of implementing the policy intervention'.

To enhance focus on systems and unpacking the attributes of the natural resource itself, Ostrom (2009) and Ostrom and Cox (2010) have proposed an extension to the above institutional analysis and development framework. The extension is a nested and multi-tiered

Social–Ecological Systems Framework. The highest tier factors may include:

1. *Action Situations* (or *Incentives*) which represents social space where two or more people are required to choose from a set of potential actions that jointly produce outcomes.
2. *Natural Resource Units* which represents the attributes of the units extracted from the natural resource system.
3. *Natural Resource System* which represents the system from which natural resource units are extracted.
4. *Users* which represents the users who routinely extract natural resource units from the natural resource system.
5. *Governance System* which represents the people and the prevailing set of institutions through which the rules and norms shaping the users of the natural resource are set.

The Social–Ecological Systems Framework enquires around the inter-relationships between social systems and ecosystems. Understanding such inter-relationships through the various mentioned factors is important to deal with the complexity in natural resource and environmental policy-making.

Bromley (1989) has opined that in a large number of development projects, the bulk of the beneficial (and harmful) impacts are on those living in close proximity to the development intervention. He argues that when local citizens are part of the planning of a development project, the chances for success are often better than the ones in which projects are external and are seen either as gifts or as impositions. Perceptions of ownership develop in the domain of property relations in and around the local community where development projects are implemented. These relations will dominate the chances of success of all land and related natural resources projects. Property relations are important in development because they inter-link people with each other for land and related natural resources. They are 'socially designed contractual arrangements among a group of people with respect to objects and situations of importance to them' (Bromley, 1989). Further, property relations are crafted by human communities to link individual and collective behaviours regarding objects and conditions of value to the community members. Often, some development projects are less successful than others, may be because they ignore the existing property relations or misinterpret the existing property relations.

In the above context, Vincent Ostrom's concept of polycentricism is particularly relevant. Ostrom (1972) defines polycentric order as the one where many elements

are capable of making mutual rearrangements to order relationships with one another within a general system of rules in which each element acts independent of other elements. Moreover, in this situation, the individuals will be led to organize elements in a polycentric order, start self-enforcing arrangements and alter basic rules. A polycentric governance system provides for freedom from hierarchical, top-down ruling system and argues for different type of conceptualizations of scale, devolution and governance. It also allows for involvement of informal institutions in governance and decentralized decision-making within a policy network. It involves the devolution of power to lower-level entities and at all scales. The aim of such systems is to be more adaptive, more interactive and be equipped with feedback loops to improve the outcome of the involvement or the activity.

## Designing Effective Institutions

### *Institutional Features*

Researchers in recent years have studied and highlighted specific institutional rules for various types of systems. New institutional economics identifies certain design characteristics for institutions that can be consistently associated with successful management of resources. On the basis of foundational literature of new institutional economics and the applied literature (Crane et al., 2002; Gandhi, 1998; Goodin, 1996; Ostrom, 1992). Pagan (2003) has mentioned five key characteristics that may be required and observed in effective institutions. They are outlined as follows:

**Clear objectives:** Clear objectives and clarity of purpose are a primary necessity. Clarity of objectives and their acceptance by stakeholders generates order, reduces the chances of conflicts, lowers the transaction costs and results in greater congruence. In the context of WSD projects, the objectives should cover all the components including NRM, PE and livelihood enhancement. They should be well-documented, communicated and shared.

**Good Interaction:** Good interaction helps in unifying the formal and informal rules and objectives by bringing together various logic and different forces. Thus, it reduces transaction costs and promotes co-operative solutions. Good interaction with other institutions is equally important as it reduces external transaction costs. For a successful outcome of WSD projects, it is very important to club together the informal (i.e., the needs, social and natural settings and the shared knowledge of the village) with

the formal rational (i.e., WSD approach and state support). Good interaction leads to planning of appropriate activities and enhance the chances of their acceptance and ownership by the villagers.

**Adaptiveness:** Adaptiveness to varying external and internal environments is necessary for reduced transaction costs and enhanced sustainable performance. The WSD institutions need to adapt to the varying physical, social and political settings in different locations and also the changes in them over time. They need to adapt to the pressures of different rationalities. Rigidity or lack of adaptiveness would raise transaction costs and lead to institutional failure. There should be scope and provision for adapting to the major variations and changes, processes for doing them and authority/delegation to implement.

**Appropriate scale:** Appropriate scales (spatial and administrative) in scope and size help to avoid large transaction costs and provide for better control on internal and external environments. It may lead to better institutional performance. Appropriate scale for WSD activities that provides reasonable control over the available resources in its command area may help in better control and command. In the case of smaller scales, external activities will affect the operation, while in the case of larger scales, control and management would be a difficult task as the transaction costs would be too high. Besides, higher scale/level issues should be taken care of by higher-level institutions.

**Compliance capacity:** Non-compliance to the rules by a large section of the members increases transaction costs, thereby making the institution less meaningful. The objectives and rules give shape and meaning to the institution, and compliance to the rules of the institution is essential to make the institution meaningful and effective. This is important from the point of view of organizational rationality. WSD is generally undertaken in areas where natural resources are scarce and fragile. A compromise with the rules can cause severe consequences. Compliance to financial rules (of activities, budgets, procedures and beneficiaries) is also important, since substantial government/public resources are involved with WSD. Therefore, strong sanctions should be provided for against breach of any rules.

### Consideration of Rationalities

Theories of management, organizational design, and governance identify some rationalities that need to be addressed for good governance and performance (Ackroyd, 2002; Groth, 1999; Nystrom & Starbuck, 1981). As described in

various literatures, rationality is the quality or state of being reasonable, based on facts or reasons rather than emotions or feelings. A rational decision is the one that is not just reasoned, but is also optimal for achieving a goal or solving a problem. Rationality involves the quantifiable formulation of a problem and making key assumptions. When the goal or the problem requires decision-making, rationality helps in identifying how much information is available. The three rationalities identified for good governance and performance are as follows:

**Technical rationality:** Good institutions should have technical rationality that deals with the efficient conversion of inputs into outputs. It needs good technology and various other determinants of high productivity.

**Organizational rationality:** Organizational rationality focuses on specialization, division of labour and effective coordination in its various functions and tasks. It helps good institutions achieve effective institutional performance.

**Political rationality:** The perceptions of fairness and justice among individuals are very important for good institutions. It helps in generating effective and sustainable institutional performance.

In the context of WSD, Gandhi (2010) has proposed consideration of eight rationalities. The complete set is as follows:

1. *Technical rationality:* It deals with the involvement of experts or technically skilled people in planning and decision-making for activities like selection of technologies. It also considers the type, specification and location of various WSD activities.
2. *Economic rationality:* It deals with the evaluation and selection of activities by giving due consideration to markets, demand, prices, profitability and returns to investment.
3. *Environmental rationality:* It requires taking into consideration the externalities and efforts towards conservation of water, land and natural vegetation on a sustainable basis.
4. *Social rationality:* It deals with the consideration of social or community setting to enhance ownership, acceptability and cooperation of different social groups for WSD activities.
5. *Political rationality:* It deals with addressing the perceptions of fairness and justice among various individuals and groups to achieve smooth and sustainable functioning.
6. *Organizational rationality:* The consideration of present level of, specialisation, division of labour,

and effective coordination is critical for effective institutions. Similarly, it is also important how institutions induce and promote leadership, managerial skills, knowledge and training to its key constituents.

7. *Financial rationality:* It involves inclusion of procedures, responsibility and accounting systems to enhance discipline and care in proper handling of the finances.
8. *Government rationality:* It requires proper design of programmes and effective and speedy support from the government system.

### Interaction: Concept, Importance and Unanswered Questions

Institutional interaction is a phenomenon in which the larger social order intersects with the situational order. Institutional interaction is a particular type of social interaction in which the participants oriented to an institutional context interact for accomplishing distinctive institutional objectives (Armenian, 1995). Interaction may consist of production and monitoring of norms and standards of expected behaviour that evolve out of consensus or mutual consent in a group, and it depends upon the response of individuals or groups to perception of cost and benefits in exchanges (Nee & Ingram, 1998). Existing institutional framework consists of formal (market-determined) and informal (derived socially and slowly changing) institutions, the major function of which is to facilitate exchange through predictable human behaviour constrained by uncertainty and incomplete information (Pejovich, 1999). Interaction can bring formal and informal rules and norms together resulting in better operation and performance of social systems (Pagan, 2003; Pejovich, 1999; Williamson, 1985).

Nee and Ingram (1998) state that institutions, in general, produce group performance by structuring social units as large as organizations and even entire economies. The interactions or complex 'network of social relations' arise because of individuals' response to perception of cost and benefits in exchanges and give-and-take in particular ties. Thus, the community-generated and accepted elements of expected behaviour, and the creation and monitoring of rules become a part of institutional interaction.

Young (1999) indicates that social, cultural and physical factors decide the settings and contexts for the institutions. In such cases, institutions induce and influence the decision-making process and make leaders interact with each other to take decisions across different contexts. Also, it has been well recognized that to bring about changes in operation and performance of social systems, there is a requirement of linkages between their formal and informal

structures (Dovers, 2001; Keefer & Shirley, 2000; North, 2000; Ostrom, 1993; Pagan, 2009; Williamson, 1985).

Also, Crase, Dollary, and Wallis (2004) argue that the 'more is better' approach for interaction with community is not always beneficial and the amount of consultation should be based on rational choice, taking into consideration the incremental benefits and costs of such interactions.

The existing literature does not critically examine the direct linkages or relationships that exist between formal and informal institutions leading to a successful outcome. As such, institutional interaction and its role towards the performance of institutions, particularly in the context of development of natural resources, have not yet been examined. There is a need to club elements of sociology, new institutional economics, management theories of governance and organizational design and application economics in order to understand and ascertain the role of institutional interaction in enhancing institutional performance in WSD. Also, there is a need to examine and understand the role of various stakeholders in watershed management interaction, through what processes, for how much duration, of what quality; and what all factors lead to and affect the institutional interaction.

### *Conceptual Framework: Demand and Supply of Good Interaction*

Interaction can be seen from the perspective of 'demand' and 'supply'. The 'demand' for interaction can vary across institutions, over time and may depend on 'drivers' embedded in the external and internal environment. The drivers may be generic or specific. Generic drivers/influencers are macro factors (Williamson, 2000) that constitute the overall institutional environment (internal and external) and create demand or increase pressure for interaction. They may include rising population, growing demand for natural resources, changes/variations in natural resource availability, changes/variations in social settings, economic and political environment and changes/variations in government policies. Specific drivers/influencers are those micro or institutional factors (Williamson, 2000) which are institution-specific and create the demand for interaction at the grassroots (village) level. These micro factors may have a direct impact on basic institutional activities including planning, implementation and management. Specific drivers may include primary stakeholders' concerns and expectations, complexity in decision-making, need for transparency and equity, need for accountability and sustainability and performance assessment by various agencies.

The drivers discussed above would result in demands for the institution to interact and supply interaction. This

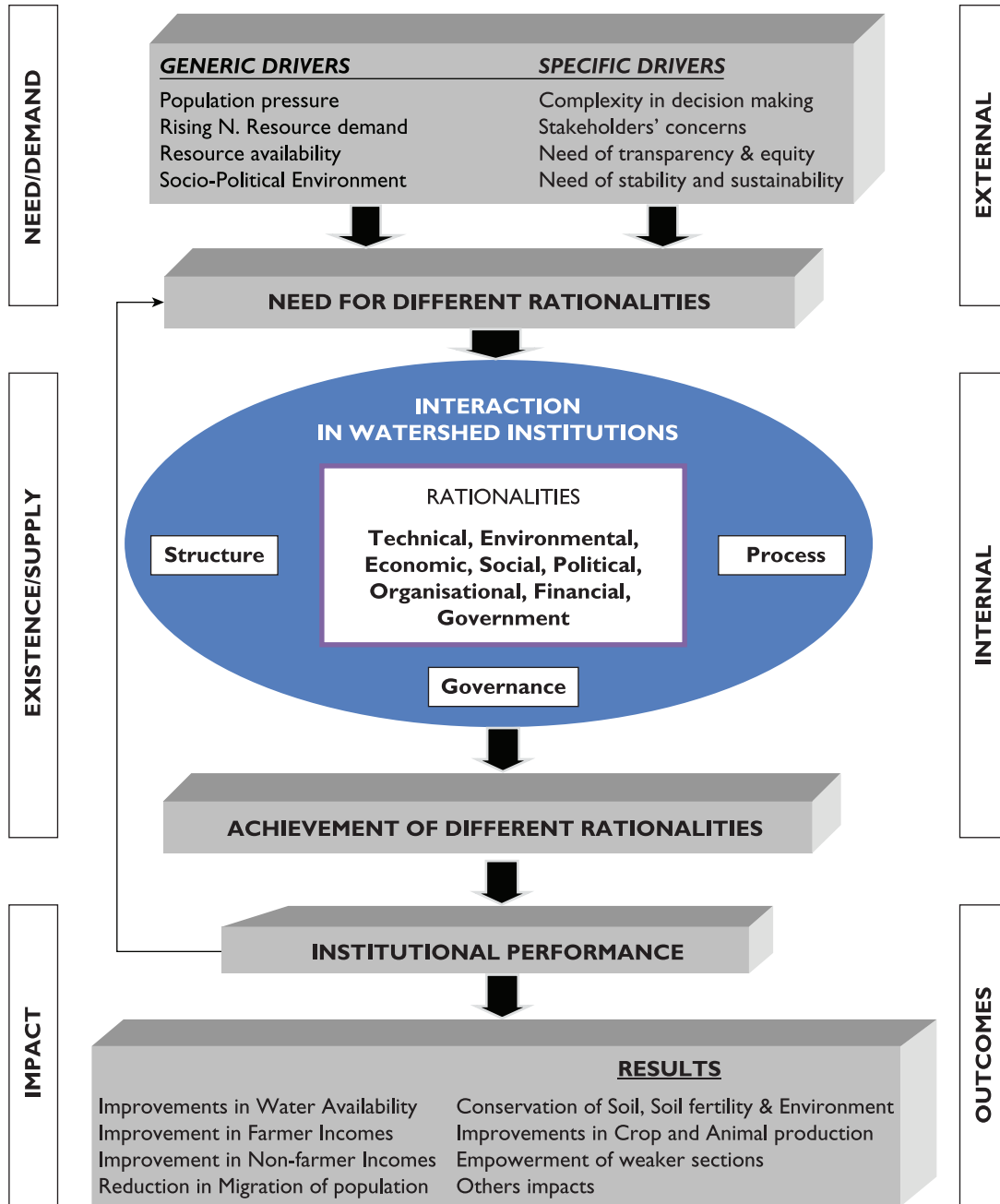
supply will come through three institutional components or features: structure, processes and governance. The structural features may include the bye-laws, membership rules, incorporation and functionality of structural components/positions, autonomy or independence from the government and structural features requiring participation such as general body meetings. Processes include the kind of processes institutions have for decision-making, whether interactive or not. Governance includes the kind of leadership and the method through which it operates, either autocratic or participatory.

The outcome would be determined by the effectiveness of demand and supply of interaction through the institution. The immediate outcome would be the state of the natural resources. This can be assessed through various measures like increased/improved water availability, soil fertility, crop yields, increased assets, farm incomes, non-farm incomes, people migration level, empowerment of weaker sections and so on. The literature reviewed and gaps identified have raised the pertinent questions that this study aims to research. The questions are now placed within a conceptual frame as depicted in Figure 2.

The external environment and its elements create a drive for the institution and place a demand for interaction. It makes the institutions seek and address the pressures of various rationalities. Based on the type of interaction and urgency of the requirement, the concerned internal components of institutions create the institutional response at various levels to the drivers, considering various rationalities. It is also important for an institution to understand which type of interaction is demanded. In the case of a demand for all three types of interaction, i.e., structural, procedural and governance, the institution needs to prioritize among them based on the type of drive and past interaction behaviour. If the institution is pro-active, i.e., if it knows the state of natural resources and understands the resulting impact, it will initiate, facilitate and enhance interaction of formal and informal components. It can thus influence the external environment accordingly. If the institution is reactive, it will need to confront the state of the natural resources and its stakeholders, and interact to bring improvement.

The proposed framework identifies the demand and supply of interaction. It also enables enquiry into the dynamic nature of the response as well as drive for interaction. It helps to bring macro and micro together and thus enables the study of the cumulative linkages while segregating the need for response. With increasing complexities in decision-making and growing awareness and empowerment of stakeholders, it is challenging for institutions to interact effectively, addressing the various rationalities. Thus, we need to observe the behaviour of an organization in order to study the institutions. Watershed





**Figure 2.** Conceptual Framework for Studying Institutional Interaction in Watershed Development

Source: Authors' own creation.

institutions are not a stand-alone entity but are embedded in the socio-economic domain of life. The environment as depicted here involves such inter-linkages and helps the study of interaction in their specific context.

### Study Approach and Methods

The study approach and methodology were developed on the basis of the conceptual framework. It was attempted

to identify specific characteristics with respect to the conceptual framework and the determinants of performance. The focus was on various aspects of institutional design and performance covering beneficiaries of NRM to understand the phenomenon and performance better. An effort was made to include a large number of beneficiaries who reaped benefits of the production enhancement and EP activities along with NRM activities. An exploratory qualitative study preceded the quantitative study and it involved field observations, conducting interviews

and preparing case studies. The study methodology included selection of the sample of institutions and related beneficiary households, followed by the development of appropriate survey instruments and the conducting of the survey.

### *Study Area and Sampling*

For the study, three districts of Andhra Pradesh, namely Anantapur, Mahbubnagar and Nalgonda, were selected. These districts have implemented various types of programmes, innovated and adapted various aspects of the WSD and influenced the national WSD policy. Thus, these districts particularly provide a good setting for studying various types of institutions and programmes. Field visits were carried out across a section of villages, and opinions were taken from experts and practitioners. Reliability of scales was also conducted. The Cronback's alpha for them was found to be above 0.83, which indicates good reliability. A pilot testing was also conducted at three villages of Mahbubnagar for improving the questionnaire design. For the study, a representative sample of 406 respondents across the three districts and four types of watershed programmes were selected using stratified random sampling.

### *Data Collection*

The units of data collection were the institutions involved in WSD. For the survey, two types of structured questionnaires were used: one for the institutions and the other for the beneficiary households/members related to the institutions. The questionnaires covered various aspects such as characteristics of the village, the WSD institution, agriculture and natural resource setting as well as various features of an institution with a focus on interaction and perceived performance of the institution. Thus, there were quantitative as well as perceptual data along with exploratory study findings which could be corroborated through triangulation. No control data was available for such a study because, in any institutional study, an institution needs to exist at the very least. In the absence of an institution, no study of this type is possible. It uses recall to the extent possible. The following sections present the findings and analysis of the research undertaken with policy implications.

### *Data Profile*

The average respondent in our study is a middle-aged or a senior farmer with a basic or minimal education, who is vulnerable because of the family he has to support with the

small piece of land and often with very limited irrigation facilities to produce from. There is generally a seasonal shortage of resources despite having multiple or, at least, one source of irrigation on the farm.

A very few of our sample respondents (3%) have studied beyond high school, while a large number of farmers are either illiterate (38.7%) or only attained primary education (27.1%). The main source of income of the sample respondents is farming, while some of them rely on agriculture labour as the other source of income. The average cultivated landholding size is 2.92 ha, while the average irrigated landholding size is 1.48 ha. The maximum cultivated land size and irrigated land size is 40 and 16 ha, respectively. The average soil quality is poor to satisfactory in the districts selected for study. Moisture availability on sample farms is average to poor and is more during the rainy season and for the farms which are near to the NRM structures. About 40 per cent of the sample farmers grow three Kharif crops as well as two Rabi crops. Due to poor water availability, summer crops are not grown in the sample villages. A large number of farmers have also started growing perennial crops. Good cohesion, an important element for the institution building, has been reported across all the districts.

The watershed committee is the main WSD institution at the grassroots level (195 out of 406 respondents) followed by PRIs (100 out of 406) and VOs (Village Organisations) (78 out of 406). Most of the projects were either implemented or were under implementation by the WDT/APD (Assistant Project Director) and project officers who belonged to the DWMA. Some programmes were implemented by Gram Panchayat and NGOs. Among the NRM activities, a large proportion belongs to the construction of check dams (41.1%) followed by percolation tanks (17.5%) and farm ponds (12.4%). Many small structures like sunken pits and rock-fill dams were also present. A lot of PE activities have taken place in the sample villages which includes sweet orange cultivation (26.3%), fertilizers (17%) and agriculture purpose loans (12.9%). Under EP activities, many loans with 12 per cent rate of interest per annum were provided to landless, female participants. A great proportion of such loans are provided for dairying, especially buffalo and cow (42.3%). Other activities undertaken in the sample villages under the purview of EP include tailoring (16.7%) and setting up of grocery shops (14.3%).

## **Results and Discussion**

### *Structure, Frequency of Meetings and People Participation in Decision-making*

Most of the sample watersheds (91.1%) have an MC, which indicates completeness in structure that is necessary

for interaction at the macro level. There is a wider use of consensus-building and election as the selection methods employed for the constitution of MC and its various constituents. The existence of the above methods again indicates completeness in structure, which, in a way, may help in generating good interaction.

At the institutional level, the meetings, either formal or informal and at various levels, play a very prominent role in taking many decisions during the planning and implementation of WSD activities. Such meetings that involve villagers are referred to as gram sabha. About 60 per cent of the respondents during the planning phase and about half of the respondents during the implementation phase reported the frequency of the gram sabhas to be poor to very poor. This hints at lesser opportunities for general public to discuss issues and raise their concerns. Similarly, for the MC, more than half of the respondents report the frequency of the meetings to be poor to very poor. For UGs, the situation is further poorer. This indicates an overall poor quantity of interaction.

People participation in the meetings of various institutions provides a good indication about interaction. For gram sabhas and UG meetings, people participation was found to be poor to very poor. But there is a lot of variation found in responses on people participation in MC meetings and it is comparatively better.

### *Institutional Interaction: Content and Quality*

Apart from the quantity of interaction, the quality of interaction or participative decision-making is also very important in delivering good results. As discussed in

conceptual framework, this can be judged by the extent to which the different critical rationalities are addressed during the interaction between various stakeholders during planning and implementation phases. Additionally, the interaction, as proposed, would depend on the structure, processes and governance features of the institution in addressing these rationalities.

### *Interaction for Addressing Technical, Environmental and Economic Rationalities*

Table 1 gives the status of interaction addressing technical, environmental and economic rationalities. Large variations were observed in various structures, processes and governance aspects of interaction which address the said rationalities. Several structural features and process features show largely a positive response, but features like inviting suggestions on environmental concerns and discussions on environmental and economic issues have poor status.

### *Interaction for Addressing Social and Political Rationalities*

The interactions related to social and political rationalities are important to ensure equitable outcomes, along with fairness and justice. There is a lot of variations on various aspects of interaction addressing social and political rationalities, as shown in Table 2. Open membership, involvement of women and weaker sections and cooperative decision-making were reported for various institutions. However, it was also reported that there is less involvement

**Table 1.** Kind of Rationalities Addressed Through Interactions (percentage)

Interactions for Achievement of	Particulars	Strongly Agree	Agree	Partially Agree	Disagree	Strongly Disagree	Mean
Technical Rationality	Technical Issues <u>were discussed</u> and taken into consideration by leaders and government.	11.1	50.2	24.9	8.9	4.9	3.5
	There was participation of <u>technical experts/engineers</u> in discussions	24.9	51	12.1	3.9	8.1	3.8
Environmental Rationality	Environment issues were <u>discussed</u> during planning and implementation of watershed development activities.	2.2	54.2	17.5	16	10.1	3.2
	<u>Suggestions</u> about environmental concerns were <u>invited</u> or considered from experts, Non-governmental organizations & locals.	9.1	30.3	41.4	14	5.2	3.2
Economic Rationality	There was <u>good discussion on Economic Issues</u> in planning & implementing watershed development activities.	0.7	77.9	16.4	2	3	3.7

**Source:** Authors' own creation.

**Table 2.** Kind of Rationalities Addressed Through Interactions (percentage)

Interactions for Achievement of	Particulars	Strongly Agree	Agree	Partially Agree	Disagree	Strongly Disagree	Mean
Social Rationality	Membership of the institution was, classes <u>open</u> to all castes and genders.	13.3	59.4	19	7.4	1	3.8
	To <u>mobilize</u> and involve all sections of the society <u>enough efforts</u> were made/considered.	35.2	37.7	13.1	6.7	7.4	3.9
	There was <u>involvement of women, small and marginal farmers</u> , and people from various religious or social groups in discussions.	20.9	46.1	21.7	9.9	1.5	3.8
	<u>Decisions</u> about watershed development were made with the <u>cooperation</u> of all castes and classes.	26.1	46.3	14.2	5.7	7.6	3.8
Political Rationality	Various <u>village leaders were involved</u> in discussions about watershed development activities in the village.	5.4	21.2	53.2	17.7	2.5	3.1
	<u>Fair chance</u> was given to various village leaders to <u>present their opinion</u> , needs and concerns.	14.5	20.9	32.8	20.7	11.1	3.1

Source: Authors' own creation.

of village leaders in institutional activities and they were considered to be less co-operative.

### *Interaction for Addressing Organizational, Financial and Government Rationalities*

Table 3 gives the status of interaction addressing organizational, financial and government rationalities. Structural features of interaction such as mandatory meetings have varied across institutions and programmes. Decision-making in such meetings was found to be participative. Open and free interaction over financial procedures, responsibilities and accounting systems increase confidence of stakeholders and acceptability of the institution. A lot of variations were observed over openness in financial matters but largely the financial discussions were not open enough. Governance features such as coordination was found lacking in interactions between the MC and the government. This may affect the institutional performance.

### *Leadership and Coordination during Various Interactions*

Apart from structure and process features, leadership and coordination are important for effective and meaningful interactions. During interactions, the presence of the leaders and their personal attributes, the acceptability of the leaders and their moderation in the interaction as well as their handling of various issues and various interest groups

are very critical for the outcome of the interaction. It was found that leadership and coordination are good in the case of interactions over technical issues but not so favourable on environmental and economic issues (Table 4).

The above findings have painted an indicative picture of the status of institutional interaction and participative decision-making at the grassroots level. The following section will try to econometrically analyze the findings and draw relationships between some critical aspects.

### *Econometric Analysis of Institutional Performance and Its Relationship to Institutional Interaction*

The performance of watershed institutions in a setting such as India can be assessed on several dimensions. But, the objective evaluation of the institutional performance is difficult as specific historical data is not available to compare. As an alternative, performance can be measured through beneficiary response on certain measurable and visible parameters such as water availability, soil fertility, crop yields, farm incomes, non-farm incomes, people migration level and empowerment of weaker sections. In this article, an aggregated parameter of institutional performance, namely 'Overall Success', is used which is the arithmetic average of the above-mentioned measurable parameters. This aggregate parameter has been used in various institutional studies in the past for examining relationship between institutional features and performance of water institutions (e.g., Crase & Gandhi, 2009).



**Table 3.** Kind of Rationalities Addressed Through Interactions (percentage)

Interactions for Achievement of	Particulars	Strongly Agree	Agree	Partially Agree	Disagree	Strongly Disagree	Mean
Organisational Rationality	<u>A good local organization</u> was set up with involvement of villagers.	23.9	60.3	14.5	1.2	0.0	4.1
	<u>Various issues</u> were taken into consideration and <u>handled well</u> .	23.7	37	25.4	11.9	2.0	3.7
	<u>Mandatory meetings</u> involving members were conducted by the institution.	23.9	60.3	14.5	1.2	0.0	4.1
	<u>Ordinary members</u> openly <u>participated</u> in the discussions and in decision making.	23.7	37	25.4	11.9	2.0	3.7
Financial Rationality	There were discussion at institution level to bring <u>transparency</u> and financial discipline.	23.1	40	31.3	3.2	2.2	3.8
	<u>Discussions</u> about management of finance were <u>open</u> and ordinary members can raise questions.	11.8	20.4	24.4	28.6	14.8	2.9
Government Rationality	The government officials interacted with Managing Committe and beneficiaries to <u>help them handle</u> various procedures and paperwork.	37.2	53	6.4	2.7	0.7	4.2
	Government officials interacted with village leaders to <u>mobilize villagers</u> and initiated the discussion for planning Watershed development programme.	39.7	44.6	13.3	2.0	0.5	4.2
	Necessary training and exposure trips for the villagers were organized by the government.	13.5	33.7	21.4	26.6	4.7	3.2

Source: Authors' own creation.

**Table 4.** Leadership and Coordination while Addressing Various Rationalities (percentage)

Rationality Type	Leadership During Interaction			Coordination During Interaction		
	Strongly Agree (Yes)	Agree (Yes)	Disagree	Strongly Agree (Yes)	Agree (Yes)	Disagree
Technical	40	40.2	19.8	25.6	50.1	24.3
Environmental	4.7	33	62.3	4.7	33	62.3
Economic	24.1	37.8	38.1	20.4	45	34.6
Social	43.6	40.6	15.7	37.3	46.2	16.5
Political	24.2	26.2	49.7	20.7	31.3	48.1
Organizational	30	42.2	27.7	23.7	47.1	29.1
Financial	23.4	56.2	16	20.5	46.5	32.9
Government	23.7	47.1	29.1	34.6	37.3	28.1

Source: Authors' own creation.

### Relationship between Overall Success and Quantity of Interaction

Quantity of interaction at the institutional level can be assessed through the role of MCs, the frequency of their meetings and people participation in such meetings. These meetings, either formal or informal and at various levels, play a very prominent role in taking many decisions during

the planning and implementation of WSD activities and, thus, are a very good measure for the quantity of interaction. For analyzing the relationship between institutional performance and quantity of interaction, the Ordered PROBIT model is used with Overall Success of the watershed development institution, measured on a scale of 1–5, as the dependent variable. This model is used because Overall Success is not continuous but a discrete variable.

**Table 5.** Parameter Estimates from Ordered PROBIT Analysis for Relationship between Quantity of Interaction and Overall Success

Parameters	Degree of Freedom (DF)	Estimate	Standard Error	Approx. t Value	Pr > t
Intercept		6.05	0.34	17.60	<.0001
General Body Effectiveness	1	0.16	0.08	1.89	0.06
Attendance in General Assembly Meetings	1	-0.06	0.08	-0.72	0.47
Frequency of Managing Committee Meetings	1	0.00	0.05	-0.05	0.96
Attendance in Managing Committee Meetings	1	0.09	0.05	1.84	0.07
Frequency of User Group Meetings	1	0.09	0.05	1.79	0.07
Chairman Effectiveness	1	-0.06	0.05	-1.20	0.23
Dummy Anantapur	1	0.21	0.17	1.22	0.22
Dummy Nalgonda	1	0.37	0.16	2.36	0.02

**Source:** Authors' own creation.

Also, this model uses a maximum likelihood estimation method and is, thus, robust even for moderate violations of normality conditions of data and regressions. Independent variables include frequency and attendance of general assembly, MC and UG meetings. Table 5 gives the parameter estimates for the same.

The results indicate that an active general body has a positive impact on institutional performance. In addition, the frequency of UG meetings bears a positive relationship with performance. In the survey, very few UGs were found to have regular meetings which justify the need for more such meetings. Attendance in MC meetings was also found to be an important determinant of institutional performance. These findings indicate that various bodies created for implanting WSD programmes at the grassroots level facilitate interaction and are very useful. Apart from the quantity of interaction achieved through the above bodies, the quality of interaction is equally important.

It becomes more important in cases where there are limitations to the quantity of interactions, which can be assessed by addressing various rationalities.

#### *Relationship between Overall Success and Quality of Interaction*

The conceptual framework suggests that effective interaction should aim at considering and addressing various rationalities that constitute fair quality of interaction and which, in turn, improves the overall institutional performance. For analyzing the relationship between institutional performance and quality of interaction, Ordered PROBIT is used with Overall Success of the WSD institution, measured on a scale of 1–5, as the dependent variable. The independent variables include interactions for addressing eight rationalities (aggregated continuous variable) and two district dummies. The summary results are provided in Table 6.

**Table 6.** Parameter Estimates from Ordered PROBIT Analysis for Relationship between Interactions Addressing Various Rationalities and Overall Success

Parameter	Degree of Freedom (DF)	Estimate	Standard Error	Approx. t Value	Pr > t
Intercept	1	-11.43	1.50	-7.63	<.0001
Technical Rationality Interaction	1	2.00	0.23	8.53	<.0001
Environmental Rationality Interaction	1	0.63	0.16	4.02	<.0001
Economic Rationality Interaction	1	-0.01	0.18	-0.07	0.94
Social Rationality Interaction	1	1.05	0.22	4.80	<.0001
Political Rationality Interaction	1	-0.57	0.24	-2.33	0.02
Organisational Rationality Interaction	1	1.18	0.23	5.23	<.0001
Financial Rationality Interaction	1	-0.11	0.20	-0.54	0.59
Government Rationality Interaction	1	0.06	0.21	0.27	0.79
Dummy Anantapur	1	-0.14	0.21	-0.66	0.51
Dummy Nalgonda	1	0.22	0.22	1.01	0.31

**Source:** Authors' own creation.

**Table 7.** Parameter Estimates from Ordered PROBIT Analysis for Relationship between Interaction Mandated by Structure, Process and Governance and Overall Success

Parameter	Degree of Freedom (DF)	Estimate	Standard Error	Approx. t Value	Pr > t
Intercept	1	-12.43	1.33	-9.36	<.0001
Interaction Mandated By Structure	1	0.31	0.32	0.97	0.33
Interaction Shown In Processes	1	1.74	0.35	4.90	<.0001
Interaction Provided Under Governance	1	2.05	0.36	5.72	<.0001
Dummy Anantapur	1	0.31	0.18	1.75	0.08
Dummy Nalgonda	1	0.53	0.18	2.92	0.00

Source: Authors' own creation.

Technical rationality interaction was found to be an important determinant for institutional performance. This finding is important as the primary task in WSD is the grounding of various NRM structures, and successful technical outcome is a prerequisite for any WSD intervention. Interactions aimed at addressing environmental rationality bore a positive relationship with institutional performance. This signifies the importance of environment which is often neglected in many development programmes. Interaction aimed towards bringing social and organizational rationalities into the fold were also found to have a positive relationship with institutional performance. This signifies that not only technical and management aspects, but social aspects that are inherent to community organizations are also important for institutional performance (see Table 6).

However, the results indicate a significant negative relationship between political rationality interaction and institutional performance. It suggests that over-emphasis on addressing political rationality by the institution through interaction with various village leaders may lead to poor outcomes. Other rationalities like economic, financial and government did not show a significant relationship with performance but they are also important.

#### *Relationship between Overall Success and Interaction through Structure, Process and Governance in Institution*

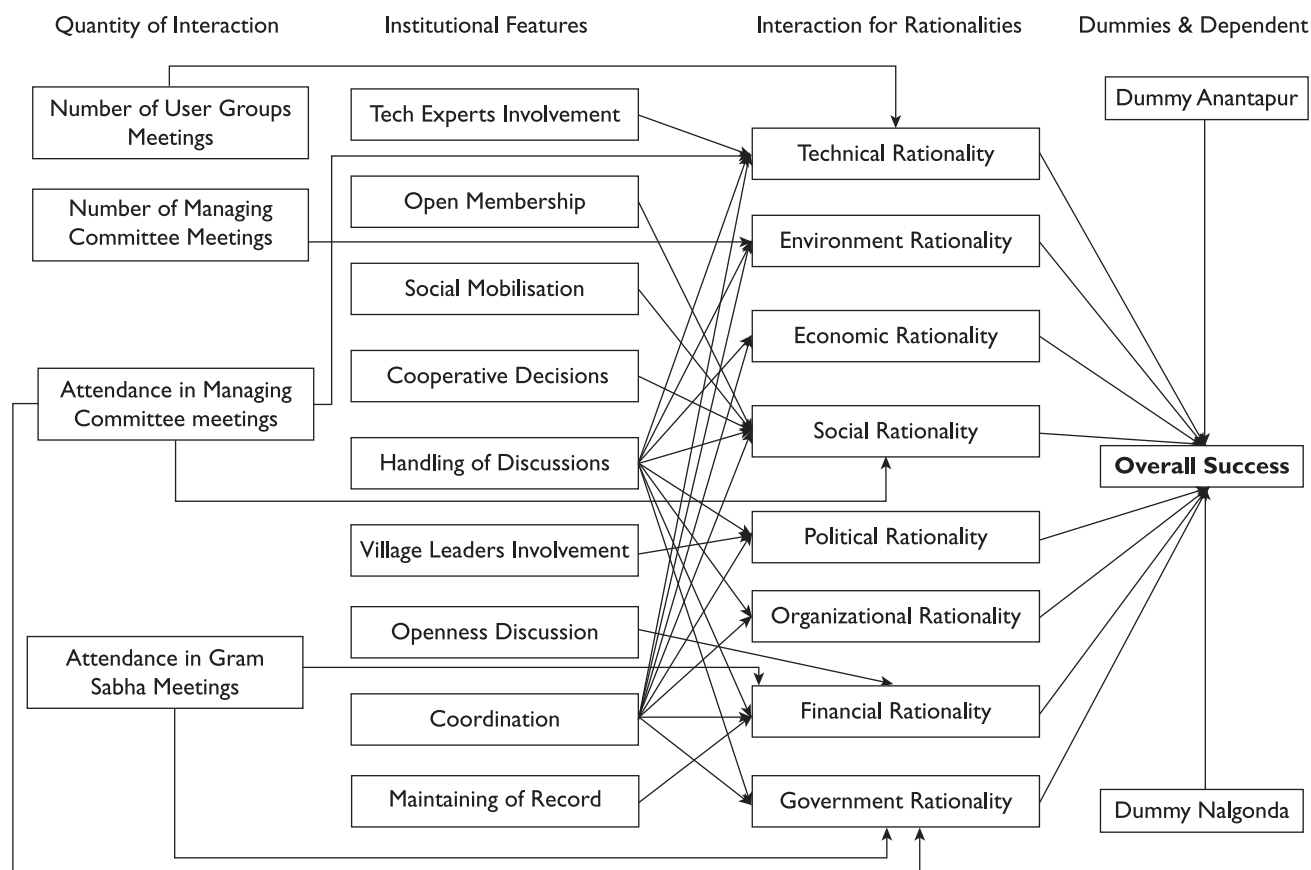
In addition to rationalities, the quality of interaction that enhances institutional performance can also be examined through structure, processes and governance components or features. An attempt has been made to relate them with institutional performance using the Ordered PROBIT model. The Overall Success is used as the dependent variable, while aggregates for structure, process and governance are taken as independent variables. Dummy variables are included for districts. Table 7 gives the parameter estimates for the relationship. It indicates that interactions

shown in processes are an important determinant of performance. It suggests that for better institutional outcome in WSD, processes should be made more interactive and participative. Also, interactions conducted under governance bear a positive relationship with Overall Success.

#### *Structural Equation Modelling*

This research suggested a framework about the quantity and quality of interaction that may be facilitated through structure, process and governance in an institution. The Ordered PROBIT model is fitted with a maximum likelihood estimate (MLE), and it estimates the regression equation using a limited dependent variable. Estimating one equation at a time has the advantage of computational simplicity, but, as these methods neglect information contained in other equations, they have limits to estimation accuracy. To address this limitation, the study attempts to use a *structural equations model* to estimate the equations jointly. In the model, both the quantity and the quality of interaction variables are used to estimate the individual relationships of variables. The performance of watershed institutions is determined through both quantity and quality of interactions. It is expected that the quantity of interaction determine the quality of interactions which, in turn, helps in determining the Overall Success of the institutions. Based on the findings from Ordered PROBIT regressions, various variables of quantity and quality of interactions were included in the model, as given in Figure 3.

Almost all the variables used in the model turned out to be significant and this shows the usefulness of the model in representing the relationship between institutional interaction and performance of institutions. This also suggests that the quality of interaction is very important for institutional performance and the quantity of interactions work in



**Figure 3.** The Structural Equation model for Institutional Interaction and Performance of Watershed Management Institutions

**Source:** Authors' own creation. The model was estimated using maximum likelihood criterion. The estimation results are given in Table 8.

**Table 8.** Structural Equation Model: Estimation Results (N = 4 06)

Equation No.	Dependent Variables	Independent Variables	Estimated Coefficient	T-Value	Significance
1	Interaction for Technical Rationality	Constant	-0.04	-0.14	0.89
		Involvement of Technical Experts	0.35	18.15	0.00***
		Attendance In MC Meetings	0.02	1.71	0.09*
		Number of User Group Meetings	0.02	1.40	0.16
		Handling of Affairs	0.39	8.70	0.00***
		Coordination	0.24	6.47	0.00***
2	Interaction for Environmental Rationality	Constant	-0.82	-2.00	0.05**
		Number of Managing Committee Meetings	0.03	1.99	0.05**
		Handling of Affairs	0.60	7.78	0.00***
3	Interaction for Economic Rationality	Constant	-0.22	-0.65	0.51
		Handling of Affairs	0.46	7.19	0.00***
		Coordination	0.54	10.03	0.00***
4	Interaction for Social Rationality	Constant	0.07	0.36	0.72
		Social Mobilisation Efforts	0.22	21.85	0.00***
		Open Membership	0.16	10.88	0.00***
		Cooperative Decisions	0.17	9.79	0.00***
		Coordination	0.32	10.79	0.00***
		Handling of Affairs	0.12	3.40	0.00***
		Attendance in Managing Committee Meetings	0.01	0.79	0.43

(Table 8 continued)



(Table 8 continued)

Equation No.	Dependent Variables	Independent Variables	Estimated Coefficient	T-Value	Significance
5	Interaction for Political Rationality	Constant	0.66	2.91	0.00***
		Involvement of Village Leaders	0.32	16.69	0.00***
		Handling of Affairs	0.16	3.80	0.00***
		Coordination	0.36	10.26	0.00***
6	Interaction for Organizational Rationality	Constant	0.48	1.79	0.07*
		Number of Managing Committee Meetings	0.01	0.94	0.35
		Attendance in Managing Committee Meetings	0.02	1.39	0.16
		Handling of Affairs	0.26	5.13	0.00***
7	Interaction for Financial Rationality	Constant	0.67	2.56	0.01***
		Attendance in Gram Sabha Meetings	0.04	1.93	0.05**
		Record Maintenance	0.19	9.61	0.00***
		Openness in Discussions	0.19	15.12	0.00***
8	Interaction for Government Rationality	Constant	0.30	6.61	0.00***
		Handling of Affairs	0.17	4.39	0.00***
		Coordination	0.17	4.39	0.00***
		Attendance in Managing Committee Meetings	2.10	7.21	0.00***
9	Overall success	Attendance in Gram Sabha Meetings	0.03	2.29	0.02**
		Attendance in Gram Sabha Meetings	0.06	2.44	0.02**
		Handling of Affairs	0.21	3.93	0.00***
		Coordination	0.26	5.59	0.00***
9	Overall success	Constant	0.13	0.37	0.71
		Interaction for Technical Rationality	0.48	10.99	0.00***
		Interaction for Environment Rationality	0.15	4.56	0.00***
		Interaction for Economic Rationality	-0.01	-0.24	0.81
		Interaction for Social Rationality	0.23	4.98	0.00***
		Interaction for Political Rationality	-0.13	-2.65	0.01***
		Interaction for Organisational Rationality	0.25	5.29	0.00***
		Interaction for Financial Rationality	-0.02	-0.56	0.58
		Interaction for Govt. Rationality	0.03	0.55	0.58
		Dummy Nalgonda	0.05	1.30	0.19
Dummy Anantapur	0.02	0.42	0.68		

Source: Authors' own creation.

tandem with the quality of interactions. The *t* values of Structural Equation model are larger than the Ordered PROBIT model for relationships between interactions for various rationalities and institutional performance.

This justifies the use of Structural Equation model. The identified interaction features, critical for institutional performance and derived from structural equation modeling analysis, are shown in Table 9.

**Table 9.** Identified Interaction Features Critical for Institutional Performance

Structure	Process	Governance	Overall Success
i. Number of Managing Committee Meetings	i. Involvement of Technical Experts	i. Handling of Affairs	i. Interaction for Technical Rationality
ii. Number of User Group Meetings	ii. Social Mobilisation Efforts	ii. Coordination	ii. Interaction for Environmental Rationality
iii. Attendance in Managing Committee Meetings	iii. Cooperative Decisions		iii. Interaction for Social Rationality
iv. Attendance in Gram Sabha Meetings	iv. Involvement of Village Leaders		iv. Interaction for Political Rationality
v. Open Membership	v. Record Maintenance		v. Interaction for Organisational Rationality
	vi. Openness in discussions		

Source: Authors' own creation.

## Conclusions and Implications

The article focuses on institutional interaction and provides an in-depth study of the nature of interactions between formal and informal institutional structures in NRM and their relationship with the performance of institutions. The study found that quantity of interaction alone is not sufficient in generating effective performance in NRM. The quality of institutional interactions based on various rationalities is equally important. Interaction in institutions is found to be multi-dimensional and multi-level. The study identifies various quantitative and qualitative features of interaction and tries to relate them with institutional performance. The econometric results indicate that an actively interacting general body, the frequency of UG meetings and attendance in MC meetings bear a positive relationship with performance. Interactions for addressing technical, environmental, social and organizational rationalities are positively and significantly related to institutional performance. But, interactions for addressing political rationality showed negative relationship with performance. Also, open membership in institutions, mandatory meetings of institutional constituents, involvement of technical experts as well as weaker sections, social mobilization, co-operative decision-making, good leadership and effective coordination were found to be significant.

The present study aims at helping policy-makers, researchers and development practitioners in crafting sustainable and better-performing institutions. It will also help policy-makers in designing guidelines, legislations, acts and policies related to NRM. The improvement can be brought about through better institutional design, well thought-out programme guidelines incorporating various rationalities, setting up of complete structures, capacity-building at the grassroots level, incorporating more participative decision-making and setting up of open but effective governance. The study recommends some specific suggestions on the following sub-topics to improve the design and functioning of WSD programmes.

**Programme Guidelines:** The programme guidelines for WSD can be revised and improved by the addition of various rationalities and factors which ensure their achievement. Technical, environmental, social and organizational rationalities must be given more importance over political rationality. Efforts must be made to devise new mechanisms for involvement of village leaders in the institution. These mechanisms must be such that village leaders can provide constructive support without interfering in operations and management of the institutions.

**Completeness of Structure and Participation:** The participation of ordinary members in decision-making and other

functions of institutions are critical to the sustainable performance of the institutions. However, it needs to be facilitated through the creation of structures like the general body and conducting regular meetings where the members can participate. Participation also needs to be promoted through governance. Efforts should be made to increase participation and also enhancing the quality of participation.

**Capacity-building for Promoting Leadership and Developing Effective Coordination Mechanisms:** Training of the members and the leaders of institutions can enhance the quality of the participation and interaction in the processes. It can also improve decision-making and enhance governance of the institutions. Similarly, efforts should be made to develop, among institutional actors, the willingness to lead, educate and initiate for generating better institutional performance.

## Note

1. A watershed, in principle, is considered to be a geo-hydrological unit or an area that drains to a common point and it includes interventions ranging from simple check dams to large percolation and irrigation tanks, from vegetative barriers to contour bunds and changes in agricultural practice, for example, in-situ soil and moisture conservation, agro-forestry, pasture development, horticulture and silvi-pasture (ICAR, 2009).

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