

UNRAVELLING INSTITUTIONAL COMPLEXITY: Actors and Rules Negotiating Water in Indian Himalayas

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ABSTRACT

Institutions integrate in a complex manner across levels in shaping and reshaping water resource management. Unraveling the complex interaction among institutions requires identifying the role of actors and rules in managing water resource. New institutionalisms across social sciences are critically evaluated for a framework to analyse interactions and the relationship between land, water and societies. The paper aims to analyse the interactive nature of actors and rules (i) influencing water policy and administration; (ii) building capability of actors to manage water crisis; and (iii) building capability of agents to negotiate towards seeking alternatives for a desired change. These objectives are examined to a core water-related issue applicable in each of the four socio-economically and hydrologically distinct hamlets selected from two watersheds in Himachal Pradesh, India. Different research investigations (primary, lead, follow-up and check) were carried by combining different research methods.

The study adopts a systematic approach to identify actors and rules integrating at various arenas to manage water. These arenas representing adaptive cycle of resource management are obscure, not clearly represented, but are hierarchically interlinked forming a 'Panarchy'. The study evaluates institutions in these arenas in four phases of adaptive cycle: policy formulation, implementation, attempts to overcome water crisis; and ability of agents to seek institutional alternatives. This helps in identifying rules that can enable actors to consciously design and self-organise towards integrating water management. The study reveals diverse actors in shaping water policies, but the absence of scope and information rules constrains these actors in taking informed decisions for a sustainable future. Implementation of these policies is controlled by statutory public actors who provide boundary rules for other actors in the watershed well endowed with infrastructure facilities, while it is socially embedded actors in remote watershed. However, it is statutory public actors who provide authority rules thereby knowingly or unknowingly facilitating inequitable distribution of water. Socially embedded actors provide all the rules required for actors to build their capability to manage water. Each of these actions is facilitated by agents who are located at various levels in space and time to integrate various actors and rules to institute change. In brief the study highlights the importance of infrastructure development for poverty alleviation, information sharing and importance of sectoral agencies to remain interactive. The findings question some of the contemporary understanding of decentralisation, resilience, collective action and participatory management providing new theoretical grounds for analysing water resource institutions.

Relevance to Conference Sub-themes: Contemporary analytical tools and theoretical questions

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1. INTRODUCTION

“Understanding institutions is serious endeavour. It is an endeavour that colleagues and I at the Workshop in Political Theory and Policy Analysis have been struggling with for at least three decades”.

(Ostrom, 2005:2)

The disappointment among research community after decades of research only illustrates fundamental problem in conceptualizing institutions and their interaction process among new institutionalism across social science disciplines (Campbell, 2004; Ostrom, 2005; North, 2005). This requires a “fundamental recasting of the way we think” about institutions and the underlying process of change (North, 2005:vii). This lies not in emphasising the importance of institutions or understanding its diversity, rather going beyond in explaining how institutions actually affect management options and outcomes (Blomquist et al., 2004) in a complex environment. The study unravels the complex nature of institutions interacting to address some of the pressing issues facing water resource management. In the process it peers through ‘black box’ of institutional processes and effects, to provide explanations of how institutions matters (Blomquist et al., 2004:927).

Institutions are rules that are patterned behaviour of a social group evolved over a period of time (history) to specify the actions required, permitted or prohibited and in a general sense govern human activity (Burns, 1987; Mitchell, 1975; Ostrom, 1998). It is these rules over which stakeholders give meaning to establish or protect their existing power relations to manage water resources. But not all stakeholders take an active role, depending on knowledge and capability they are ‘actors’⁶ (Long, 1992) and as ‘agents’ (Giddens, 1984) in water resource management. It is the interactive nature of actors (including agents) and rules that constitute integrated water resource management. The paper aims to analyse the interactive nature of actors and rules (i) influencing water policy and administration; (ii) building capability of actors for diverse actions to manage water crisis; and (iii) building capability of agents to negotiate towards seeking alternatives for a desired change. These objectives are examined to a core water-related issue applicable in each of the four socio-economically and hydrologically distinct hamlets selected from two watersheds in Himachal Pradesh, India.

The paper unravels the complex integration of water resource institutions in eight sections. The following section presents a diagnostic view of integration. The third section critically evaluates new institutionalism across social sciences for a framework to analyse institutional integration. The fourth section applies the framework empirically using diverse research investigation. With a background on the study area in section five, the sixth section unravels integration in arenas located as panarchy. The seventh draws implication for integrated management water resources. The final section concludes by drawing theoretical and methodological implication to examine institutional complexity.

⁶ Actor Network theory recognises contextual factors as actors (Law, 1992).

2. INTEGRATED WATER RESOURCE MANAGEMENT: A Diagnosis

Integrated water resource management (IWRM) has undergone significant transformation in the past few decades from a narrow sectoral integration (Mitchell, 1990), to community-based conception that recognises the interactive nature of actors and rules (Morrison, 2004). Many international⁷ and regional bodies⁸ embrace the need to realign the functioning of sectoral organisations with hydrological boundaries in order to promote IWRM. It represents a major policy initiative for many nations to protect environmental resources (such as US, UK, Australia) and to alleviate poverty (India, South Africa, Tanzania, Zimbabwe). There has been a drastic increase in financial allocation among international⁹ and national agencies for community-based watershed management programme known across the world in different connotation¹⁰. Though the ideology is attractive, there is frustration in its application (ADB, 2003; Bellamy & Johnson, 2000; Biswas, 2004; Margerum & Borne, 1995; Moench et al., 2003; Mitchell, 2004; UN-WWDR, 2003). It is important to diagnose different dimensions of integration to offer insights for analysing institutional integration. Morrison (2004) and McDonald et al., (2003) delineates six dimensions of integration: strategic, structural, procedural, functional, knowledge and facilitative integration building on Ostrom (1990; 2001), Margerum and Born (2000) and Healey (1997) that can serve as a diagnosis.

Diagnosis of integration reveals Strategic integration¹¹ involves contested, multiple and overlaid policies in shaping water resources. It calls for seeking acceptable outcomes, through negotiation, debate or through ‘aggressive participation’, to reduce conflicts and expand complementarity (Bellamy & Johnson, 2000; Jennings & Moore, 2000; Pressman & Wildavsky, 1984; Svendsen et al., 2005). Structural Integration questions contemporary assumptions (Bandaragoda, 2005; Kolavalli and Kerr, 2002:227; Wester et al., 2005) that watershed is an ideal management unit and actors are homogenous entity (Cleaver, 1999:603; Lane et al., 2004; Mehta, 2002; Moench et al., 2003; Mosse, 1997). To understand the relationship between actors and contextual factors, it is important to analyse multi-scalar institutional arrangement that characterises linkages and networks in resource management (Haughton and Counsell, 2004). Participatory approaches have emerged as an important tool for procedural integration. Participation is a ‘systemic process’ rather than ‘systemic problem’ (as often referred by conventional proponents ref. Cooke and Kothari, 2001), where each actor dominate wanting to achieve their social goal. This requires considering rungs in Arnsteins’ (1969) participatory ladder in tandem by focusing on the capability of actors, their origin and functioning. Integration of knowledge

⁷ International Water management Institute (IWMI), Food and Agricultural Organisation; and World Bank are few to name.

⁸ For instance, Water Development Framework of European Union.

⁹ World Bank has increased their share to support community-based watershed management programme, especially in Latin America and Africa (World Bank, 2004). India annually spends about US\$500 for CBWM, in addition to large sum allocated by international donors.

¹⁰ Community-based watershed management is known as integrated catchment management in Australia (Mitchell, 1991; Bellamy et al, 1999), integrated watershed management in India and some parts of Africa (Farrington et al., 1999) integrated environmental management (Margerum & Born, 1995); community-based watershed management in Thailand (Wittayapak & Dearden, 1998); village lands management approach in dry land Africa (Turner, 1998), and collaborative watershed groups in United States (US) (Moore and Koontz, 2003).

¹¹ Refer Mitsi and Nicol, 2003:12 for contestation in policies in Zimbabwe; Schulze et al, 2004 in South Africa; Lelo, et al, 2005 in Kenya; Molle, 2005 in Mekong basin; Baviskar, 2004; Chhotray, 2004; Mollinga, 2001; and Robbin, 2000 in India.

emerges not from the existence of knowledge with actor, rather is generated through constant interaction among actors as part of their daily struggle with the environment, and the prevailing rules. Facilitative (skills and finance) integration calls for examining diverse institutional arrangements that provide actor commands over resource and opportunities. The functional attributes (such as equity, responsibility, coordination and accountability) that govern integration are highly diverse in social realm of resource management; effective resource management depends on the ability to complement each of these diverse functional elements to manage water resources. This diagnosis reveals several mismatches between conventional approach of IWRM and social reality of integration of water resource management institutions.

3. NEW INSTITUTIONALISM IN SOCIAL SCIENCES

The interactive nature of actors and rules have been recognized by early institutionalist across major social science disciplines, but was dismissed as “they had nothing to pass on except a mass of descriptive material waiting for a theory or a fire” (Coase, 1983:230). A major revival of early institutionalism is emerging in recent decades across social science disciplines –economics (North, 1990; Ostrom, 1990), sociology (Powell & DiMaggio, 1991), political science and in the discipline of environment and resource management (Dorcey, 1986; Mitchell, 1975; 1990). Broadly three categories of institutional analysis cutting across disciplinary boundaries have been recognised: rational choice institutionalism, historical institutionalism and organisational institutionalism (Campbell and Pederson, 2001; Hall & Taylor, 1997; Campbell, 2004). Cross fertilisation among these three forms of institutionalism though had provided clarity on the actors and rules and in identifying the types of institutional change, they fall short in explaining the process of integration and capturing the dynamic nature of institutional analysis. The prospects for better comprehension of institutions remain in incorporating natural resource institutionalism that provides significant insights in understanding the process in a dynamic scenario (Gunderson and Holling, 1995; 2001).

Rational choice institutionalism consists of two distinct schools - the transaction school (North, 1990; Williamson, 1985) and collective action school (Ostrom et al., 1994) having its roots on methodological individualism. Organisational institutionalism primarily emerged from sociology questioning rational choice institutionalism. They argue that organisations change in response to norms and values imposed on them by powerful constituents in their environment (normative), and at the same time depending on their perception of appropriate practice in the world (cognitive) (Scott, 1985; Campbell, 2004:19). Historical institutionalisms evolved by political scientists from the classical political economy were primarily concerned with integration of institutions affecting political and economic decision-making at broader societal and state structures. Being concerned with historical and comparative perspectives, they were able to highlight the role of institutions in facilitating and constraining political actors.

Natural resource institutions emerged from interdisciplinary sciences on resource and environment management discipline, though dominated by geographers and ecologist. These institutionalists primarily focus on the relationship between natural resources, its management and its linkages with institutions (Mitchell, 1975; 1990; Holling, 2001). In contrast to its counterpart they explain institutional integration in terms of

dynamism and prescription, and embrace uncertainty and unpredictability. Being rooted in empirical reality and communicated with metaphor and example, it integrates the essence of ecology, economic and social science theory with a goal of being (Holling, 2001:391). In contrast to other institutionalist who is concerned with predicting and identifying institutional change, the natural institutionalists embrace ‘sustainable future’.

Each of these analysts constructs relationship between actors and rules to explain the process of interaction towards understanding institutions. Though they have a common goal and seem to have developed independently (Hall & Taylor, 1997), there are marked similarities, differences and complementarities in their approach (Table. 1). The following section examines these to evolve a framework to analysis institutional integration in a complex environment by clarifying rules, the actors and the process of interaction.

TABLE. 1 COMPARISION OF INSTITUTIONAL ANALYST

ELEMENTS OF INSTITUTIONAL INTEGRATION	RATIONAL CHOICE INSTITUTIONALISM		ORGANISATIONAL INSTITUTIONALISM	HISTORICAL INSTITUTIONALISM	NATURAL RESOURCE INSTITUTIONALISM
	Transaction Cost Approach	Collective Action Choice Approach			
Theoretical Roots	Neo-classical economics	Neo-Classical Economics/ Political Science	Phenomenology/ Ethno-methodology/ cognitive psychology	Political Economy	Resource and Environmental Management
Definition of Institution	Formal and informal- but give primacy to formal rules.	Formal and informal- but give primacy to formal rules.	Formal rules and cultural frameworks, cognition and routinised process	Formal and Informal Rules	Law, transactions, social psychology stimuli, customs and norms.
Rationality of actors	Instrumental	Collective (Rational egoist)	Institutions motivates rationality	Rationality is socially constructed	Procedural
Process of Integration	Relationship among ‘mental construct’.	Emphasis interaction in action arena and provide a broad framework.	Networks as forums	Strategic Integration between actors and rules	Integration in hierarchical based arenas - ‘Panarchy’
Forms of Institutional Analysis	Ex-ante	Institutions as constraining (ex-post)	Institutions as facilitating action (ex-ante)	Institutions as constraining (ex-post)	Integration in the form of adaptive cycle.
Favoured Patterns of Institutional Change	Punctuated Equilibrium/ evolutionary	Punctuated Equilibrium/ evolutionary	Punctuated Equilibrium/ evolution/ punctuated evolution	Punctuated Equilibrium/ evolution/ punctuated evolution	Sustainable Future

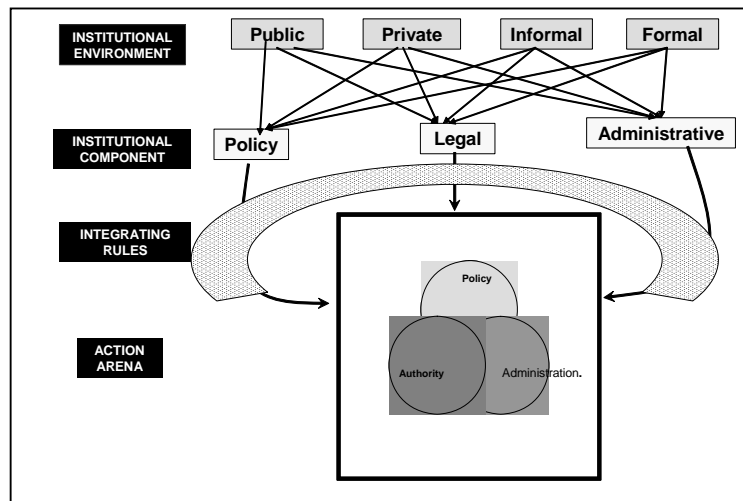
3.1 Rules

Institutions are recognised as rules. However, each institutionalist differ what rules represent. Rational choice institutionalist and historical institutionalist define institutions as formal and informal rules and compliance procedures, where no rules are going to be optimally efficient. Organisational institutionalist do recognise institutions as formal and informal rules, but drawing on phenomenology, ethno-methodology and cognitive psychology they provide in-depth understanding of the informal rules as cultural frameworks, symbolism and taken for granted cognitive structures. While NRI recognise rules as all kinds of human relationships (Mitchell, 1975). What is interesting is most of the new institutionalist (RCI, HI, and OI)

distinguishing two types of rules - formal and informal¹². This distinction fails to reflect the social reality and is misleading too¹³ (Clever, 1999).

In analysing the interactive nature, it is important to distinguish rules based on their origin. Rules have their origin from Statutory Acts and are socially embedded. Statutory backed rules are of two types: one concerned with the welfare of the public, and the other concerned with protecting rights of individuals or groups of individuals. While socially embedded rules may be formal and informal. These four types of rules interact within an *institutional environment* to integrate water resource management. Each of these rules consists of three components (policy, legal and administrative), which operates in a 'ebb and flow' regime' (Pressman and Wildvasky, 1984; Svendson, et al., 2005) in contrast to linear and hierarchical progression as claimed by RCI (Ostrom, 1990; Saleth and Dinar, 2004). *Institutional components* have myriad of *integrating rules* to negotiate water management. These *integrating rules* provides position, boundary, aggregation, information, authority, pay-off, and scope rules to integrate resource management decisions (Ostrom, 1998). Heuristically applied these seven integrating rules operate at the lowest level to make related to policy, administration and implementation within an arena (Dorcey, 1986). These complex rules are hierarchically arranged as *institutional environment*, *institutional components* and *integrating rules* in an arena (Fig. 1) by providing structures within which actor (individual and groups of individuals) of a society cooperate and compete to manage water.

FIG. 1 INSTITUTIONAL ARRANGEMENTS IN ACTION



3.2 Actors

Rationality of actors is thinly defined by rational choice institutionalist (Friedman, 1996:2). Historical and organisational institutionalism provides one sided version on

¹² Formal rules are considered as those backed by law, robust, openly shared and clearly structured arrangements and enforced. In contrast, informal rules were norms upheld by individuals through mutual agreements, invoked in day-to-day living and enforced by socially embedded actors.

¹³ For instance, caste or an even family that is considered as informal by conventional institutionalist, have rules that are robust and openly shared formal rule as statutory rules.

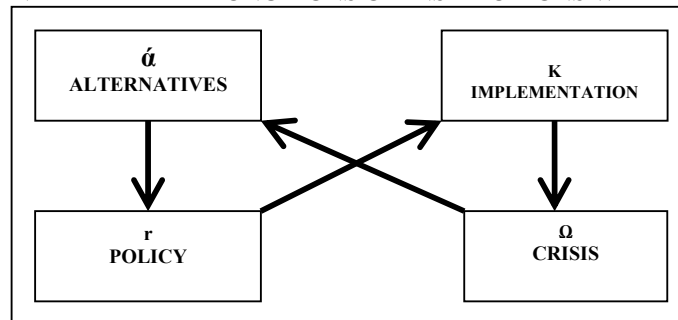
the rationality of actors': theory of constraint and theory of action, respectively. Campbell (1997:40) argues comprehensive understanding of actor's rationality requires both these that accounts for "how the interests, preferences, identities and ideas that motivate actors are socially constructed and affect policy making and institutional building". But Campbell (1997) fails to inform institutional analyst on how to examine. Though he recognises the importance of identifying their origin, ignores them as it is "impossible to pinpoint their origins" (Campbell, 1997:42). Leach et al. (1997) provide a better illustration to pinpoint the origin through rules. It is these rules that provide endowment for actors (constrains) and they help in transforming these into entitlements (action) to build capability of actors. Depending on their differential capability, actors emerge as agents (Giddens, 1984; Leach, et al., 1997; Long, 1992).

3.3 Action Arena as a Dependent and Independent Variables

One of the major gaps facing new institutionalism is their inability to explain integration of institutions. The institutional analysis development framework (IAD) of collective action school provides a broad framework to capture various factors influencing the action arena¹⁴, but is inadequate in its rigour and is dynamics. This requires amendments to make the framework dynamic by recognising arena as an 'adaptive cycle' (Holling, 2001) where diverse forms of integration takes place (McDonald et al., 2003). There is no single arena, but they are multiple existing hierarchically in social sphere forming a 'panarchy' (Dorcey, 1986; Holling, et al., 2002) representing a complex adaptive system (Railsback, 2001).

Each arena in a panarchy has four phases of institutional functions (Gunderson et al., 1995:497-499): policy making, implementation, crisis and alternatives (Fig.2). Most institutions establish their own policies (r) or ideologies, and then spend most of their time and energy becoming more efficient in implementing (K) them. The resulting myopic inevitably leads to crisis (Ω) and then search for alternatives (\acute{a}). The four phase model provides useful insights into the dynamics of resource management institutions interacting in an arena.

FIG. 2. INTERRELATED FUNCTIONS OF INSTITUTIONS WITHIN ARENAS



Analysing institutions setting policies and its implementation offers opportunity to identify growth and stability. This ex-post analysis represents a longer period of slow

¹⁴ Researchers from other disciplines have attempted to examine the interactions in concepts similar to action arena, such as 'forums' (Meinzen-Dick and Bruns, 2000; Moench, et al., 2003), 'platforms' (Chamala, 1995; Steins and Edwards, 1999; Moench, 2003) or 'nodes' (Healey, 1999). Action arena (hereafter referred to as arena) is more appropriate to describe actions rather than platforms, forums or nodes.

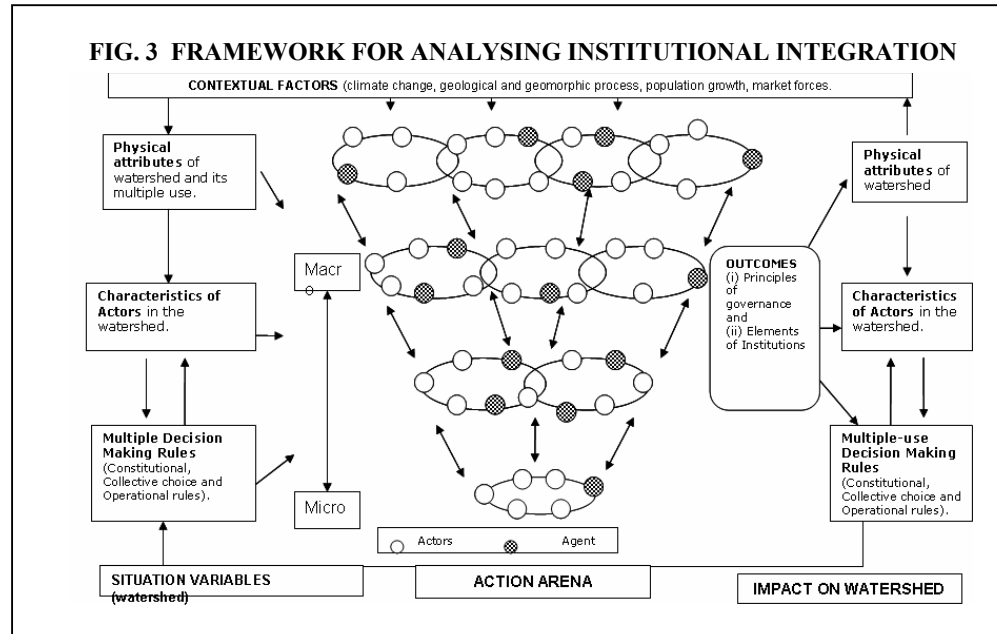
accumulation and transformation. The gaps in the implementation of these policies leads to crisis (Ω) challenging the inadequacies of the existing institutions, where actors evolve various actions to manage the crisis and thereby search for alternatives ($\acute{\alpha}$) for managing resources. Analysing the phase from crisis to alternatives (ex-ante) provides innovation for overcoming the resource crisis. Conventional assumptions often focuses on ex-post or ex-ante as separate objectives institutional analysis (North, 1990; Ostrom, 1990; Saleth and Dinar, 2004; Campbell, 2004), these two loops act sequentially and are important in examining the complex interaction among water resource institutions.

Arenas are both formal and informal, are location-specific or generic, and evolved or created (Dorcey, 1986). Being obscure, these arenas are not always clearly represented in space and time for analytical purpose, rather depending on a 'strategic context' they are accessed, activated or created. Strategic context is triggered by a problem, where a wide range of actors attempt to overcome the problem by having a shared vision and understanding to make well-informed strategic choices that shapes their future, and more importantly, ability of them to administer and enforce these decisions (Alexander, 2001) towards a institutional change. Here power is concentrated on the rules codified by information and images of representation around which actors organise and decide their behaviour (Castells, 1997:359, cited in Booher and Innes, 2002:224).

3.4 Patterns of Institutional Change

New institutionalist, except NRI has been primarily concerned with a best way to describe institutional change (North, 1990; Ostrom, 1990; Campbell, 1997; 2004). In contrast, NRIs are pragmatic; they are concerned with the process causing those changes (Mitchell, 1975:248; Gunderson & Holling, 2001). In complex environmental systems characterising panarchy there is interplay between change and persistence. Broadly three such phases can be identified; incremental, lurching and transformational (Holling et al, 2002). In recent years, there is increasing call for resilient approach (Holling, 2001; Harrison, 2003). However, not all components of water resource institutions can self organise to remain resilient, some require conscious designing (Carpenter, et al., 2001). In this context it is important to identify integrative rules that can enable actors to consciously design and self-organise (Anderies, et al, 2004; Carpenter, et al., 2001) themselves towards integrating water management.

The framework for analysing institutional integration, the panarchy (Fig. 3) is not a stand alone entity; they are depended on situational variables that influence decision within arena. These decisions act independently to influence the situational variables. The *situational variables* consist of attributes of the physical resources, attributes of the community and prevailing rules. Contextual variables influence the arenas at any point of time, thus leading to punctuation in the institutional change that continuously interact in shaping resource management decisions. The framework can be evaluated from the attributes (responsibility, equity, accountability, coordination and participation) governing the negotiation process among the actors and agents (UN-WWAP, 2003).

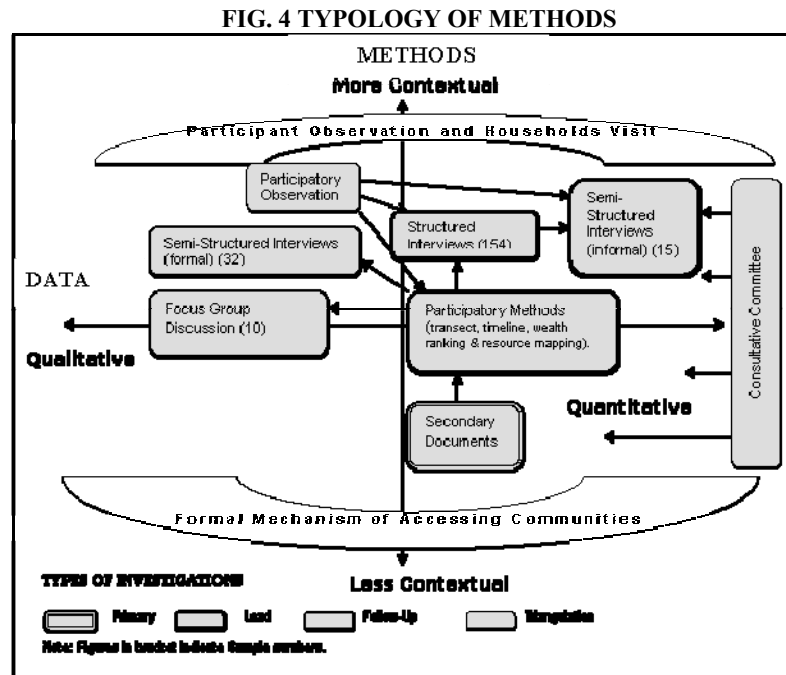


4. METHODOLOGY

The study uses a systems approach that combines comprehensive and integrative perspectives to unravel institutional complexity (Mitchell, 2005:1338-1339). The first is applied at a strategic and normative level by drawing on both scientific and technical understanding and local knowledge on water policy, its implementation and crisis management. The latter is applied at tactical or operational level using integrative perspective to remain selective and focussed in examining institutional complexity. Comprehensive and multi-methods are used for this systems approach that mixes both positivist and interpretive techniques to understand the role of actors and rules. Different research methods are used to examine the research objective of the study (Young, 1999) and to obtain contextual information and different data (quantitative and qualitative) types. However, its application depends on the types of investigation that researcher adopts to capture the complexity. Following Hentschel (1999) four different types of investigation were applied to unravel institutional complexity (see Fig. 4): *Primary investigation* to collect non-controversial information; *Lead investigation* to examine the core issues of integration; *Follow-up investigation* to supplement lead investigations; and *Check investigation* to triangulate other types of investigation. These investigations were applied through participant observation and households visit, through formal mechanism of accessing communities and through consultative committees that provided a good foundation for operationalising research design. The information recorded in note pads, in questionnaire, electronic form and through photographs are transcribed for analysis.

Conventional institutional analyst (Agrawal and Chhatre, 2006; Agrawal and Gupta, 2005; Gibson et al., 2005; Lam, 2001; Svendsen et al., 2005; Poteete & Ostrom, 2003) tend to rely on theoretically driven variables and analyse causal relationship among them leading to 'logically fallacy of institutional analysis (Ellison, 1996). The analysis here attempts to overcome this 'fallacy' by considering variables (influencing water resource institutions) as reflective i.e., at once they are dependent, but in other

they are independent. Further, in the period of indeterminacy the values cannot be definitive, rather based on probability that an explicit scientific hypothesis is true given a set of data (Ellison, 1996:1039). Bayesian Belief Network (BBN) helps to overcome these by using probability calculus. Here the interrelationship among variables is built and validated through statistical testing, qualitative information and logical reasoning of the researcher to construct the network (Cains, 1999).



5. HIMACHAL PRADESH: The Valley in Motion

The complexity of water resource institutions is unravelled in India with comparative study of two watersheds in Sirmaur district of Himachal Pradesh. The study is appropriate in India, which represents one of the successful democracies in the world, where power is dispersed among various actors and the negotiation among competing actors can be best understood on the dispersal of power across levels (Kohli, 2001). In this power decentered nation, the state represents an intricate mosaic of hills, valleys, fast flowing and turbulent rivers and soaring high mountains covered with snow with significant tensions among competing discourses of capital-intensive forms of economic development, environmental conservation and participatory forms of eco-development (Coward, 2003; Baker and Saberwal, 2003). The district is an ideal candidate to examine the actions of actors in accessing water due to presence of diverse agro-climatic conditions within the district (suitable for comparability), scarce availability of water, socio-economic backwardness and existence of diverse irrigation system. In this backward district, four hamlets were selected from two watersheds- Khairi-Ka-Kala watershed and Rajana Watershed. The watershed Khairi-Ka-Kala watershed characterises low hills sub-tropical (Shiwalik) zone located between 600-1000 MSL and is easily accessible to plains. The Rajana watershed characterises mid-hills sub-humid zone located between 1000 to 2000 MSL and is relatively remote. The hamlets in each watershed were selected through discussion with

gatekeepers and village leaders on its location in watershed (upstream and downstream), economic backwardness of the hamlet, scarce availability of water (for irrigation) and more important willingness to support the research.

The hamlets Khairwala and Pipalwala were selected out of 10 hamlets in Khairi-Ka-Kala watershed. The former is remotely located in the upstream (with 4 km. of foot path across streams and mountains connecting to the motorable road). It has Muslim Gujjars (scheduled tribal) and Rajputs (forward caste). The people though agriculturist, supplement their livelihood by selling milk and getting labour employment outside the hamlet. It has lift irrigation facility, where water is lifted from the nearby river Markhanda. This helps the residents to grow maize, wheat and fodder grasses. In contrast, hamlet Pipalwala is multi-caste, well connected to the nearest town and is located in plains that enable people to depend on other sources of income rather than agricultural only. The *Khul* (diversion-based) irrigation systems that draw water through gravity from the river Markhanda is the only source of irrigation. This enables to cultivate maize, wheat, fodder grass and vegetables for home consumption.

Compared to its counterpart, the hamlets in Rajana Watershed located in the mid-hills sub-humid zone (hereafter referred to as mid-hills) is remote and are agriculturist (with limited employment opportunities). Here there are two major caste-the Rajputs (forward caste) and Kohli (scheduled caste), with Brahmans and *Chamars* (another class of Scheduled Caste) being minor. These two hamlets though have similar socio-cultural characteristics and only 100 metres apart in altitude (in terms of distance it is about 500 metres), yet there is drastic differences in their agricultural pattern, thereby affecting their actions to access water. While the hamlet Uppala Rajana (located upstream) grows tomato and ginger (also have potential to grow other vegetables) in rainfed conditions (with limited irrigation in May) and organically. It also has a very good soil condition. In contrast, hamlet Nichala Rajana (downstream) is unable to grow cash crops successfully due to pests and unsuitable soil conditions, in spite of having *Khul* based irrigation facilities. Examining water resource management in these diverse settings offers a range of insights for understanding the management and the options.

5.1 Water Management in a ‘Strategic Context’

Conventional institutional analysts who are driven by theoretical relevant causal relationships (Agrawal, 2001) fail to consider research problem holistically thereby missing out the complex factors affecting the problem. In order to examine research problem holistically it is important to identify water management problem in a ‘strategic context’. Water resource management problem was identified through secondary documents, semi-structured interviews and focus group discussions in the hamlets. Of various problems faced by people in the watershed, the core water related problem was identified to examine institutional integration. In the hamlets Pipalwala, Khairwala (both from Khairi-Ka-Kala watershed) and Nichala Rajana (Rajana watershed) ‘distribution of water’ was one of the problem, which is normally told to outsiders as problem of ‘less water more land’ in khul and lift irrigation command. While in the hamlet Uppala Rajana, the problem was non-availability of any irrigation facilities, which makes the people demand for water management programmes that can augment water supply.

5. INSTITUTIONS INTEGRATING WATER RESOURCE MANAGEMENT

Institutions integrating water resource management reveal diverse role of actors and rules in influencing water policies, authorising distribution and in influencing their capability to evolve diverse actions. Actors influencing policy and implementation are classified based on their control, intervention, implementation and intermediate actors, while in building capability, they act as external variables, endowments provider (physical and household), production function or entitlements and as intermediate variable in facilitating actions to access water.

5.1 Water Resource Policies: Multiple and Diverse

Policies emerge incrementally and cumulatively by international agencies, Supreme Court of India, government of Himachal Pradesh, Princely ruler, market, caste, households and contextual factors (climate, Physiography, demography and historic factors). These diverse actors integrate diverse rules to IWRM in the watershed (Table 2 & 3). In the hamlet Pipalwala of Khairi-Ka-Kala watershed, the statutory public actors (the Princely ruler of Sirmaur, Government of Himachal Pradesh (GoHP), international development agencies and Supreme Court) and contextual factors control policies by providing boundary and position rules for actors¹⁵.

In the hamlet Khairwala, 'less water and more land' problem was mainly controlled by government of Himachal Pradesh (GoHP) that introduced lift irrigation programmes in late 1990's as part of the irrigation development programmes and the households residing under the Nahan electoral constituency by providing boundary and position rules. The former introduced programmes, while the latter wanted to appropriate these programmes through their elected representative - the Member of Legislative Assembly (MLA) of Nahan. The subordinate agencies, the DoIPH and MLA take position rules (the former wants to implement the programmes, while the latter wants to seize this opportunity to increase 'vote bank') and by aggregating rules that is subsequently implemented by DoIPH and the households in Khairi-Ka-Kala watershed (with the former authorising the implementation). This has resulted in not only extraction of water from river Markhanda for the lift irrigation programmes in the hamlet Khairwala, but also led to unregulated extraction to meet lift irrigation demand of other hamlets in the constituency, subsequently affecting irrigation needs of Khairwala hamlet in Khairi-Ka-Kala watershed.

¹⁵ The Princely Ruler of Sirmaur who controlled the region in 1880's had the right to construct khul irrigation system by exploiting the contextual factors (the rainfall and physiographic conditions) to irrigate his orchard in the watershed (DoR, 1890). After Independence in 1947, the GoHP and its department of irrigation and public health (DoIPH) and Land & Revenue department (LRD) intervened in these systems to address national development concern- provide ownership rights over land, increase irrigated area for food security and promote participatory management.

TABLE. 2 PRINCIPAL ACTORS INFLUENCING WATER RESOURCE POLICY

Categories of Actors	STATUTORY		SOCIALLY EMBEDDED		CONTEXTUAL
	Public	Private	Formal	Informal	
KHAIRI-KA-KALA WATERSHED - Pipalwala					
Controlling	International Agencies, Supreme Court, Princely Ruler Government of Himachal Pradesh	-	-		Rainfall Physiography; Historic
Intervening	Department of Irrigation and Public Health (DoIPH). Land and Revenue Department.	-	-		-
Intermediate	Land and Revenue Department	-	-	Households in Daduwala hamlet. Households in Pipalwala hamlet.	-
Implementing	Princely Ruler, DoIPH, BBGKIC	-			-
KHAIRI-KA-KALA WATERSHED - Khairwala					
Control	Government of Himachal Pradesh	-	-	Vote bank (People in the Jurisdiction of Nahan Constituency),	
Intervening	DoIPH, Member of Legislative Assembly (MLA)	-	-		-
Implementing	DoIPH	-	-	Households in Khairi-Ka-Kala watershed.	-
RAJANA WATERSHED – Uppala Rajana					
Control	Government of Himachal Pradesh				Climate Physiography; Historic
Intervening	-	Market	Caste	Households in Uppala Rajana	-
Intermediate	-	Market		Households growing cash crops in Uppala Rajana	-
Implementing	-	-	Caste	-	-
RAJANA WATERSHED – Nichala Rajana					
Control	Government of Himachal Pradesh				Climate, Historic, Physiography
Intervening	-		Caste	Households in Nichala Rajana	-
Intermediate	-				
Implementing	-	-		Households in Nichala Rajana	-

In contrast, the policies in Rajana watershed is controlled by GoHP and contextual factors (climate, physiography and history) that provides boundary rules for actors by encouraging neo-liberal policies to convert the state into a ‘fruit-bowl’ economy (Tribune News Service, 2000). This is also facilitated by the market. However, the prospects of these controlling actors depend on how market, caste and households through position and aggregation rules. In Uppala Rajana, caste has endowed the different household’s lands with different size¹⁶ and quality that provides differential access to cultivation of cash crops. The intermediate actors, market and households growing cash crops, largely the Rajputs determine access of cash crops to nearest market¹⁷. Gloomy picture portrayed by media and government agencies has led the households in Uppala Rajana to demand for irrigation to increase their revenue. In contrast, the neo-liberal policies have had negative impact on the downstream hamlet, Nichala Rajana due to controlling effect of contextual factors. Non-conductive climatic and poor quality soil (not conducive for tomato, ginger, chilly and turmeric), has played a intermediate role forcing households to retain subsistence crops (wheat,

¹⁶ About 20 percent of the households (mainly Rajputs) having land more than 2 acres who could grow tomato, ginger, chilly and ayurvedic products, but not for the rest 80 percent (mostly Kohli’s), who does grow these cash crops on a small scale and depend on labour employment within and outside the watershed.

¹⁷ As the Rajputs produce more products, they have a right to bring in middle men to access markets, often Kohli’s are forced to accept these middle men, who sometimes gives lesser rates for their products.

rice pulse and small scale ginger and turmeric) in spite of existence of khul irrigation in the hamlet. The only option for these households had been to demand for better irrigation to grow more subsistence crops.

TABLE. 3. RULES INFLUENCING WATER RESOURCE POLICIES

CATEGORIES	RULES
KHAIRI-KA-KALA WATERSHED – Pipalwala Hamlet	
Boundary	<ol style="list-style-type: none"> 1. Highly variable rainfall – Need to store water. 2. Highly fragile Physiography – Need to store water. 3. Implement development programmes – Implement water management programmes and provide landownership rights to tenant cultivators. 4. Princely Ruler owns orchard and is a ruler of the region– right to construct <i>khul</i> irrigation system. 5. Proximity of land to <i>khul</i> – Higher is the probability for irrigation rights. 6. Community-based management efficient – implement community-based groups.
Position	<ol style="list-style-type: none"> 1. Implement water management programmes – provide access to water. 2. Store water – cultivate horticulture crops. 3. Provide land ownership rights to tenant cultivators. 4. Tenant cultivators get land ownership rights. 5. Regularise labour – higher is the cost maintaining <i>khul</i>.
Scope	-
Aggregation	<ol style="list-style-type: none"> 1. Good relationship with Princely Ruler –Extend irrigation rights. 2. Land rights granted for Pipalwala hamlet households– land is in close proximity to <i>khul</i>. 3. Higher is the probability for irrigation rights – Hamlet Daduwala can use close acquaintance with Princely Ruler to demand irrigation right. 4. Higher the cost of maintaining <i>khul</i> – Implement Community-based management.
Information	-
Authority	<ol style="list-style-type: none"> 1. Cultivate horticulture crops – construct <i>khul</i> irrigation system. 2. Land of Pipalwala households in close proximity to <i>khul</i> – get irrigation rights from <i>Khul</i>. 3. Close acquaintance with Princely Ruler – Daduwala hamlet get access to <i>khul</i> irrigation rights. 4. Implement Community-based approach – extend irrigation command.
Pay-Off	<ol style="list-style-type: none"> 1. Three fold increase in <i>khul</i> irrigation command between 1880's to 2003.
KHAIRI-KA-KALA WATERSHED – Khairwala Hamlet	
Boundary	<ol style="list-style-type: none"> 1. Introduce irrigation programmes – Implement Irrigation programmes. 2. Higher the vote- higher is the ability of the elected representative (MLA) to influence change.
Position	<ol style="list-style-type: none"> 1. Elected as a MLA- influence development programmes. 2. Implement irrigation programmes – Assess technical feasibility.
Scope	-
Aggregation	<ol style="list-style-type: none"> 1. Technically feasible– higher is the probability to install irrigation schemes. 2. Politically influential programmes – Higher is the probability to install irrigation schemes.
Information	-
Authority	<ol style="list-style-type: none"> 1. Higher the probability to install irrigation scheme –Install lift irrigation scheme.
Pay-Off	<ol style="list-style-type: none"> 1. Higher the installation of Lift irrigation scheme – Higher is the perceived extraction of water from river Markhanda.
RAJANA WATERSHED - Uppala Rajana	
Boundary	<ol style="list-style-type: none"> 1. Suitable climate for cash crops. 2. Perishable nature of the product – seasonal or short is the duration for market. 3. Higher the caste of households – Higher will be caste of the middle man accessed. 4. Higher the landholdings – higher is the area under cash crops. 5. Higher the competition from other regions (Mumbai) – Lower is the price.
Position	<ol style="list-style-type: none"> 1. Suitable climate for cash crops - Higher is the incentive for cash crops. 2. Seasonal or short is the duration for market – lower is the price of the product. 3. Higher the caste of households – Higher will be caste of the middle man accessed. 4. Higher the landholdings – higher is the area under cash crops. 5. Higher the competition from other regions (Mumbai) – Lower is the price.
Scope	-
Aggregation	<ol style="list-style-type: none"> 1. Higher is the caste of middle man accessed – Good (returns) from the market. 2. Higher the area under cash crops – Good (returns) from the market. 3. Seasonal nature or short duration of product – short is the income generation period. 4. Higher the competition from other regions – lower is the price.
Information	-
Authority	<ol style="list-style-type: none"> 1. Good returns from the market – Higher are the income from cash crops.
Pay-Off	<ol style="list-style-type: none"> 2. Higher the income from cash crops – higher is the demand for water management programmes.
RAJANA WATERSHED - Nichala Rajana	
Boundary	<ol style="list-style-type: none"> 1. Unsuitable climate for cash crops– Lower incentives for cash crops. 2. Perishable nature of the product – seasonal or short is the duration for market.
Position	<ol style="list-style-type: none"> 3. Lower the incentive for cash crops – lesser is the area under cash crops.
Scope	-
Aggregation	-
Information	-
Authority	<ol style="list-style-type: none"> 1. Lesser the area under cash crops – lower is the income from cash crops.
Pay-Off	<ol style="list-style-type: none"> 1. Lesser the income from cash crops – higher is the demand for water management programmes.

5.2 Distributing Water

Actors and rules integrating in the watershed reveal the importance of statutory public actors in providing boundary, position and authority rules over distribution (Table. 4 & 5). In Khairi-Ka-Kala watershed, it is the international development agencies and Supreme Court that provides boundary rules for actors. The former proposes community-based approach, while latter imposes financial restriction thereby giving way to community-based approach. However in the Khairwala, the caste also controls by providing the boundary rules for actors. This led to formation of Bikram Bagh Khul Irrigation Society (BBGKIS) in Pipalwala and Khairwala Lift Irrigation Society (KLIS) in Khairwala that is authorised by the DoIPH. In Pipalwala, BBGKIS has not been efficient in distributing water, as they don't have any past experience and have to accommodate social bonds of preferential treatment for some. In contrast, the caste intervenes in the distribution of water, by endowing actors with differential land size (Scheduled Tribes holding larger land), thereby authorising large landowners to distribute water. This is knowingly or unknowingly authorised by DoIPH leading to inefficient distribution of water.

TABLE. 4. PRINCIPAL ACTORS INFLUENCING WATER DISTRIBUTION

Categories	STATUTORY		SOCIALLY EMBEDDED		CONTEXTUAL
	Public	Private	Formal	Informal	
KHAIRI-KA-KALA WATERSHED – Pipalwala Hamlet					
Control	International Development agencies. Supreme Court	-	-	-	Historic
Intervening	DoIPH.	-	-	-	-
Intermediate	-	-	-	Households in Pipalwala having irrigated lands.	
Implementing	BBGKIS	-	-	-	-
Outcome	-	-	-	Households in Pipalwala having irrigated land.	-
KHAIRI-KA-KALA WATERSHED – Khairwala Hamlet					
Control	International Development agencies. Supreme Court	-	Caste	-	-
Intervening	-	-	Caste	-	-
Intermediate	-	-	-	Households having lift irrigated land in Khairwala.	Historic
Implementing	KLIS	-	-	-	-
Outcome	-	-	Caste	Households having lift irrigated land in Khairwala.	-
RAJANA WATERSHED – Rajana Hamlet					
Control			Caste (Rajputs and Kohlis)		
Intervening	GoHP				
Intermediate			Caste		
Implementing			Caste		
Outcome			Caste		

The distribution of water in Rajana watershed is similar to Khairwala, where statutory public actors knowingly or unknowingly reinforce socially embedded rules, thereby legitimising supremacy to the existing social structure and in the process maintaining the inequity among the society. The caste is the only controlling actor in the hamlet. The upper caste, Rajputs own 55 percent of their land in the upstream and rest 45 percent in the midstream of the khul irrigation command. In contrast, the Kohli's

more than 90 percent of them own land in the midstream or in the downstream of the khul irrigation command. It is also true in terms of size of the landholdings, with 55 percent of Rajputs having large (more than 2 acres) landholdings and 33 percent of them small (1 – 2 acres). In contrast, 42 percent of Kohli's have marginal (less than 1 acre) and 33 percent having small (1 to 2 acres) landholdings. This unequal distribution of land authorises the supremacy of Rajputs (61%) in influencing water distribution in the Khul irrigation command of the Nichala Rajana hamlet. Being categorised as 'private'¹⁸ *khul* by the department of irrigation and public health rarely oversees the distribution of water, in a way facilitating the inequitable distribution of water.

5.3 Capability to Manage Water

The capability for the households to evolve various forms of actions is largely set by socially embedded actors, with market playing a minor role. It is interesting to note that in hamlet (Pipalwala) that has good infrastructure facilities (or connection with outside world) the capabilities are largely built by households and market. In contrast, as hamlets (Khairwala, Uppala Rajana and Nichala Rajana) get remote or interior, the role of caste and historic factors assumes predominance (Table 6 & 7).

TABLE. 5. RULES INFLUENCING WATER RESOURCE DISTRIBUTION

CATEGORIES	RULES
KHAIRI-KA-KALA WATERSHED – Pipalwala Hamlet	
Boundary	1. Community-based management efficient – implement user group approach for water management.
Position	1. Regularise labour contracts – higher is the cost of khul maintenance. 2. Location of land in upstream – more is the stealing of water. 3. Higher the cost of khul – implement Khul Irrigation committee (KIC)
Scope	
Aggregation	1. Less experience in distributing water – inefficient is the distribution of water. 2. Higher stealing of water – inefficient is the distribution of water.
Information	
Authority	1. Form Khul (KIC) irrigation committee – water distribution inefficient.
Pay-Off	1. Inefficient is the distribution of water in khul irrigation command.
KHAIRI-KA-KALA WATERSHED – Khairwala Hamlet	
Boundary	1. Community-based management efficient – implement user group approach for water management. 2. Scheduled Tribes – Higher is the size of landholding.
Position	3. Higher the landholdings – higher is the stealing of water in the command area.
Scope	
Aggregation	1. Less the experience in distributing water – Inefficient is the distribution of water. 2. Higher stealing of water – Inefficient is the distribution of water.
Information	
Authority	1. Form Lift (LIC) irrigation committee – water distribution inefficient.
Pay-Off	1. Inefficient Distribution of water in Lift Irrigation Command.
RAJANA WATERSHED – Nichala Rajana Hamlet	
Boundary	1. Higher the caste – their landholdings is in the head reach of the khul command.
Position	1. First settlers (Rajputs) – are landlords. 2. Second settlers (Kohli's) – tenant cultivators. 3. Distribute excess lands to tenant cultivators (the Kohli's) -Give authority to landlords (the Rajputs) to part away the excess land.
Scope	
Aggregation	1. Rajputs is given authority to distribute land –Poor quality and downstream lands available to tenant cultivators.
Information	
Authority	1. Location of Rajputs land in the Upstream of the <i>khul</i> irrigation command – Rajputs have more say in the distribution of water. 2. Poor quality land available to Kohli – less say in the distribution of water.
Pay-Off	1. Caste-based distribution of water.

¹⁸ *Khuls* are categorised as private in revenue records, when it is managed and maintained by descended of one community, here Rajputs. Considered as government, if that right was handed over to the government.

In the hamlet Pipalwala, household as actors play a prominent in endowing resources, in production function and in their action, with intermediate role of markets. Interestingly, there is no external factor influencing the capability of households. Cattle's per household play a dominant role as an endowment, but its ability get cash returns from market depends on the household size. As the household's income from dairy increases, the ability to adopt dissemination-based action or resignation from taking any action increases. If there is lower cash income from dairy, higher is the probability of resistance-based action.

In contrast, in the upstream hamlet Khairwala and in hamlets of Rajana watershed caste, household and historic factor influence the capability of the actors. Among these caste has been the dominant played directly, indirectly or in a combination of both.

TABLE. 6. ACTORS INFLUENCING CAPABILITY OF HOUSEHOLD IN THE WATERSHEDS

Categories	STATUTORY		SOCIALLY EMBEDDED		CONTEXTUAL
	Public	Private	Formal	Informal	
KHAIRI-KA-KALA WATERSHED – Pipalwala Hamlet					
External Factors					
Endowment			Household		
Production Function			Household		
Intermediate		Market	Household		
Actions			Household		
KHAIRI-KA-KALA WATERSHED – Khairwala Hamlet					
External Factors			Caste Household		Historic
Endowment			Household		Historic Demographic
Production Function		Market	Household		
Intermediate			Household		
Actions			Household		
RAJANA WATERSHED – Uppala Rajana					
External Factors			Caste		Historic
Endowment			Household Caste		Demographic Historic
Production Function		Market			
Intermediate			Caste		
Actions			Household		
RAJANA WATERSHED – Nichala Rajana					
External Factors			Caste		
Endowment					
Production Function					
Intermediate					
Actions					

In the hamlet Khairwala caste plays both a direct and indirect role (through dairy income) in influencing the actions of the actors. Indirectly, it endows (cattle's per household, irrigated landholdings and percentage of adult males) the households production function related to dairy income. Rajputs generally resign from taking any action, while Muslim Gujjars adopt various actions (resistance, negotiation and dissemination) depending on the income from dairy. Interestingly, caste plays an indirect role in the hamlet in Uppala Rajana by building series of endowments (physical and demographic) and production function. Unirrigated landholdings, its location, sex ratio (or higher women members) and percentage of households in non-farm sector influences the production function of the actors. This is supplemented by caste influencing intermediate actors; access to market for agriculture produce and thereby agricultural income. Finally, it is the income from agriculture and non-cash

income from dairy that directly influences the action of the households. The higher the income from agriculture and dairy more is the negotiation and resistance based action, while lower income from agriculture and higher is the probability of resignation from any action.

TABLE. 7. RULES INFLUENCING CAPABILITY OF HOUSEHOLDS IN WATERSHEDS

CATEGORIES	RULES
KHAIRI-KA-KALA WATERSHED – Pipalwala Hamlet	
BOUNDARY	
POSITION	1. Higher the cattle's per household – higher is the production of milk.
SCOPE	
AGGREGATION	1. Higher the production of milk – Higher is the cash income from dairy.
INFORMATION	
AUTHORITY	1. Higher the cash income from dairy – Higher is the dissemination and resignation types of action.
PAY-OFF	
KHAIRI-KA-KALA WATERSHED – Khairwala Hamlet	
BOUNDARY	1. Rajput the caste – resignation is the action. 2. Rajput the caste – less is the income from dairy. 3. Rajput the caste – higher is the income from regular employment.
POSITION	-
SCOPE	-
AGGREGATION	-
INFORMATION	-
AUTHORITY	1. Higher the income from dairy – more resistance is the action.
PAY-OFF	-
RAJANA WATERSHED – Uppala Rajana	
BOUNDARY	1. Rajput the caste – unirrigated land located near residence. 2. Rajput the caste – larger is the family size. 3. Rajput the caste – lower is the % of household in non-farm sector. 4. Higher household size – larger is the unirrigated landholding. 5. Higher the sex-ratio – higher is the unirrigated landholding. 6. Higher the sex ratio – higher is the area under maize.
POSITION	1. Higher the % of household in non-farm sector – higher is the income from labour employment. 2. Higher the unirrigated land – higher is the area under tomato. 3. Higher the unirrigated land – higher is the area under maize-ginger. 4. Higher the unirrigated land – higher is the area under maize. 5. Higher the unirrigated land – higher is the non-cash agriculture income. 6. Unirrigated land located nearer to residence – higher is the area under maize-ginger. 7. Higher the % of household in non-farm sector – higher is the area under maize.
SCOPE	1. Higher the area under tomato – higher is the area under cash crop. 2. Higher the area under maize-ginger – higher is the area under cash crops. 3. Higher the area under maize – higher is the non-cash agriculture income. 4. Higher the unirrigated land – higher is the non-cash agriculture income. 5. Higher the area under cash crops – higher is the income from cash crops.
AGGREGATION	1. Good access to market – higher is the income from cash crops. 2. Higher the unirrigated land – higher is the non-cash agriculture income.
INFORMATION	-
AUTHORITY	1. Higher the income from cash crops – higher is the total income from agriculture. 2. Higher the income from non-cash crops – higher is the total income from agriculture.
PAY-OFF	1. Higher the % of income from agriculture – more resistance-based is the action. 2. Higher the % of income from dairy – more resistance-based is the action.
RAJANA WATERSHED – Nichala Rajana	
BOUNDARY	1. Rajputs the caste – class-based is the action
POSITION	-
SCOPE	-
AGGREGATION	-
INFORMATION	-
AUTHORITY	1. Rajputs the caste – class-based is the action
PAY-OFF	1. Rajputs the caste – class-based is the action

In the hamlet Nichala Rajana, caste has a direct influence in the capability of the households. Being Rajputs in caste, there are 50:50 chances of them adopting class-based and passive action, while Kohli's there are 75 percent chances of probability of them being passive, with rest adopting resistance-based or resign from taking any action. The class-based and passive actions are peculiar to this hamlet due to significant influence of caste on their day-to-day living.

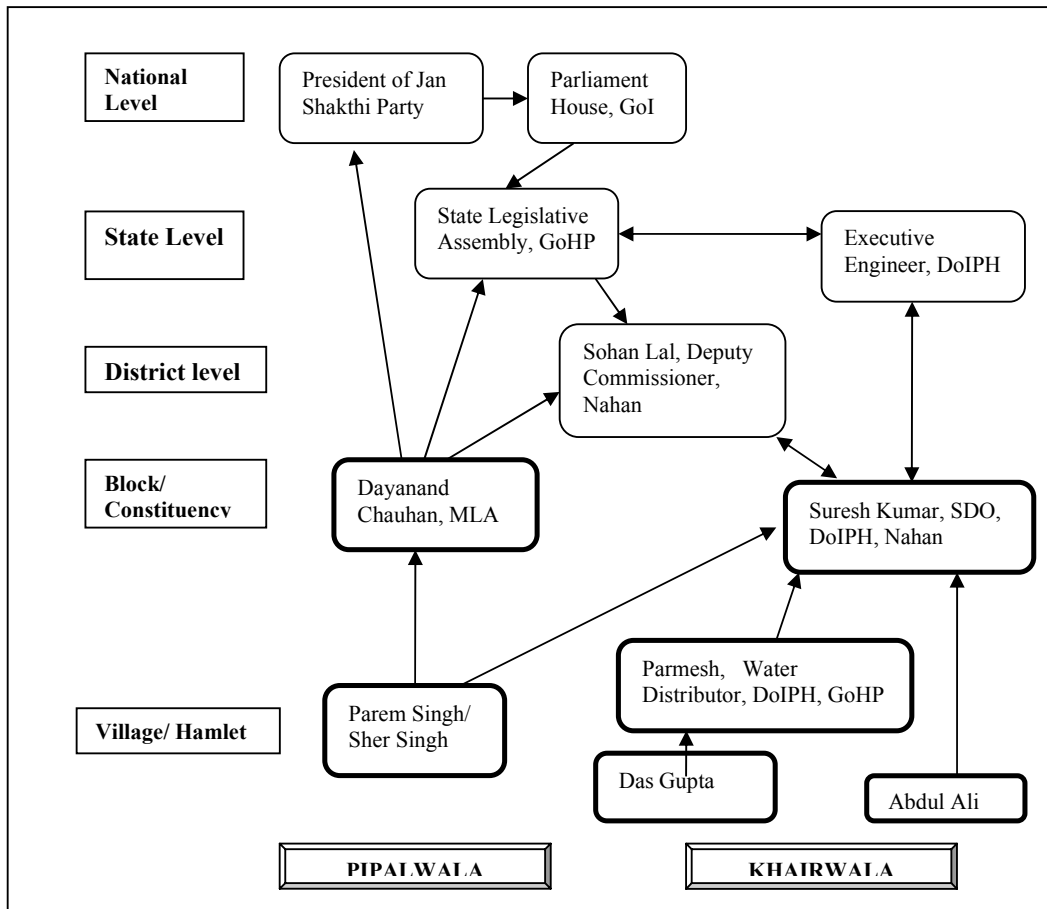
The actors in the case study watershed demonstrate diverse actions to manage water depending on their capability provided by the rules. Broadly, these actions represent the following 6 categories: class-based, resistance, negotiation, dissemination, passive and resignation (Box. 1). The actions examined are instantaneous and one-time actions. Often actors use a combination of different actions. Examining a combination of actions of each households is not only time consuming but do not reveal the weakness of existing institutional structure. The importance of examining instantaneous action of the households reveals the inadequacy of existing institutional arrangements that facilitate such actions.

Box. 1 DIFFERENT ACTIONS TO MANAGE WATER

1. *Class-based:* Those whose actions are characterised by unequal roles for unequal members, with an overriding concern for control. More important is that they use the existing organisational structures to implement their control.
2. *Resistance based:* Actors who are pragmatic in evolving action based on individual rationality. Resistance-based actionist believes that his/ her action will certainly make a change in the way water is managed. As one of the farmer in Khairwala commented (SPMM, 2004) “it is only by this action (stealing water) can I get water to my field”. Such actions give rise to libertarian form of governance, resting on neo-liberal policies, where stakeholders are free to bargain.
3. *Negotiation-based:* Actors combine individual rationality with consensus seeking communicative behaviour. They believe in negotiating their action using the hierarchy of the management structures. In a way this strengthens the existing the institutional arrangements.
4. *Dissemination-based:* Actors communicate only to inform others their concern, but do not have any solutions to their concerns. They are similar to environmental activist, who raise voices, but do not have any pragmatic solutions.
5. *Passive:* Actors who do not have freedom to organise their own and suffer at the hands of the class-based actors. They tend to cope with everyday living as best as fate allows.
6. *Resignation:* These Actors have power to exercise but withdraw from making any action. They are assuming ‘fate’ is the only decider for their life. Statements such as “what can we do in a world where might is right” (SPMR, 2004) to manage water is common among these stakeholders.

7. AGENTS INTEGRATING INSTITUTIONS

Analysing integration of institutions in reshaping water management requires identifying agents in these arenas and their negotiation process. Due to limitation imposed by research, the negotiated-based action, and class-based actions are examined to identify agents integrating institutions across levels for institutional change. Examining these two actions was convenient for two reasons: (i) It aims to strengthen the existing institutional arrangements through consensus-based action; and (ii) the agents were easier to identify and examine, compared to other actions. The hamlet-agents are identified through structured interviews from households adopting negotiation and class-based action. Of these, the hamlet agents most often accessed by household were identified through structured interviews. Each of these agents were interviewed using semi-structured informal tool to understand their perception of the water resource problem and solutions they propose and the other agents accessed. This snow-balling technique helped to identify network of agents involved in the management of water in these watersheds. In the Khairi-Ka-Kala watershed hamlet agents (Parem Singh and Sher Singh in Pipalwala; Abdul Ali and Das Gupta in Khairwala) access a network of other agents in achieve their goal of getting a lift irrigation scheme (Fig. 5).

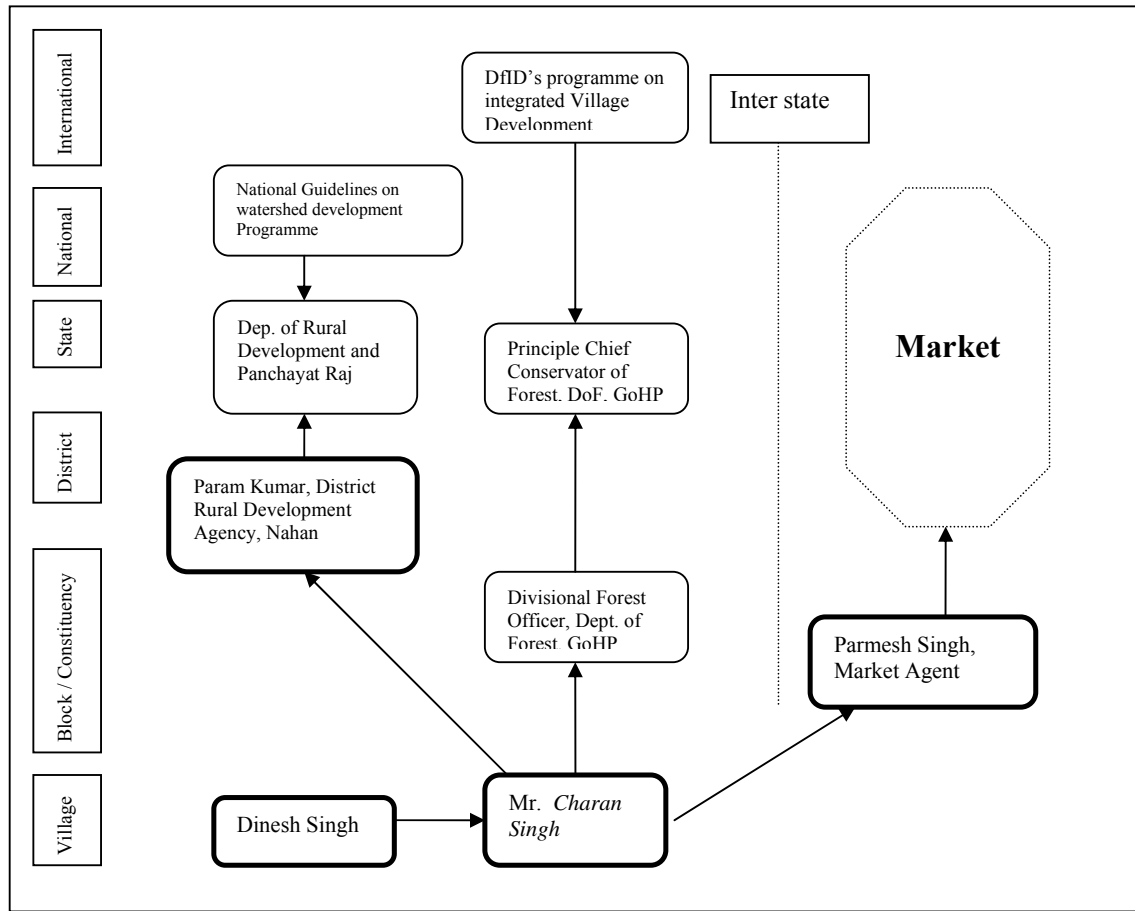
Fig. 5. AGENTS IN DIFFERENT ACTION ARENA- Khairi-Ka-Kala Watershed

In the hamlet Pipalwala, the hamlet-agent have been making attempts to get a lift irrigation scheme in their hamlet to solve the water management problem. For this they access Mr. Suresh Kumar, Sub-Divisional Officer of DoIPH and Mr. Dayanand Chauhan, the Member of Legislative Assembly (MLA) the political representative of their constituency. These agents in turn have to access other agents in different arenas to fulfil the demands. The former has to access his superior, Executive Engineer, DoIPH, GoHP, and the Deputy Commissioner of Nahan. While the latter has to access the State Legislature Assembly, National President of the Lok Jan Shakthi party, and the Deputy Commissioner of Nahan. There are series network of agents which they have to seek to fulfil the demands for additional lift irrigation schemes in the Pipalwala hamlet level agents. In Khairwala hamlet, two hamlet-agents access the Mr. Suresh Kumar, SDO of DoIPH for two different purpose; one aims to seek additional irrigation scheme and the other aims to influence the DoIPH to take over irrigation management from the Khairwala Lift Irrigation Society (that is dominated by Gujjars). Different purpose contradicts each others action and thereby revealing the friction in the hamlets over water management.

In Rajana watershed (Fig. 6), agent Mr. Charan Singh attempt to solve water problem of both the hamlets (Uppala Rajana and Nichala Rajana) by seeking two options: (i) increase availability of water through various water harvesting measures (as they are been told during watershed training programme) and (ii) Promote better access for their agricultural produce (ginger, tomato, Okra, and other vegetables and medicinal

crops) to market centres. In turn access the Param Kumar Singh of the DRDA to seek additional funds under the watershed development programme, access DFO to get more funds from Integrated Village Development programmes of the Dfid and market to get adequate returns for the cash crops.

Fig. 6. AGENTS IN DIFFERENT ACTION ARENA- Rajana Watershed



Rules play a dominant role in negotiating each of the agents in the decision-making arena. They motivate the agents to enter the arena, facilitate, constrain and support their decisions in the arena. Each agent have their own agenda to negotiate their decisions, which determines their characteristics based on their actions they adopt. Examining the characteristics of the agents helps in identifying the types of agents involved in the arena. Broadly we find five types of agents involved in the watershed: goal-oriented; maintaining position, supportive, opportunistic and reactive agents. There were two each from goal-oriented, maintaining positions and supportive agents, one for opportunistic and four reactive agents in the watersheds.

Goal-oriented agents are mainly from the hamlets, who respond to the change in the water environment, but remain purposeful in their action. These agents though are well established leaders of the hamlets, it is the information rule facilitated by social network that plays a dominant role in the agency. Agents attempting to maintain their position are namely those who fear insecurity to their position rules. In the watershed they were namely the political representative and hamlet-agent. Reactive agents are those who react to the change occurring in the environmental settings under their

control. These agents are from government bureaucracies and from hamlets. Already endowed with boundary and position rules, these agents are requested to react to the changing environment. In the process depend on information rules provided by social network or from the organisation they represent. Opportunistic agents are those who utilise the negotiations that is taking place among the agents in the arena for his or her own benefits by manipulating the situation. Supportive agents are those who link hamlet agents with other agents to facilitate the decisions that are favourable to the hamlet agents. These diverse types of agents provide opportunities to understand the changing social and environmental scenario at the local level. It is important for development actors remain interactive with these agents to understand the dynamic nature of the social and environmental context. This calls for sectoral actors to remain interactive to identify needs and the aspiration of the agents to evolve contextual relevant programmes. It is interesting to note that in each of the arena, there are three different types of agent; agent who initiates (reactive or goal-oriented agents), agent who is supportive to the reaction and those who take opportunity of this reaction to maintain their position. These agents negotiate among each other to take decisions relating to managing water in these arenas.

Attributes Governing Negotiation

Attributes governing the negotiation among agents are given different meanings by agents depending on their ability to achieve them during the negotiation process. Equity for instance is perceived by agents to be achieved through technical options, external interventions, technical and social feasibility, vote-bank and price mechanisms. Agents assume or are assigned responsibility to take decisions in the arena. While coordination range from a combination of informal and formal contacts to personal communication to price structures that determines the coordination among agents. Participation is based on trust built by agents over a period of time among each other, reluctant participation, passive, communicative forceful means and prices that determines the participation of the agents. While accountability takes different meanings from street talks, volunteered accountability, formal written request to undisclosed information. These differential perceptions are influenced by particular actors and the rules that govern the negotiations, making it complex for tinkering with attributes of governance.

8. IMPLICATION FOR INTEGRATED WATER RESOURCE MANAGEMENT

Integrated water resource management in the case study watersheds demonstrates complex interactive nature of actors and rules. Here integration takes place across levels among individuals and groups in arenas that are less visible or easily identifiable for intervention. These arenas represent adaptive cycle where the role of actors and rules are examined in shaping policies, its implementation, crisis created by mismatch between policies and implementation leads to diverse action, and emergence of agents to evolve alternatives of water resource institutions. Here actors and rules do not necessarily follow hydrological boundaries. This is contrast to contemporary programmes and policies that widely calls for realigning the administrative functions along hydrological boundaries. Any attempt to IWRM needs to consider the rules that actors access for integration to emerge, rather than conventional attempt to focus on structures.

Actors and rules attempting to conserve water integrate in diverse ways to influence policies, its implementation and in building capability to manage crisis. The policies shaping water resources in the case study demonstrates diverse actors contesting incrementally in shaping the policies. This contested nature of water policy only questions the broadly held paradigm emphasising the need for ‘sharing power’ (Borini-Feyerabend, et al., 2005) and ‘devolving powers to actors and institutions at lower levels’ (Agrawal and Ribot, 1999; Ribot, 2002; Larson & Ribot, 2004) towards management of natural resources. Such ideologies assume that power is held by government or at higher level and therefore call for devolving them to other actors. Lane et al (2004) argues the call for devolving powers are misplaced and do not reflect the ground reality of policy making. The contestation of diverse actors in shaping water resource policy in the case study watersheds are relevant in the context of work from number of other scholars who have demonstrated the ‘politics of policy’ (Baviskar, 2004; Chhotray, 2004; Mehta, 2003; Mollinga, 2001). Often recognition of such politics leads the scholars to conclude for one form of governance over the other.

The study demonstrates what ever forms of governance actors actively negotiate in influencing water policies. The forms of governance is not important, rather it is the rules that help actors to negotiate in an informed manner to modify the outcomes for sustainable future. The study demonstrates a notable trend on the role of actors and rules as one move from well connected region to remote regions. In the well connected region (namely through road and public transportation facilities) it is the statutory-public rules and contextual factors that control the policies. The intervention is by statutory public rules and the implementation is through a combination of statutory-public and socially embedded informal rules. Statutory public rules plays a major role in controlling and finally in authorising these negotiated policies, thus revealing the significance of statutory public rules in stewarding water resource management. In remote regions, socially embedded informal rules control these policies along with statutory-public rules and contextual factors. Though the interventions are through a combination of statutory-private and socially embedded (formal and informal) rules, it is the latter which authorise the policies. However, absence of scope and information rule to enable actors to modify the outcomes for effective water resource management has been a main constraint for actors take informed decisions. This has few implications for water resource management institutions: (i) The importance of statutory public actors in regions in regions well-connected to outside world in initiating change that would offer opportunities for other actors to modify to suit local realities; (ii) The importance of actors to share information and offer scope for other actors to make a informed water related decisions; and (iii) The importance of improving infrastructure facilities to further open-up remote regions.

The implementation of these policies to distribute water is controlled by both statutory public actors (often extending to national and international) and socially embedded actors. The former play a prominent role in regions those are well-connected to outside world by controlling and intervening water distribution. The latter actor plays a prominent role in remote regions. What is interesting is the fact that though diverse actors attempt to distribute water, it is the statutory public actors who authorise the pattern knowingly or unknowingly facilitating the large landholders and depriving the small and marginal landholders. Interestingly, these marginal landholders have other

alternatives livelihood options in hamlet (Pipalwala) that is well connected to outside world, while in remote hamlets (Khairwala, Uppala Rajana and Nichala Rajana) these have led them to poverty. This implies that water resource management can be effective in addressing poverty only in remote and traditional societies. However, infrastructure development in contrast can play a major role in alleviating poverty. Second, it also requires sectoral agencies to play a prominent role in monitoring and evaluation of their sectoral programmes to remain equitable and efficient through interactive approach with ground realities of resource management.

Capability of the actors to manage water is only through socially-embedded actors, with minor role played by market and no role from statutory public actors. The households play a dominant role in building capability of actors in region well-connected, by providing endowments and production functions. This is in contrast to caste and historic factors playing a major role in remote regions by setting boundary and position rules for actors. Various scholars reveal that better off and more powerful local groups (generally caste) tend to appropriate greater level of benefits from community-based resource management. Caste is one of the major actors influencing the power. Agrawal and Gupta (2004) reveal how the upper caste have higher probability to participate in community-based resource management programmes due to high stakes involved with their landholdings in the Himalayan regions in Nepal. However, not always landholdings remain a dominant variable. In the state of Andhra Pradesh in southern India, Chhotray (2004) demonstrates how Naidu community leaders in spite of having less landholding continuously search for new bases of domination through fiscal control and opportunity to cultivate close relations with bureaucrats in community-based watershed management programmes. These scholars did identify the importance of caste in influencing the capability of households; however fall short in revealing how. The study reveals caste directly, indirectly and in combination influence capability. This has important implications for conventional programmes that often rest on negotiated and communicative based approach to build capability of actors. These programmes fail to understand the historic and socially embedded nature of actors' capability. The importance of this socially embedded actor can only negated through improved infrastructure facilities that will offer actors to modify their endowments and production functions and also through targeted programmes. Differential capabilities endowed results actors evolving diverse actions to modify the existing institutional arrangements. These actions range from class-based, resistance, negotiation, dissemination, passive and resignation from taking actions in the watersheds. These diverse actions correspond to the social behaviour of the cultural theorist (Gyawali, 2001). Each of these actions is important to identify agents and their effort to towards institutional change. However, many of the contemporary programmes consider these diverse actions as 'systemic problem' rather as a 'systemic process' of institutional change.

The systemic process of participation of actors facilitates by number of agents who access various decision-making arenas to seek institutional alternative. The paper examines only those agents facilitating negotiated and class-based actions. Agents facilitating these actions are diverse come together in arena to facilitating these actions to manage water. These arenas are not space-based entity (such as courts, stakeholder meetings) that is visible and easily accessible for institutional designers to intervene; rather these arenas are obscure, not clearly represented in space and time. In these arenas, agents though have a common purpose of managing water resources,

each have their own agenda to negotiate the decisions. Here decisions among agents involves time factor to build trust and gain confidence to take decisions. The attributes governing their decisions are diverse and illustrates complex nature in their existence depending on their ability to achieve their social goal during the negotiation process. These differential perceptions are influenced by particular actors and the rules that govern the negotiations, making it complex to tinker the attributes of governance.

9. CONCLUSION AND FUTURE DIRECTIONS

The study unravels the black box of the institutional process of water resource management by critically reviewing new institutionalism across social sciences disciplines. Analysing actors and rules integrating water resource management in socially and hydrologically distinct watersheds, they study questions the conventional approach of promoting integrated water resource management focusing on stakeholder's involvement in arenas at one level or the other through consensus-based collective action (Ostrom, 1998; Jasper, 2003; Bruns and Meinzen-Dick, 2000). The analysis demonstrates that integration taking place across and space and time in diverse arenas hierarchically placed in a 'panarchy', which is are not clearly visible or easily identifiable for external intervention. In these arenas it is only those stakeholders who have access to rules get involved to manage water playing diverse roles as actors and agents. Here statutory and socially embedded rules interact in a complex ways. Statutory rules remain public and private that incorporate global, national and regional values, which are statutorily applied over a larger jurisdiction. In contrast, socially embedded rules are formal and informal that incorporates localised individual and community values, but widely prevalent. These two contrasting rules do not represent weak or robust rules; rather they interact through actors by complementing each other in shaping water resources in the watersheds.

The study adopts systems approach to unravel institutional complexity in four phases of adaptive cycle in 'panarchy'. Analysing the actors and rules in shaping water resource management, the study emphasis the importance of information and scope rules for diverse actors to negotiate water policies. Information among actors are biased, contested, concealed and only revealed when required. In such contested environment, knowledge on water resource management is generated through regular interaction among actors with dynamic environment. Facilitating information on water resource for informed decision-making should go beyond, enacting Right to Information Act and application of technology (Burton & Molden, 2005) to assess water resources towards facilitating interaction among actors. Better infrastructure facilities, media and telecommunication play a major role. Here 'what' information are presented is not important, rather 'how' it is represented through interaction with other actors towards making of water policy. Effective implementation in of water resource policies requires statutory actors (both public and private) to monitor and evaluate water distribution. This requires constant interaction with ground reality of water management by sectoral agencies. Capabilities of actors are diverse and built only by socially embedded actors and historical factors. These differential capabilities cannot be negotiated through consensual or communicative form of decision-making, rather it requires targeted approach to build capability of the real poor, while creating enabling environment through improved infrastructure for those

who have the capability to migrate. Differential capabilities of actor's lead them to adopt a systemic process to bring about institutional change. Agents play a major role in facilitating the process of institutional change. Recognising these agents for innovation and to remain adaptive requires statutory sectoral actors to remain interactive to facilitate these agents.

Water resource management can play effective role in alleviating poverty only in remote and traditional societies. In contrast development of infrastructure can be more effective in alleviating poverty by providing opportunities for the poor, at the same time help in sharing information for informed decisions on water resource management. This supplemented with interactive role of sectoral agencies with ground realities of resource management, targeted approach to address the poor and to facilitate agents can offer opportunities to remain adaptive to social and resource dynamics.

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