Sustainable Water Management in Semi-Arid India:

Learning from the *Gond* and *Kohli* Indigenous Communities

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Part One

Chapter 1. Introduction

1.1 Introduction

> What is common to the greatest number gets the least amount of care.
>
> (Aristotle 350 B.C., 57)

> Water is probably the only natural resource to touch all aspects of human civilization: from agriculture and industrial development to the cultural and religious values embedded in society ... and ... the need and demand for water have been driving forces of social, economic, and cultural development throughout human history.
>
> (Koi chiro Matsura, Director General of UNESCO cited in Castelein and Otte 2002, vii)

Water is a vital resource to sustain all forms of life. It is the key to development and sustenance of all communities and has a central place in human lives. Unfortunately, Aristotle's predicament is very much applicable to this most important resource on the earth – freshwater. Under conditions of increasing stress on this essential renewable but scarce natural resource, effective and efficient management of water is emerging as an urgent contemporary issue. The realisation of its limited availability in space and time has necessitated the design of new globally viable water management regimes aimed at striking a balance between water used as a basis for income and its protection. Through these regimes it is hoped to ensure its sustainability through present to future generations (Agarwal et al. 2000).

These issues of global and local sustainability drew international attention in the World Commission on Environment and Development (WCED) report, *Our Common Future* (1987), which was a landmark document. The report defined 'Sustainable Development' as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1990, 5). Subsequently, there have been several declarations and publications by the United Nations Educational, Scientific, and Cultural Organisation (UNESCO), the International Union for the Conservation of Nature and Natural Resources (IUCN) and the United Nations Environmental Program (UNEP) which have established a need for effective management of water resources that rely upon a 'command-and-control' approach.[1] However, this has primarily been a 'top-down' approach

1 A command-and-control approach is one where political authorities mandate people, by enacting a law, to bring about behaviour and use an enforcement machinery to get people to obey the law (Elazegui 2002, 1).

with general enthusiasm for 'scientific irrigation' development implemented by centralised regulatory bodies (Molle, Mollinga, and Wester 2009).[2]

The 20th century was characterised by a 'hydraulic mission', in which an engineering approach (hydropower, irrigation, transportation, and so on) was combined with the concept of regional development (reforestation, industrial development, and so on) (Molle, Mollinga, and Wester 2009; Molle, Mollinga, and Meinzen-Dick 2008; Briscoe and Mallik 2006). However, towards the end of the century construction activities reduced, as there emerged acute environmental problems coupled with social problems (Molle, Mollinga, and Meinzen-Dick 2008; Gleick 2003; Shiva 2002; Viessaman 1990). The World Commission on Dams (WCD), in their 2000 report, concluded that too often "an unacceptable and unnecessary cost in terms of social and environmental has been paid by people displaced, Indigenous people, by communities downstream, by taxpayers, and by the natural environment" (WCD 2000, xxxi). This has resulted in various water conflicts over the Nile in Africa, the Jordan in Israel, rivers in Nigeria, Bolivia and many other countries. In India too, every major river has become a site of 'irreconcilable' water conflicts such as the Narmada, Krishna, Ganges, Sutlej, and Kaveri. It became evident from the various conflicts over water that in its distribution there was a tight relationship not only between the environment and livelihood aspects but also with the 'political nature' of water. Water resource management has been divided between different agencies creating different power bases and hence competition between these sectors (Molle, Mollinga, and Meinzen-Dick 2008). As a result of these conflicts, there has been a growing awareness among natural and technical scientists, of the need for an integrated approach involving all stakeholders, including the community.

Over the last decade, the need for a paradigm shift has been advocated by a number of theorists from the disciplines of Geography, Environmental Studies, and Social Sciences (Pahl-Wostl et al. 2007; Gleick 2000; Cortner and Moote 1994). While these theorists agree upon a decentralised and more flexible participatory management approach, most recent analyses emphasise that effective governance must be based on principles of equity and diverse knowledge integration. Furthermore, these seem to be as important for dealing with water resource management problems as technological knowledge (Agarwal et al. 2000). The need for conflict resolution has resulted in the development of concepts of 'deliberative democracy' (Gupte and Barlett 2007) which has further heightened the participatory techniques of 'co-management' or 'co-construction of knowledge' between multiple stakeholders (Warner 2008; Shiva 2002). Knowledge of the cultural dimension is

2 A top-down approach is a strategy adopted by government agencies to prioritise and solely appreciate professional and scientific 'expert' knowledge (Smith 2008, 354).

highlighted as being crucial for understanding barriers to the adoption of new technologies and new management strategies (Pahl-Wostl et al. 2007; Berkes 1999; Warren, Slikkerveer, and Brokensha 1995). Understanding the significance of culture has resulted in restructuring of water governance regimes promoting alternative management structures by state, privatisation, and the empowerment of communities (Molle, Mollinga, and Meinzen-Dick 2008; Merrey et al. 2007; Meppen, Bellamy, and Ross 2005). Thus, a transition seems under way from 'hard' technology-based centralised approaches to a 'soft' path embracing decentralised and participatory approaches (Pahl-Wostl 2007; Gleick 2003). However, these participatory approaches invite criticism as being 'alien' in origin as they are based on the assumption that local communities lack any traditional or Indigenous water management system and knowledge (Iyer 2003).

In the last two decades there has been an acknowledgement for the need of local communities to be involved in natural resource management. This interest has been greatly triggered by the literature exemplifying community-based natural resource management (CBNRM) that demonstrate successful outcomes. The reliance on decentralisation and devolution of authority on natural resource management to ensure long term sustainability, and equity has also been stated in the Millennium Development Goals (United Nations 2000). However, this kind of idealisation has remained theoretical to a great extent and mostly focused on *what* the approach aims to achieve (Lahiri-Dutt 2008; Iyer 2007; Ross, Robinson, and Hockings 2005). These management approaches have given little attention to how these approaches would function in a given context (Ross, Robinson, and Hockings 2005; Bellamy et al. 2001).

Since the beginning of the 21st century new water management interventions have been designed and implemented based on participatory approaches where involvement of all the stakeholders in water management institutions has been the key strategy. The collective dilemma of the water sector has given rise to the concept of Integrated Water Resources Management (IWRM). This integrated approach has emerged from the perception that the socio-human factors, the ecological system, and the economic issues need to be incorporated together (Matondo 2002). The World Summit on Sustainable Development held in Johannesburg in 2002, emphasised the development of an IWRM plan by each nation, which would aim at integration of multiple elements including land and water management, surface and groundwater, upstream and downstream users and uses, social, economic and environmental sustainability, and most significantly, it would involve the integration of community stakeholders in decision-making processes at all levels (Biswas 2005; Agarwal et al. 2000). Today, after almost a decade since the development of the IWRM concept, there

are notably few examples of the transformation of this concept into action, and further there is fewer consensuses on prioritising social, environmental and economic sustainability (Molle, Mollinga, and Meinzen-Dick 2008; Jakeman et al. 2006; Bellamy and Johnson 1997). Furthermore, the participatory process is distorted by power relations and the gap between different approaches by different sectors, and the lack of co-ordination between them has further intensified conflicts (Molle, Mollinga, and Meinzen-Dick 2008; Shiva 2002). Thus, despite the apparent emphasis on IWRM, water problems still continue to escalate and are often framed in too many disciplinary agendas.

In relation to the inappropriate management of water resources, it is important to highlight another significant aspect of water availability. The availability or scarcity of water depends on the region. Arid and semi-arid regions globally face the greatest pressures to deliver and manage freshwater resources (Arab Water Council 2009; Food and Agricultural Organisation 2008; IUCN 1991) (refer Figure 1.1). These regions are specifically characterised by low and great variability in precipitation from year to year with intense heat and high evaporation rate.

Figure 1.1: Climate change impact across semi-arid regions across the world (FAO 2008)

Problems of water scarcity are further exacerbated by population growth, expansion of agricultural activities, increasing pollution, and the most recent concern, climate change. Many countries in these regions are already water stressed and are likely to face further challenges due to climate change (Arab Water Council 2009; Mata 2008). The major impacts on water are identified as increased evapo-transpiration, decreased run-off, groundwater recharge decline and increased salinity (Bates et al. 2008). For example, by 2050 many African countries are projected to have a massive decrease in water availability (Bates et al. 2008). The salinity levels in the Murray-Darling river basin in Australia are expected to increase by 13-19% by 2050 due to increased evapo-transpiration and decreased run-off (Mata 2008). As a result, most of these regions are the focus of potential conflicts over water scarcity and there is a need to develop efficient and adaptive management strategies for water security (Arab Water Council 2009; Bates et al. 2008; Gleick 2003).

It is significant to note that arid and semi-arid regions already face water management challenges due to scarce availability of water resources. However, in most of these regions 'traditional' approaches are prevalent to address this scarcity, based on lifestyle adaptations and learning to live with their environment (Harmsworth 2002; Gorjestani 2000; Agarwal and Narain 1997). These attempts can be seen, for example, in the form of contour bench terraces for soil and water conservation; *qanats* to access aquifers on hillsides; *tarais* in the Thar to tap shallow aquifers; diversion of flood waters into fields; and other intricate rainwater harvesting systems like *kuis* (pits), *kunds* (tanks) and *baodis* (step-wells).These wide variety of approaches to water management are based on two important features namely: consumption did not exceed supply and management by co-ordinated efforts of the community (Arab Water Council 2009; Agrawal and Narain 1997). Changes in these two features, in terms of increased allocation of resources and the emergence of centralised management systems, coupled with the increasing population, increasing demand and economic focused growth have disrupted the traditional systems.

India is no exception to this 'globalised' trend of water management and being a country consisting of significant arid and semi-arid regions, currently its water resources are vulnerable to climate change. As most literature suggests, India's current water crisis has been mostly due to extremely poor management (Iyer 2008; Brooks 2007; Briscoe and Malik 2006; Shiva 2002). The focus of India's development since Independence has been on economic growth with a major emphasis upon industrialisation and agricultural cultivation which uses modern techniques and ground water exploitation. Figure 1.2 indicates the exploitation of ground and surface water in India since 1997 and projects their depletion if the current systems of management are continued. Clearly, enough consideration has not been

given to adequate and sensitive water legislations and policies and, further even less emphasis on local control and community-based initiatives (Sangameswaran 2008; Brooks 2007).

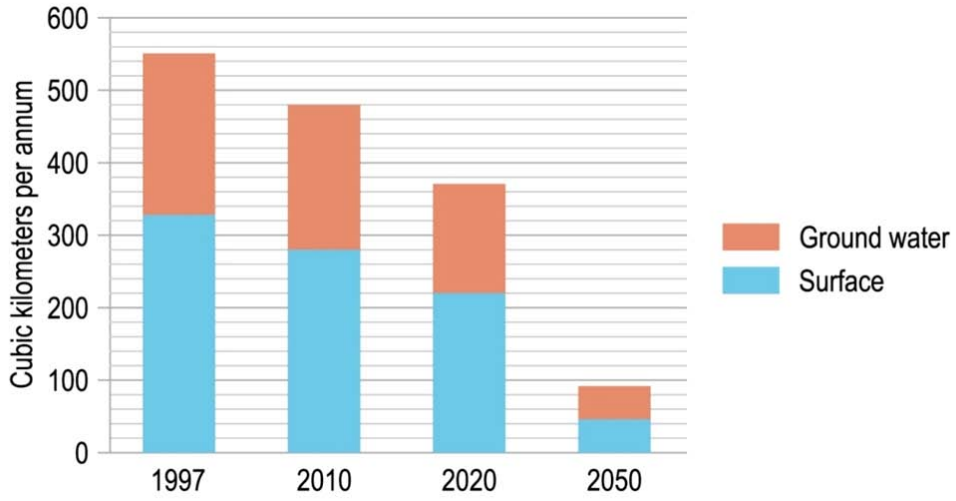

Figure 1.2: Surface water and groundwater in India over time (Briscoe and Malik 2006)

Indeed, a majority of local communities in India that employ traditional or localised water management practices are located in rural areas and organised in villages. The relevant question is, therefore, how was water management traditionally organised in rural communities so that the needs of the community were met through successive generations? Many ecologists and social activists agree with Norberg-Hodge and Goering (1986) that "traditional societies are the only tested models of truly sustainable development" (Wheeler 2004, 26). On the whole, traditional societies seem to have lived with a reverence for land and nature, and the present planning and regulatory bodies need to acknowledge them and learn from them. However, investigation of their existence and form of traditional 'localised' water management systems appear to have been little valued in modern development projects for sustainable water resource management (Shiva 2002; Agrawal 2001; Agarwal and Narain 1997).

However, the Indian National Government has proposed several initiatives that seek to decentralise water resource management. These include the *73rd and 74th Constitutional Amendments Act* to develop the remarkable *Panchayati Raj* Institution (PRI) in 1992 and the *National Biological Diversity Act 2002*, which mandates the development of Peoples Biodiversity Register by the community. In addition the State of Maharashtra, where the selected case studies are located, is considered a pioneering state in adopting the PRI and

also to attempt restructuring of its institutional structure (World Bank 2000). These initiatives are fore sighted compared to other national and state counterparts. However, despite their originality and positive intentions they have mostly failed to address water management and the engagement and participation of Indigenous and local communities at a local level.

There are several projects that have incorporated traditional knowledge in developments which have focused on improving the socio-economic conditions of the local people. These projects have focused on the local skills and techniques related to the production of rural produce such as organic manure, jute and other forest products, as well as rural art and medicinal plants (Tella 2007; Sen 2005). However, there have been few studies in India that have attempted to document and evaluate the traditional water management systems and practices, and further, even fewer studies which have tried to integrate these systems in the development of a sustainable water resource management plan (Kelkar 2007; Chakravarty, Badam, and Paranjape 2006; Sharma 2003; Shah and Raju 2001; Agarwal and Narain 1997). Such studies are essential to bridge the gap between the 'top-down' technical and quantitative approach that is common in Indian water management and a 'bottom-up' approach that capitalises on local community knowledge.[3]

However, these kinds of community-based systems have come under considerable criticism from various theorists. Some of them suggest that the 'traditional' or 'Indigenous' communities cannot always be considered to exercise environmentally sound practices, especially in the present changed contexts (Agrawal 1999; Baviskar 1996). Furthermore, the CBNRM might not truly engage the communities in decision-making (Sangameswaran 2008). To further complicate matters, Husain (2008) and Leach, Mearns, and Scoones (1999) point to the inter-community discrepancies owing to caste, gender, and economic status, which might affect the dynamics of CBNRM.

Consequently, building on this emphasis on community-based management systems and the relevance of Indigenous knowledge in semi-arid regions, the focus of this research is upon the participation of Indigenous communities in water resource management at the grass-roots level in semi-arid region of India. This research will critically analyse the policies on integrated and participatory management in the Indian context. Further, this study will evaluate the community-based organisational structures developed for efficient water management in two Indigenous communities (*Gond and Kohli*) across three villages. The objective of this research is to observe sustainable water management practices which

3 A bottom-up approach is defined as a strategy to appreciate and incorporate local people and their local knowledge, skills, needs and experiences (Smith 2008, 354).

integrate Indigenous knowledge and to make recommendations to institutional structures to involve the communities in semi-arid landscapes in India in the management of their water resources.

The discipline of landscape architecture has always been an action oriented practice to improve the quality of land and resources through design, planning and management. This concern aligns with this research which aims to improve the process of water management. Thus, the discipline of landscape planning offers a productive field of knowledge and expertise to understand the interrelationship between human, cultural values and landscapes to achieve their long-term sustainability (Gobster, Nassauer, and Nadenicek 2010; Chivian and Bernstein 2008; Butler and Oluoch-Kosura 2006; Luz 2000; Thayer 1989; McHarg 1971).

1.2 Research questions and objectives

Given this context, the focus of the proposed research is on the role of the local social, cultural, and organisational institutions of Indigenous communities in semi-arid regions of developing countries that govern sustainable water management.[4] The research seeks to understand the experiences of the Indigenous communities and of the experts (resource planners, scientists, and managers) and their opinions on perceptions of an integrated management approach. The central research questions are thus:

Research question 1:

> How does the Indian Government's decentralisation policy actually devolve at the local level for sustainably managing water resources through the participation of Indigenous communities?

Research question 2

> What are the opportunities and constraints that arise from the decentralised and participatory water management approaches adapted by the Indigenous communities in the selected case studies and lessons learnt from them?

These two questions will be addressed in the two parts of this research. All of the key themes of the first research question are examined in Part One of the thesis and provide the analytical framework to address these two research questions in context specific detail in Part Two. The first question is based upon decentralisation attempts in national and state level

4 Preliminary findings from this study were submitted for book and journal publication and also presented at a conference. These papers are included in Appendix F, G and H respectively.

policies in India. The second question attempts to draw lessons from the Indian case studies by focusing on sustainability and Indigenous participation in water resource management in a specific context. In an attempt to answer the above research questions, the following objectives of this research emerge:

1. Investigate broad literature for particular definitions, elements, and characteristics of sustainable water management to assess the existing management processes of water resources;
2. Examine current water management policies and approaches for semi-arid rural areas in India;
3. Highlight significant aspects of the historical water management institutional structures and practices of the Indigenous communities of *Gond* and *Kohli,* and evaluate their potential contribution for integration in current water management institutions to address water problems;
4. Assess the current water management institutional structures and practices developed in the selected case studies in India;
5. Propose a framework for integrating the Indigenous communities and their knowledge in the mainstream process for sustainable development.

1.3 Rationale of this research

It is well acknowledged that over the past decade problems of water scarcity and conflicts are increasing especially in arid and semi-arid regions. In fact, 10% of the world's population occupies one-third of the earth's surface which is semi-arid or arid. Firstly, population pressures and pollution are causing urban and agricultural areas to be reliant on non-sustainable groundwater supplies. Increasing water demands create potential conflicts between human needs and those of native ecosystems (Sadoff and Muller 2009; Falkenmark 2003; Postel 2003; Shiva 2002; Gleick 1993). In particular, human impacts on riparian ecosystems are perhaps greatest in the arid and semi-arid regions of the world (Arab Water Council 2009; Mata 2008). Secondly, climate change and variability in climate are making a growing percentage of the earth's population vulnerable to both drought and flood. Semi-arid regions in the world, including those in the Indian sub-continent, are regarded as highly vulnerable due to unpredictable rainfall and increased frequency of droughts and floods (FAO 2008; Mata 2008) (refer Figure 1.1). According to recent Indian studies on climate change it has been predicted that there will be increased rainfall variability and higher temperatures in the semi-arid regions of India (Mujumdar 2008; Global Environmental Negotiations 2001; Indian Institute of Tropical Meteorology 1997). Therefore, it is extremely important to address

this issue of unreliable distribution of water by examining the water management practices in these regions of India which might be able to offer some aspects for a sustainable future. In this way, a study such as this can provide insights into sustainable water management in these vulnerable areas, and potentially offer recommendations for equivalent sites.

This study acknowledges that there is much rhetoric surrounding the concept of sustainability and the transition to more participatory modes of resource management. Most of this research originates from developing nations and rural settings. However, there is little analysis of how the Indigenous people in such regions may be involved as on-going collaborators. There has been minimal effort towards approaches that can cement continuous and lasting partnerships between different stakeholders. To understand how the principles of sustainability and participatory management can be applied to Indigenous communities, this research deliberately focuses upon three such communities within the semi-arid region of India. It aims to understand their approaches to water management which are rooted in their historical contexts and knowledge bases, combined with current thinking.

The reasons for undertaking this research include:

1. the need to investigate historical precedents of water resource management in semi-arid regions, and to establish links between historical techniques and the requirements of the current sustainable development debate, and to therefore obtain lessons from the past to inform contemporary water resource management;
2. the necessity for consideration of the unique impacts of the local natural, socio-cultural context on the management practices of water resources;
3. the need to recognise the role of Indigenous communities and their knowledge of resource management, with an emphasis on the limitations in semi-arid regions which are without any perennial source of water; and
4. to better understand the role and value of water resource management institutions as an opportunity for collaboration between Indigenous communities and technical scientists/ planning officials towards social change.

Furthermore, the research is further motivated by the researcher's personal concern to investigate and qualify water-based resource management in semi-arid areas in India. Guba and Lincoln (2005) have suggested the significance of 'self-reflexivity' in the process of research. The researcher here realises that her social and academic background will have influenced the current research approach in more than one instance. She belongs to a family

living in the study region, and has been born, and brought up in an area where on average two farmers commit suicide everyday due to non-availability of water.[5] In addition, she is fully aware of the hardships faced by the people who often have limited or no access to water for domestic use.

The researcher is a qualified Architect with a specialisation in Landscape Architecture with research interests in cultural landscapes, water conservation and sustainable management of natural resources involving communities. Her Master's thesis dealt with proposing a comprehensive cultural landscape development plan for the conservation of the traditional tank system of the *Gond's* and *Kohli's* in the same region of India. This created a personal interest in taking the research significantly further by examining the role of institutional structures and the engagement of Indigenous communities in resource management. In this way the current research work recognises the influence of the researcher's background on the study process as well as the opportunities this background presents in terms of her ability to interview Indigenous community participants' first-hand.

1.4 Research methodology

The contested and dynamic nature of the terms 'sustainability' and 'water management' were appreciated from the beginning of this study. As a result, it was acknowledged that an interdisciplinary approach would be needed to explore the vast differences across the disciplines of social, cultural, environmental sciences, and related professionals of technology, science, and planning. In addition, this research involves Indigenous people and therefore requires an interpretive historical study approach that acknowledges and explores socio-cultural aspects (Groat and Wang 2002). The methodology adapted for the study of traditional knowledge is not straightforward, and it is well to have some awareness of the considerable problems that attend to this work (Sillitoe and Barr 2004). An integrated perspective has been adopted here, and this implies a willingness to learn from both past and present approaches to water management with a genuine attempt to avoid the dominance of any one approach (Sillitoe and Barr 2004).

The first research question *How does the Indian Government's decentralisation policy actually devolve at the local level for sustainably managing water resources through the participation of Indigenous communities?* aims to understand the relationship between the Indigenous community, their traditional water management knowledge and system, and contemporary expert approaches. The second research question *What are the opportunities*

5 This statistics is based on the local knowledge of current affairs published in the local media.

and constraints that arise from the decentralised and participatory water management approaches adapted by the Indigenous communities in the selected case studies and lessons learnt from them? addresses the issue at a local context. As the study requires a multi-disciplinary approach, the research is located within the constructivist and participatory research paradigms which are most suited when the study involves an understanding of the various perspectives of stakeholders, at the same time acknowledging their 'experiential knowledge' (Denzin and Lincoln 2005; Heron and Reason 1997). Constructivist analysis and participatory research will be utilised for this research, to build a detailed account of cultural and social factors that cannot be measured by quantitative methods alone. Thus, this study addresses the critical need for a qualitative understanding of the role of Indigenous community participation in water resource management.

It was first considered necessary to develop a more comprehensive understanding of issues arising for Indigenous community participation, in order to improve the basis for recommending practical solutions. As a result, a case-study approach was adopted as the most appropriate methodology for this research, to develop a holistic explanation for Indigenous water management practices and their implications (Yin 2003).The time required for the study of Indigenous people was also important as it could be attempted in a short or long time frame depending upon familiarity with the community. Consequently, in this case an interpretive historical study was proposed to understand the water management system of the *Gond* and *Kohli* communities in India, as these belong to the researcher's place of origin and are known to the researcher.

In response to the two main research questions that structure this study, the research aims to develop a framework for an integrated approach to water management, which would combine an understanding of traditional knowledge with the prevailing technical, quantitative, and scientific approach of the water policy authorities.

The study reported here was conducted in three main stages (refer Figure 1.3). The first part sought to comprehend the wider theoretical literature for understanding the different concepts of sustainability, governance structures, water management, and Indigenous participation. This discussion brought together an analytical framework which was used as a tool for analysis of the case studies in the second part. The second part comprised extensive fieldwork involving open-ended in-depth interviews, analysis of government documents, archival interpretation, and field observations. This phase also comprised analysis of the data collected using the analytical tool developed in the first stage of the research. The final stage

brought together the discussions of parts one and two, and provided answers to the research questions.

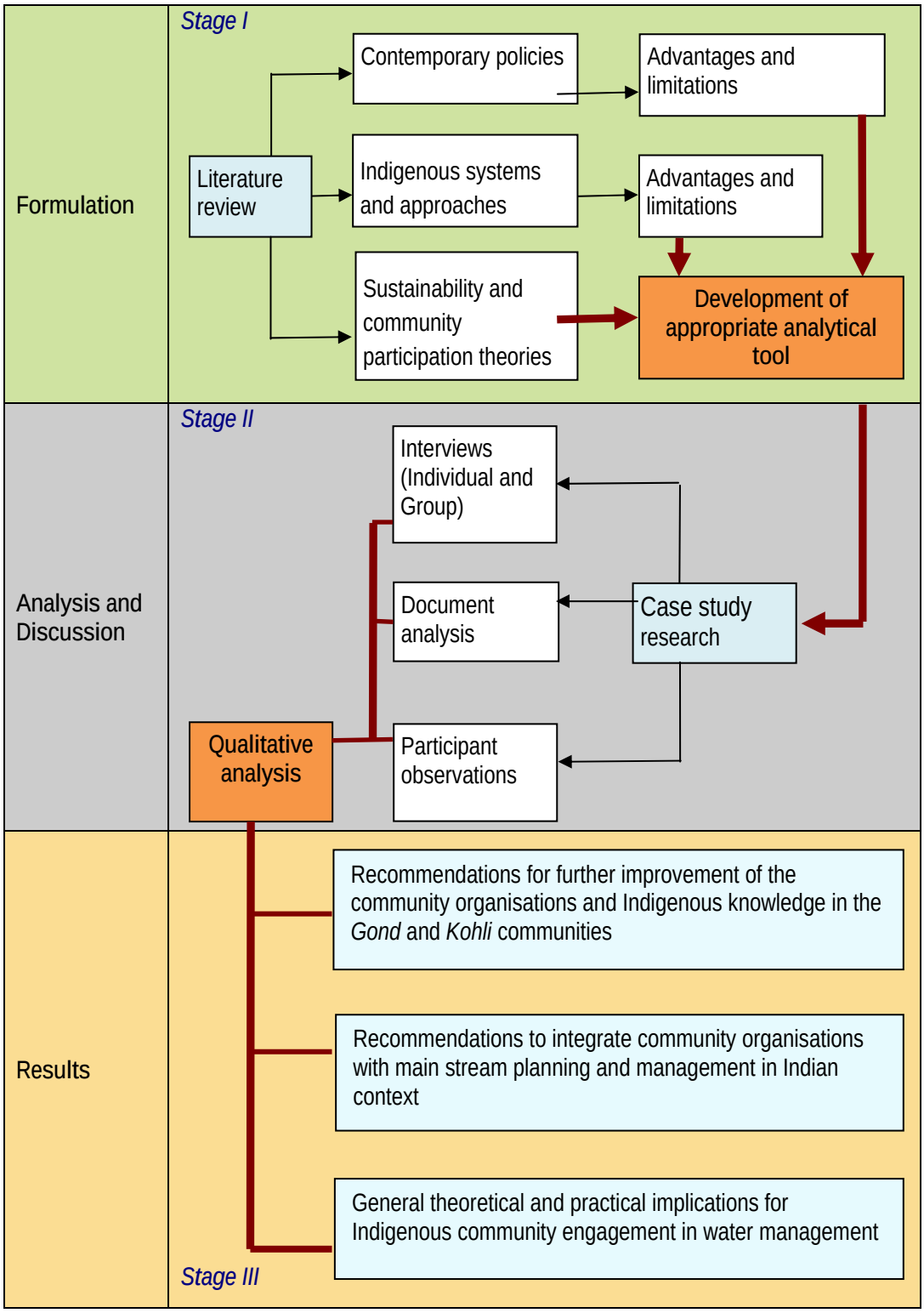

Figure 1.3: Three stages of research

1.5 Case studies

Given current water crisis identified thus far, it was decided early in the research process to select case studies in the semi-arid region of India. The Vidarbha region in eastern Maharashtra state is a semi-arid region and receives average rainfall of 107cm annually (Indian Institute of Tropical Meterology). The rationale for selecting Maharashtra State, apart from having a semi-arid climate, was that it is one of the pioneering Indian states to have a Water Conservation Department in place and also has proposed *State Water Policy* for the better integrated approach in its watershed management programs. In addition, the State is planning to restructure its institutional hierarchy through the establishment of the Maharashtra Water Resources Regulatory Authority (MWRRA). Moreover, it has had a thriving tradition of local action in water management (Narain and Chugh 2008; Lele 2000). Thus, this State provides an interesting context for investigating processes of institutional integration in water management.

It was decided that the study would be conducted in three villages namely Aashti, Mendha, and Rajapur, located in the semi-arid region of the Maharashtra State (refer Figure 1.4). The research was undertaken in the Indigenous communities of *Gond* and *Kohli,* who historically had developed an efficient water harvesting and management system in the central part of India, which was also known as the *Malguzari* system. The underlying idea was to choose case studies from similar climatic zones and having a common historical background of resource management, which would contribute towards facilitating a comparison across their current community-based resource management. Besides, having similar historical and cultural backgrounds but diverse environmental, social, economic, and institutional settings, was also expected to explain how and why particular ways of decision-making and management process were devised by the respective community.

Moreover, the selection of communities was important to comprehend the socio-cultural changes within the community, which have also altered their internal communal rights to natural resources. Pre-existing organisational structures, including both social and institutional, clearly have an impact on the management regime (Husain 2008). In order to gain an insight into the dynamics within these community groups, three diverse groups were selected: one a homogenous group of *Gonds* (Mendha) and another two heterogeneous groups containing a majority of *Kohlis* (Aashti and Rajapur). This gave an opportunity to widen the research to consider the impact on the entitlements and capabilities of community members, and to ensure intra-generation equity along with inter-generation equity.

It was considered that these similarities and differences would help towards a better understanding of the various ways in which the communities perceived sustainable water management. It was also acknowledged that these factors would have a strong influence on the process of water management in the case studies. Therefore, applying the analytical framework across the case studies helped in comparing the efficiency of the local institutional structures in managing their water resources in light of diverse challenges.

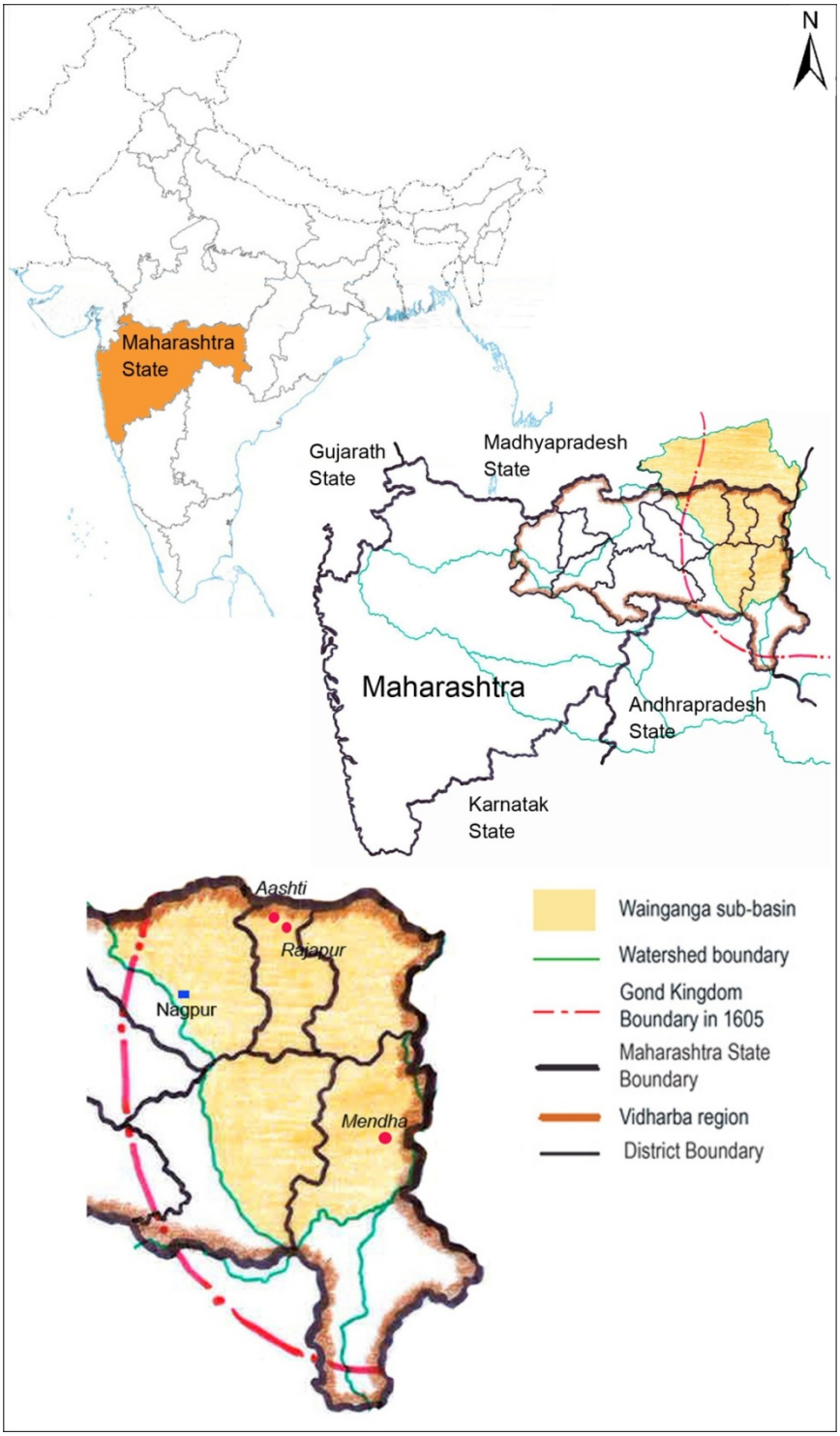

Figure 1.4: Location map of the selected case studies (Maps not to scale)

1.6 Thesis structure

This chapter has introduced the background of the study, the research questions, the rationale for conducting this research, and the phases in which the research was conducted. It will also outline the two part thesis structure referring to literature review and theoretical framework in first part and context specific detail analysis using the framework in the second.

Chapters 2 and 3 present the literature review and provide definitions of various concepts used in the analysis of the case studies. Chapter 2 discusses the key terms, 'sustainability' and 'sustainable water management'. It provides a global overview of various approaches and perspectives associated with water management to achieve sustainability of resources. This chapter also presents the concepts of Indigenous knowledge and communities. It argues strongly for the relevance of Indigenous communities in effective water management. The limitations and advantages of contemporary approaches to water are explored here. Chapter 3 presents the second part of the literature review, developing the theoretical framework. In this chapter, the concepts of governance and decentralisation for effective resource management are explained and their effectiveness in the process is explored. Further, this chapter investigates theories of community participation, comparing and contrasting various levels of participation. Factors that are responsible for effective participation are discussed including the importance of social capital, social learning, and the significance of the power and knowledge relationship. The chapter ends with the development of a cyclic model for sustainably managing water resources which is used to evaluate contemporary approaches.

Chapter 4 explains the research methodology and methods which cover the three phases of this research. The methodology was driven by epistemological principles that in turn guided the choice of research paradigms, methodology and methods. The case study approach is explained here, together with the rigorous methods of data collection, field notes, interviews, transcripts, and analysis processes applied. Ethical concerns involved in the conduct of this research are also discussed.

In the second part, Chapter 5 discusses current Indian water policies and evaluates their attempts to decentralise power to local institutions. The chapter seeks to address the first research question and evaluates the efficacy of Indian water policies in terms of their attempt to involve Indigenous communities. It also serves as a basis to interpret the opportunities and constraints these policies provide for adapting decentralisation at grass-roots level. The

historical nature of water management by the Indigenous communities of *Gond* and *Kohli* is understood and their relevance in the present context is also established.

Chapter 6 presents data collected during the fieldwork, building the three case studies. Background information of the three case studies is provided, with the approaches adopted for water management. The discussion reveals the various features of the decentralised institutional structures and participatory approaches undertaken by respective villages. Chapter 7 uses the theoretical framework from Chapter 3 to analyse the participatory decision-making processes. It focuses on what makes these approaches effective and reveals the various challenges faced by the communities. The chapter also identifies commonalities and differences across the three cases, which would help to further improve water management.

The final chapter summarises the research findings in relation to the two research questions outlined in Chapter 1 and further provides recommendations for future Indian government policies for developing a holistic policy towards integrating the Indigenous or local communities in water management process to achieve sustainability. It also provides recommendations for the Indigenous communities to enhance the adaptation of the National Government decentralisation policy. The Chapter concludes with recommendations for future research.

1.7 Definition of terms

Some of the terms used frequently in the thesis are explained below. These are not arranged alphabetically but listed structurally in terms of their occurrence in following chapters and relation to each other. The following terms describes the three-tier structure of *Panchayati Raj* Institution.

Panchayati Raj Institution – It constitutes a three-tier structure namely: *Zilla Parishad* at the District level, *Panchayat Samiti,* and the *Gram Panchayat* at the village level (refer Figure 1.5).

Zilla Parishad – *Zilla Parishad* is the representative body of all *Taluka's* constituting the district at the district level, and *Gram Panchayat's* at the village level.

Taluka or *Tehsil*- It is the lowest administrative unit formed by a cluster of *Gram Panchayat's*, which have the Block Office under its structure, responsible for all aspects of rural development.

Panchayat Samiti – *Panchayat Samiti* works at the *Taluka* level under the rural development office. It is a body representing elected members from the constituting *Gram Panchayat's*.

Gram Panchayat – It is the lowest-level unit of the three-tier *PRI.* It is an elected village council for a group of villages or for individual village (depending on the size and population).

Gram Sabha – *Gram Sabha* means a village council.

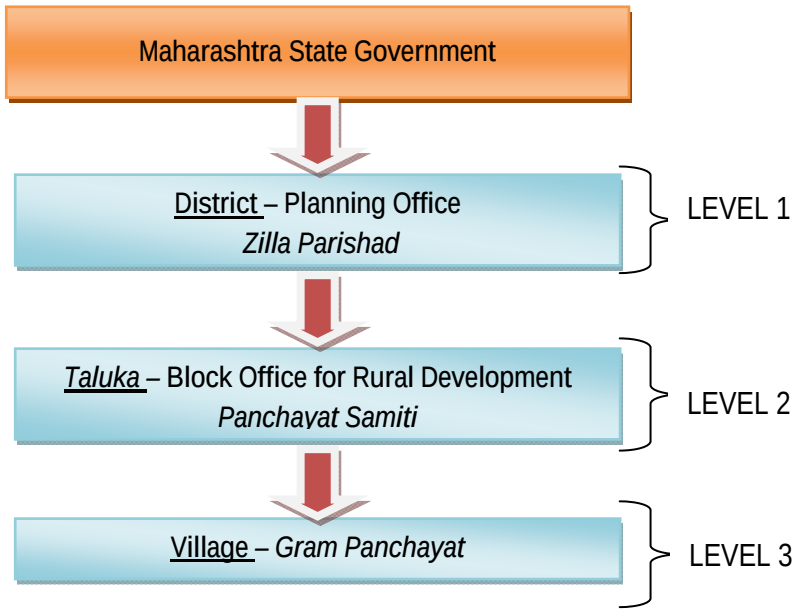

Figure 1.5: Three-tier structure of the *Panchayati Raj* Institution

The following set of terms is used in relation to explaining the *Gond* and *Kohli* traditional water harvesting system and current management practices.

Bodi – It means a small farm pond.

Bund – Retaining wall of the tank usually built from compacted earth.

Pankar – A landless labourer employed by the *Gond* chief for water distribution.

Pat – Channels made in earth for distribution of water from the tanks

Pokhar – Remnant water pools in a dry river.

Tudum – A step-like structure, with holes on each step, built on the *bund* of the tank, to allow water to flow into the distribution channel.

Malguzar- Person appointed during the Colonial period as a village head who was responsible for collection of tax.

Nistar rights – Customary rights of local people over natural resources.

Nistar Patrak – Recorded bona fide statement of customary rights

Aamsabha – It is a public meeting held in the presence of all villagers.

Sarpanch – Head of the Village *Panchayat*.

Shramadan – Voluntary labour

Tharav – Resolution

Tolas – Village hamlets

Chapter 2. Literature review

Introduction

Sustainability debates are complex and have implications for various disciplines. Consequently, it is beyond the scope of this study to aim for complete authority over this extremely contested and multi-faceted concept. This research attempts to understand *'sustainability'* with a particular concern for its implications on the *'process of water management'* and at the same time to focus deliberately on the role of '*Indigenous communities'* and their knowledge in the process of water management to achieve sustainability.

In the last two decades, the concept of 'sustainability' has been central to many discussions on economic development, socio-cultural improvement, human well-being, ecological protection, and natural resource management. Despite these multiple endeavours, there remains difficulty in achieving a comprehensive understanding of the concept (Kallio, Nordberg, and Ahonen 2007; Biswas 2005; Tortajada 2005; Becker, Jahn, and Stiess 1999). Problems of a lack of a clear meaning and realistic application remain, and these are clearly evident in the case of sustainable water resource management. The realization of water as the basis for the sustenance and development of all communities, together with its limited availability, has created an increasing necessity for the development of new water management regimes. As a result in recent years there has been considerable scholarly interest in the development of efficient sustainable water management policies by major institutional and government agencies. Generally these initiatives have offered extensively centralised, technological, and capital-driven approaches. Nevertheless they often remain incompatible with the local situation in terms of the physiography, and the climate, as well as the lifestyle, values, and attitudes of people. Even where some studies have tried to address local concerns and suggested a more decentralised and participatory approach, the significance of community participation in the management of water resources has still largely been overlooked by policy-makers and the local implementing authorities. In particular, very little attention has been given to integrating the long, historically-founded Indigenous practices of water management into contemporary understanding. Moreover, there have been very few explorations to understand these traditional systems in detail, and to evaluate their sustainability in the present context.

The first section of this two-part chapter clarifies the conceptual debate about sustainability and the various approaches proposed for sustainable development. It attempts

to focus on the process of sustainable management of water resources by highlighting the recent development of an integrated approach to management. It argues the significance of a 'participatory paradigm' within sustainable water management. The second section then aims to develop an understanding of the participation of Indigenous communities in water management against a backdrop establishing the relevance of Indigenous knowledge for sustainable development. It highlights the few successful efforts undertaken to involve Indigenous people in sustainable water management. Finally the chapter concludes by identifying certain principles of sustainability that are also an integral part of Indigenous practices, and argues for the need to develop institutional structures to incorporate Indigenous communities in mainstream planning processes.

2.1 Sustainable water resource management

Recently the term 'sustainability' has become a catchword and over the last few decades there has been debates among various disciplines about the evolution of the term from 'concept' to action based 'process' . The following section explores these developments and, while it does not aim to be comprehensive, it addresses the major debates chronologically evolving around the concept of sustainability, which are directly aligned with this research.

2.1.1 Sustainability and its various dimensions

The core idea behind the term sustainability must first be situated within the realisation of the change in relationship between the natural environment and humans, with the latter attempting to take control over the former. Growing concern over this issue brought together many theorists, and even governments, to formulate a way out of the myriad environmental as well as social problems which would affect future development if these conditions continued (United Nations 1973). However, these discussions mostly focused on what was termed 'environmentally sound development', and specifically social, institutional, and economic dimensions (Mebratu 1998, 501). The *World Conservation Strategy* (WCS) published by the International Union for Conservation of Nature and Natural Resources (IUCN) (1980) initially sought to address this by seeking a compromise between environmental concerns and development. Although the focus of this strategy was mainly on environmental conservation, it also emphasised the mutual dependency of conservation and development, at the same time, ensuring the welfare of all forms of life on the earth. However, despite its attempts to engage the 'average citizen' in these key issues, the WCS failed to achieve any form of practical participation at the grass-roots level (Moffatt 1996, 12).

In 1987, the term 'sustainable development' was first formalized in the World Commission on Environment and Development (WCED) report *Our Common Future*, also known as the *Brundtland Report*. Here the term was defined in the following way:

> Humanity has the ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs.
>
> (WCED 1990, 25)

This definition received widespread consensus as it addressed key social, environmental, and economic issues including "poverty alleviation, environmental improvement, and social equitability through sustainable economic growth" taking a unifying approach to concerns which were until then dealt with in isolation (Mebratu 1998, 501-502). However, this was rather a broad definition of the term which makes it difficult to assess 'development' and how to achieve balance between the social, environment and economic aspects of the triple – bottom line (Williamson, Radford, and Bennetts 2003). Furthermore, economic development was given the strongest priority in the policy-making of resource management so social aspects were often sidelined (Elliot 2006). Consequently, by constructing such a broad picture of the existing opportunities and constraints for sustainable development, the WCED failed to effectively translate the policies into an action plan (Moffatt 1996). A later definition given by the IUCN (1991, 10) presented a similar broader perspective, acknowledging that development is not possible without consideration of the environment: "Improving the quality of human life while living within the capacity of supporting ecosystems".

Following the WCED report, the *Earth Summit* or the United Nations Conference on Environment and Development (UNCED) was held in Rio de Janeiro in 1992. The main contribution of this conference was the development of *Agenda 21*, which was an attempt to initiate some action and enable further understanding of the complex relations between the trio of cultural values, the environment and the economy. Furthermore, it stressed the need to develop a 'bottom-up' and participatory approach by individual national governments at different scales which was a new and significant development in emphasis.

As this brief outline suggests, early efforts to define sustainability yielded little shared understanding due to diversity in perceptions and this variety of attitudes and interpretations persists. The process of defining 'sustainability' has recently been challenged and three current debates are emerging. The main debate is between those examining

sustainability through scientific, technological, and economic growth and those who believe that it cannot be achieved through a primarily economic structure. The earlier concept, known as 'weak sustainability', is based in neo-classical economic theory and it argues that increased economic growth which is equitably distributed will deliver the necessary improvements to the human condition (Purvis and Grainger 2004; Neumayer 2003; Mebratu 1998). This approach fits well with the conservation movement within industrialised nations and with international development agencies and research institutes. They aim to achieve sustainable development by quantifying environmental impacts by detailed scientific, economic and policy analysis (Tortajada 2005; Biswas et al. 2004; Wheeler 2004).

In contrast, there has been a minor emergence of environmentalists and sociologists who believe that a truly sustainable development concept is unable to coexist within current capitalist approaches. From this perspective the issues which then need to be considered are about *what* we consider as basic needs and *whose* basic needs are in focus (Tortajada 2005; Wheeler 2004; Williamson, Radford, and Bennetts 2003). This approach is referred to as 'strong sustainability' and it values 'natural capital' in an environment-centric approach (Neumayer 2003).

Many theorists believe that today the concept of sustainable development has largely evolved from the 'weak' position. Some continue to argue that the natural environment can be protected by assigning a value to its use based on people's willingness to pay (Dresner 2002). There have, however, been numerous criticisms of this approach due to several issues: how to ensure equity among various groups in society; how to reach equitable positions for developed and developing nations (Biswas 2005; Easter and Hearne 1995); and how inter-generation resource needs could be reflected within the current economic market (Shiva 2002; Easter and Hearne 1995).

Several other rifts impede the implementation of action based on clear goals of sustainability. One significant debate continues between the 'Deep Ecologists' and 'Social Ecologists' about social and environmental equity (Biswas 2005; Wheeler 2004; Norberg-Hodge 1986). There has also been a particular, though minor, emergence of concern as to what extent could the knowledge and practices of Indigenous people be used as models of sustainability (Sillitoe 2007; International Council for Science 2002; Gorjestani 2000; Agrawal 1995a). A particularly relevant approach was taken by Becker, Jahn, and Stiess (1999, 7) who defined sustainability from the field of social sciences, emphasising the human-nature relationship as a product of "strategies and socially negotiated goals which refer to the interactions between societies and their natural environment, including the mutual interference

of different societal processes among themselves and with ecological processes". From this perspective, engagement of Indigenous or local people is crucial for any attempts towards sustainable development.

In addition, there is much diversity across developed and developing nations in terms of physical environments, natural resources, social norms, cultures, financial situations, and institutional frameworks. The effectiveness of governance structures and legal frameworks differ from country to country and region to region depending on these aspects. Further, countries are at different stages of development and their needs vary across time (Tortajada 2005). However, despite these dissimilarities, policies and institutional structures are often being copied from developed nations by other less industrialised countries, often without due consideration of the local context and the specific needs of the local communities.

Today, despite these weaknesses and contradictions regarding the definition of 'sustainability', it can be acknowledged that the concept is unique in terms of its attempt to incorporate environmental and inter-generational and intra-generational dimensions within the dominant neo-classical economic development theory (Purvis and Grainger 2004; Elliot 2006). It is an extremely significant step to bring together several issues like social equity, health, fiscal controls, natural resources, poverty, and technologies which were previously dealt with in isolation. Moreover, the term also encourages collaboration between diverse disciplines with experts claiming that an integrated framework is required to understand complex natural and human systems for their long-term well-being.

Consequently, it is clear that sustainability is a complex and dynamic phenomenon that requires an integrated approach to understanding the whole range of issues that are central to its operationalization (Jabareen 2008; Soderbaum 2007; Tortajada 2005). The dynamic nature of the concept is pointed out by Kallio, Nordberg, and Ahonen (2007) and Newman (2005) who believe that sustainability is best treated as an 'evolution' and a process that is prone to continuous change and adaptation. According to Kallio, Nordberg, and Ahonen (2007, 48), understanding the process of sustainability is of high relevance as "the purpose of the journey is not to reach the destination – the purpose is the journey itself".

To summarise, there have been numerous positive developments in the past decades that have attempted to understand and enrich the concept of sustainability, whilst adding further complexity to the concept too. Many of these have resulted in increasing general, academic, and institutional awareness about the need to take drastic measures for the long-term well-being of not only human-beings but also of the natural environment. It has been shown how important it is to comprehend the concept of responsibility towards our

natural resources, which complements earlier Indigenous approaches to resource management. The concept of 'sustainability' has evolved as a complex system for a possible solution to a range of problems for a better future. This research aims to understand the process of water management and proposes integrated community participation as an increasingly important step to achieve sustainable water management. The following section discusses the various dimensions of sustainability in relation to shifting priorities and models developed to further explain the interrelationship between these dimensions.

Shifting priorities in the sustainability debate

The complex nature of the concept, and the difference in understanding of the term 'sustainability' across social, economic, environmental, and institutional discourses, requires an understanding of the key dimensions of sustainability. This can clarify the term from a broader perspective. Furthermore, this section discusses the various dimensions of sustainability and shifting priorities that have emerged in varied discourses and identifies the ways these dimensions have been modelled to further clarify the most important underlying principles of sustainability.

Since the *Brundtland Report*, in 1987, the principal dimensions of sustainability are customarily seen as social, ecological and environmental. However, most of the literature focuses attention on environmental and economic issues, and the social dimension is comparatively less addressed. Nevertheless, various authors have exemplified different aspects of the social dimension. Coleman (1990) has identified social organisation with features such as trust, norms or reciprocity and networks of civil engagement. Identical to this is Ostrom's (1990) emphasis on the richness of the organisational ability and social structures within a social organisation. Putnam (1993) further argues the importance of civic participation for social cohesion in addition to the benefits of economic development.

Becker, Jahn, and Stiess (1999) have proposed three broad dimensions of sustainability: analytical, normative, and strategic. The analytical approach focuses on social development within ecological limits, whereas the normative aspect connects the dimensions of equity (inter-generational and intra-generational and gender) with justice within the social environment (Jabareen 2008; Becker, Jahn, and Stiess 1999). The strategic dimension stresses the importance of an effective governance structure with co-ordination at all levels and scales (Franks and Cleaver 2007; Meppen, Bellamy, and Ross 2005; Becker, Jahn, and Stiess 1999). This strategic dimension is also argued as 'institutional' in recent literature with refined theoretical understanding, emphasizing the aspects of participation, social equity, and

also democratic and political processes for achieving it (Bohnet 2006; Borrini-Feyerabend and Tarnowski 2005; Keiner 2005; Spangenberg 2002).

Social sustainability has traditionally been considered to encompass a component of culture. However, in current debates culture is gradually emerging out of the realm of social sustainability posing a distinct dimension of sustainability (Duxbury and Gillette 2007; Nurse 2006; Hawkes 2001; Berkes and Folke 2000; Sustainable Development Research Institute 1998). Culture has largely been associated with the conservation of 'arts' and 'cultural heritage' including environmental philosophy, cosmology, and Indigenous ecological knowledge in the past (Duxbury and Gillette 2007; Posey 1999; Slikkerveer 1999; Berkes and IUCN 1989). However, more recently the debate has moved beyond these to include culture as a "whole way of life" and as "human interaction with the environment", and to focus on institutions that ensure effective implementation of these relationships (Nurse 2006, 36; Berkes and Folke 2000; Warren, Slikkerveer, and Brokensha 1995). This widened understanding of the concept of culture brings a whole range of cultural aspects together including Indigenous knowledge systems, within development activities (Warren, Slikkerveer, and Brokensha 1995). Thus, culture was stressed as an independent dimension of sustainable development.

Building on this cultural emphasis, the Sustainable Development Research Institute (SDRI) (1998, 18), based at the University of British Cokumbia, has defined "cultural sustainability" as "the ability to retain cultural identity, and allow change to be guided in ways that are consistent with the cultural values of the people". It has now been established that sustainable development and flourishing of culture are interdependent (Hawkes 2001; SDRI 1998). Hawkes (2001) further relates that a sustainable society depends upon a sustainable culture. Therefore, consideration of complex cultural arrangements within a society and their relationship within their specific ecological context has become fundamental to the understanding and operationalisation of sustainability. This approach aims to address the issues of caste and other social hierarchical structures which have developed as a result of complex and diverse cultural systems.

These various dimensions of sustainability are not mutually exclusive, but instead intertwine in the necessary tradeoffs that are innate in any decision-making process. These inter-relationships between dimensions further increase the complexity inherent in sustainability and decision-making. Mebratu (1998) elaborates 'holistic sustainability' by emphasizing that for a sustainable outcome, interaction between each part is as important as sustainability in relation to the needs of an individual. In order to understand these

relationships, the next section discusses links between the various dimensions, represented in theoretical models.

Models

These various dimensions and principles of sustainability have been applied to generate models of sustainability to understand their inter-relationships. The earliest model was a simple Venn diagram depicting a rationalization of the interaction between the economic, environmental and social dimensions of sustainability (refer Figure 2.1). This is also called the 'Three circles model' that emphasises the three named elements as the basic aspects of human society. However, there are significant problems with this model. Autonomy given to individual elements, lack of their integration, and the resultant prioritisation of one element over another are major obstacles in achieving sustainability (Giddlings, Hopwood, and O'Brien 2002). Furthermore, the model does not clearly address the aspect of the "human quality of life" within the sustainability concept (Keiner 2005, 380) a theme that has become increasingly prominent in sustainability debates.

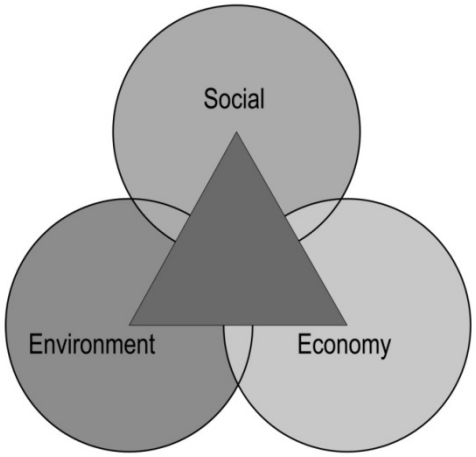

Figure 2.1: Venn diagram

Conceptually, the IUCN later proposed the 'Egg model' in 1994 which emphasised that people are within the ecosystem (Guijt and Moiseev 2001). The second model in figure 2.2 is referred as an 'Egg model'. This development implies a shift towards an ecological worldview. It further upholds that all economic development should be bent towards social progress and that these combined goals must be achieved together within the environmental carrying capacity of the place (Keiner 2005; Wheeler 2004; Giddings, Hopwood, and O'Brien 2002; Guijt and Moiseev 2001) (refer Figure 2.2). This embedded model thus suggests a

movement towards 'strong' sustainability implying that economic values are only a subset of larger social and ecological values (Wheeler 2004; Giddings, Hopwood, and O'Brien 2002).

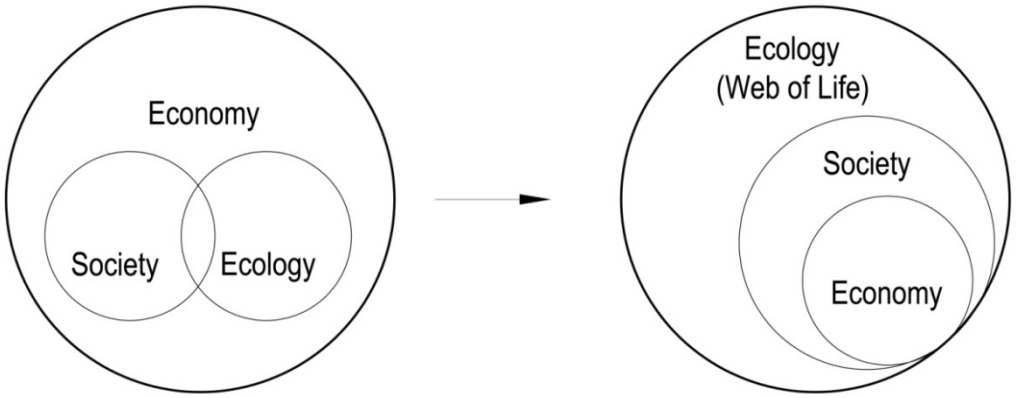

Figure 2.2: **Transition from economic to ecological perspective** (Wheeler 2004, 31; Mebratu 1998, 513)

Apart from the circle models, Ekins and Max-Neef (1992) proposed a tetrahedron model as an integration of the ethical, ecological, social, and economic aspects (refer Figure 2.3). This model implies no hierarchical pattern and suggests equal importance to each aspect (Moffatt 1996). A similar 'prism of sustainable development' is adapted by Spangenberg (2002) which focuses on four dimensions of sustainability namely: Environmental (natural capital); Economical (man-made capital); Social (human capital) and Institutional (social capital) (refer Figure 2.4). This kind of model helps to represent the complexities as actions involved in sustainability without imparting hierarchy to any single aspect. It also substantiates the notion that sustainability can be achieved simultaneously across all four dimensions, if regular interaction is maintained between them (Keiner 2005).

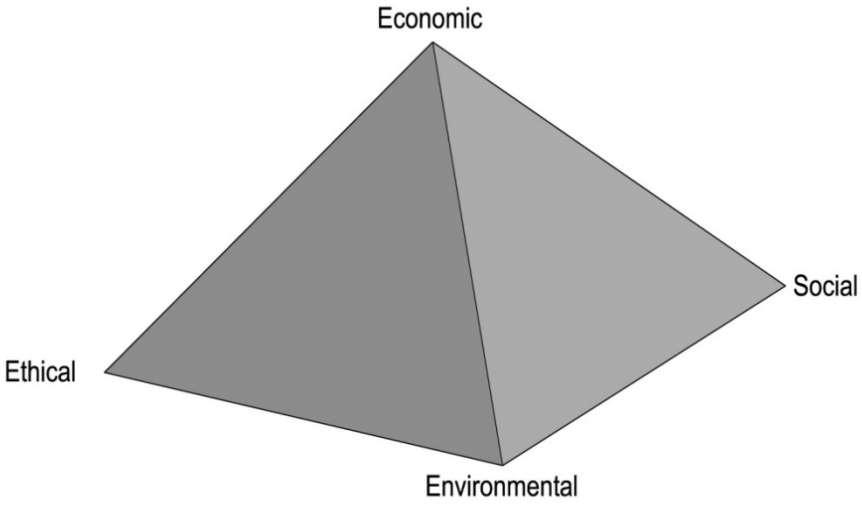

Figure 2.3: **Tetrahedron model** (Ekins and Max-Neef 1992, 87)

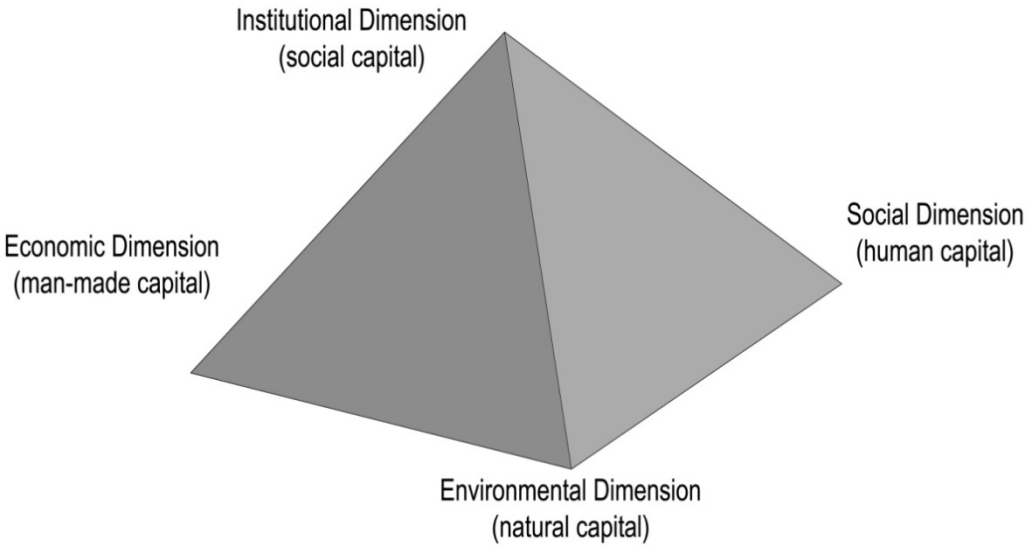

Figure 2.4: Prism model (Spangenberg 2002, 303)

Since the initial emergence of culture as a separate entity, there have been two significant models proposed, which incorporate a cultural component. The first one is adapted from Hawkes (2001), who addresses the need for integration of a cultural perspective into public planning for its vital role in community sustainability in terms of quality of life (refer Figure 2.5). Then, similar to the Venn diagram model, New Zealand's Ministry of Culture and Heritage (2006) proposed a model interconnecting cultural, social, environmental, and economic considerations through community well-being for sustainable development (refer Figure 2.6). With a similar goal, Nurse (2006) proposes culture as a central pillar in a model, thereby allowing a greater diversity in policy choice, at the same time stressing the context-specific nature of the choices (refer Figure 2.7).

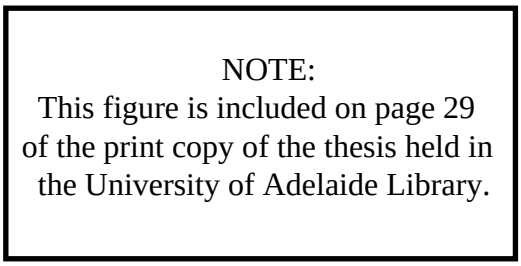

Figure 2.5: Holistic model for community sustainability (Runnals 2006, 10)

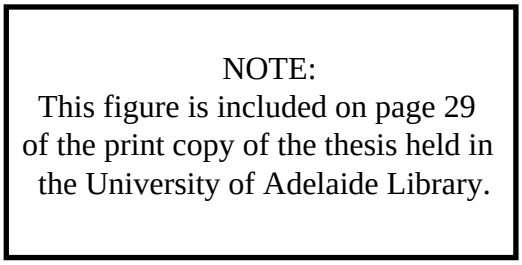

Figure 2.6: Four well-beings of community sustainability (New Zealand Ministry for Culture and Heritage 2006, 5)

Figure 2.7: Culture as central feature of sustainability (Nurse 2006, 40)

These diverse models represent the shifting relationships between dimensions of sustainability and differing priorities that need to be further developed to achieve an improved sustainability structure. The above discussion has highlighted the need for an integrated model that incorporates all the key dimensions and better elucidates the evolutionary and dynamic nature of sustainability. Therefore, a cumulative model, based on the review of literature has been devised for this specific research and is illustrated in Figure 2.8. This model brings together all the five principal dimensions of sustainability: social, cultural, environmental, institutional, and economic, that have emerged during the evolution of the discourse on sustainability and establishes the inter-connectedness of these dimensions as a process of constant transformation. The model thus establishes that a variation in any one dimension is cause for and consequence of variation in another.

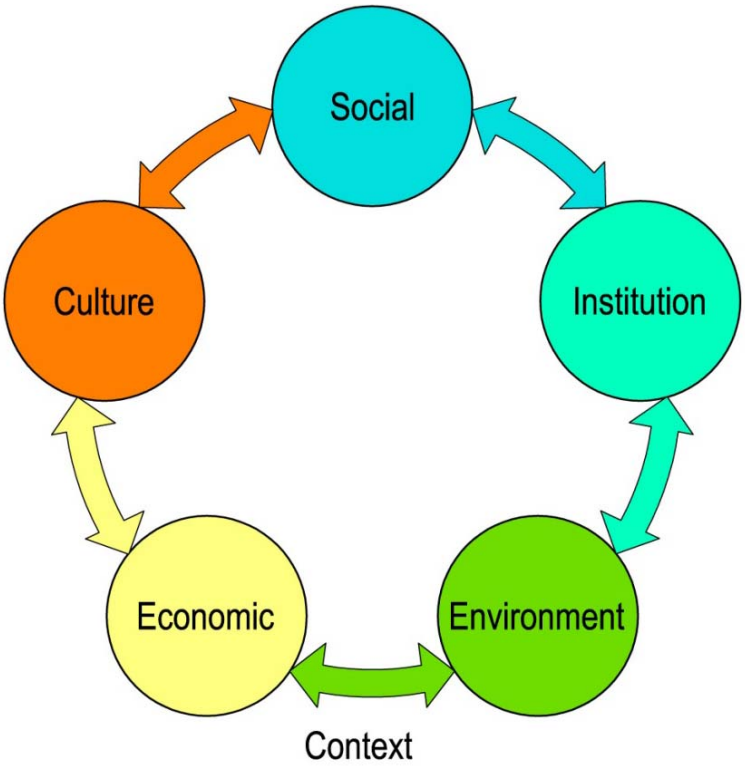

Figure 2.8: Cyclic sustainability model proposed by researcher

Principles for realising sustainability

Thus we can see that, owing to the complexity of the term and its extensive and diversified application, it is not possible to have one common set of principles of sustainability. Furthermore, as there is an evident shift in priorities in the concept of sustainability, there is also recurrent progress to develop principles for action to achieve sustainability. From the previous discussion it is evident that the various scholars discussed above have proposed diverse principles relevant to their discourses. For example, the Rio Declaration from the UNCED in 1992 drafted 27 principles. Another set of principles was proposed in *Agenda 21* which adopted the Rio declaration and is considered as a local implementing guide to sustainability. Three principles of sustainability were proposed by Giddings, Hopwood, and O'Brien (2002), supporting the established arguments on sustainability: futurity (inter-generational and geographical needs); equity (across intra-generational, gender and caste); and importance of biodiversity (inter-species equity). The emphasis on inter-generational and intra-generational social and biodiversity equity thus reinforces the early *Brundtland Report*. Both Meppen (2000), and Palmer, Cooper, and van der Vorst (1997) reinstate similar principles as futurity, public participation, environment, and equity. The former of these justifies the role of flexible institutional structures for effective participation in decision-making.

It is clear that governance structures establishing frameworks integrating both 'top-down' and 'bottom-up' approaches are needed to effectively operationalise sustainability (Meppen, Bellamy, and Ross 2005; Kranz 2004; Berkes 1991; North 1990; Ostrom 1990). Furthermore, systems must be integrated to ensure that all factors concerned with social, environmental, economic and cultural well-being are considered for sustainability planning and management (Miller 2005; Tortajada 2005; Pezzoli 1997).

A significant tool in effectively implementing the complexities of this integrated sustainability planning is agreed to be public participation or community involvement (Mostert 2006; Mishra and Bajpai 2001). Therefore in recent literature, community participation and empowerment through social capacity building have emerged as key factors in decision-making across various levels (Soderbaum 2007; Tippett, Handley, and Ravetz 2007; Pahl-Wostl et al. 2007; Casari and Plott 2003; Agrawal 2001; Pretty 1995).

In addition, it is essential that these integrated, and participatory approaches must adapt to the changing contextual conditions (Olsson, Folke, and Berkes 2004; Folke et al. 2002). Social, cultural, and ecological systems are under continuous change. Given this uncertainty current management approaches must build on the existing knowledge and understanding of the ecosystem and accordingly develop practices that respond to the ecosystem (Berkes and Folke 2000). In order to achieve this, it is increasingly proposed to develop institutional and organisational structures that can undertake these adaptive processes (Dale et al. 2000; Meppen 2000).

Thus, the importance of developing a coherent set of sustainability performance criteria has been established as a result of this literature review. These performance criteria can be adopted as an instrument across all social, cultural, geographical, and disciplinary boundaries to operationalise sustainability. The following table summarises the primary concepts that have emerged from the literature review and performance criteria for the theoretical concepts that can be used to evaluate effective sustainability process. Thus, this table helps to move forward from setting the sustainability goals to actual actions or processes to achieve them.

Key concepts – Emerged from literature	Performance criteria – To evaluate the key concept of sustainability
Governance and effective institutional structures Effective decentralised institutional structures with co-ordination across various levels. Decision-making powers with the local institutions.	
Integrated multi-disciplinary approach Consideration of all dimensions of sustainability: social, cultural, economic, environmental, and institutional in the decision-making process. Also integration across various disciplines and departments in an organisation.	
Ecological integrity Understanding the biological diversity and complex ecological processes and considering humans a part of the system. Responding to the unique local natural context.	
Participation and empowerment – capacity building and social learning Support and involvement of the whole community in the process of decision-making. Empowerment of local communities (who are not always involved) to mobilise local knowledge, and to ensure capacity building of the community.	
Equity – inter and intra generational and gender Social equity in terms of conserving water for present as well as future needs. Equal representation and sharing across gender boundaries.	
Adaptability Continuous improvement in the planning strategies is needed to adapt to the changing environmental, social, technological, and economic aspects over time.	

Table 2.1: Summary of principles for realising sustainability

In the above discussion, summarised in Table 2.1, the complexities of the discourse of sustainability are evident. However, five prominent dimensions of sustainability have emerged: social, cultural, environmental, economic, ethical, and institutional. These dimensions have to be understood in relation to each other to comprehend sustainability effectively. The discussion has also highlighted certain important principles of sustainability that should guide active sustainable planning and management and, by extension, sustainable water resource management.

Resource management and sustainability

A recent concept of resource sustainability has surfaced under the umbrella of ecological sustainability (Holling, Berkes, and Folke 2000; Paehlke 1999). It is now widely accepted that there is major crisis in the management of natural resources. There is an urgent need to look into new policy directions towards the sustainable use of natural resources. Current policies tend to view natural resources as commodities (Gadgil and Berkes 1991), but evidently in a larger context this concept is not conducive to sustainability. Many scholars

have highlighted the inadequacy of the western science as being technical, reductionist, and detached from local people (Shiva 2002; Colding and Folke 2001; Holling 2001; Holling, Berkes, and Folke 2000). Therefore, an integrated and interdisciplinary approach is needed to understand and manage of natural resources. This involves rethinking resource management in terms of: cultural capital as a significant dimension of sustainability (Berkes and Folke 2000); and taking into consideration the evolutionary character of social and natural systems (Holling, Berkes, and Folke 2000).

One aspect of resource sustainability that is particularly significant in local contexts is the practical operation of resource management. Before considering water resource management, it is necessary to briefly set out what the terms 'development' and 'management' mean in the context of resource management. The term 'development' has been mostly associated with growth. However, development has been defined as "a process of directed change" (Lele 1991, 609). Thus, it includes both the goals of the process and the means to achieve them, although the distinction between the two is rarely considered. Consequently, for a research project of this kind, both the goals and the process must be considered. 'Management' in this context comprises inventory, assessment and research; decision-making; policy-making and planning; implementation; monitoring and evaluation; and enforcement (Pinkerton 1989). In simple terms, it is a process to accomplish desired goals. Also, this process needs to be participatory, enabling meaningful engagement of all stakeholders during the planning and management process (Tippett, Handley, and Ravetz 2007).

Fundamentally, a participatory approach involves the sharing of power and responsibilities between all stakeholders i.e. between the government and the local community (Berkes, George and Preston 1991). In this regard, Ross, Robinson, and Hockings (2005) recommend the adoption of an 'adaptive management' approach for participatory management. This would more likely offer the opportunity to improve and develop the participation process at every stage and develop effective relationships. Holling (1978) described adaptive management as a cyclical process that adopts a learning approach to environmental management. This could be related back to the principles of sustainability which needs an adaptive learning approach. This cyclic approach involves assessing, planning, implementing, monitoring, and evaluating and this would then further link to the next management cycle which would improve on the previous cycle. Such an approach will be particularly useful in the case of natural resource management where there is contested authority over the management responsibilities (Ross, Robinson, and Hockings 2005).

Furthermore, this kind of management, through its steps – action, feedback and changes – allows for institutional learning (Holling, Berkes, and Folke 2000).

The concept of resource management differs from one interest group to another so the term is complex to define. This complexity is further compounded by the fact that these interest groups may range from the international through to the national to the local level (Est and Persoon 2001). Conventionally, resource management is considered to be a government business as all natural resources are considered to be the property of the nation.[1] However, over the year's government management practices have not provided desired results in most countries in the world (Lahiri-Dutt 2008; Iyer 2008, 2007; Berkes and Folke 2000; Gadgil, Berkes, and Folke 1993). Hence, this assumption needs to be rethought. Therefore, in this research the term 'sustainable adaptive management' is employed, instead of 'development', as the aim is to understand the *process* of sustainable water management to achieve sustainability of the resource.

2.1.2 Sustainable water management

Given the threats to water resources in arid and semi-arid regions, management of these resources must be sustainable. The simplest definition of 'Sustainable Water Resource Management' (SWRM) is to manage water resources while taking into account the needs of present and future society, industry, and the environment, while also conserving the water quality. However, this still resonates with 'top-down' approaches. Water resource management for sustainable development also requires a deeper understanding of community roles, knowledge of water within greater natural systems, and consideration of basic human needs (Agarwal et al. 2000; Gleick 1998; Easter and Hearne 1995; Cortner and Moote 1994; Viessman 1990). The International Hydrological Programme, a UNESCO initiative, noted:

> It is recognised that water problems cannot be solved by quick technical solutions; solutions to water problems require the consideration of cultural, educational, communication and scientific aspects. Given the increasing political recognition of the importance of water, it is in the area of sustainable freshwater management that a major contribution to avoid/solve water-related problems, including future conflicts, can be found.
>
> (World Water Assessment Programme 2006, 10)

1 This attitude is also evident in the current Australian Labour Government's proposed Mining Tax, which emphasises that all natural resources are property of the nation and any profit obtained from their extraction should be used for the benefit of community and be equally shared.

According to Loucks (2000, 46), “Sustainable water resource systems are those designed and managed to fully contribute to the objectives of society, now and in the future, while maintaining their ecological, environmental and hydrological integrity”. However, in this respect there has been little effort to understand the objectives of community in terms of their socio-cultural and economic relationships to water resources. The following section discusses some of these issues by identifying varied interpretations of SWRM. In doing so, it also maps the major principles underlying this concept.

There were numerous policy declarations related to SWRM in the 20th century at both international and national levels. Some of them were issued by international organisations such as the UNESCO, the IUCN, and the UNEP, while others were issued at national levels providing interpretations of earlier international reports in the context of particular countries. The primary goals of these 20th century water management and planning initiatives were to support increasing levels of economic development. However, consideration of basic human needs, ecological water requirements, socio-cultural aspects of the community, and the desires of future generations were excluded from these policies (Gleick 1998). The policies were very broad and generalised for all types of natural environments, focusing on sustainable development at the national level (Cortner and Moote 1994; Easter and Hearne 1995). They did not mention the actual management process and sustainable development at the local level. Consequently, there is an urgent need to ‘work’ (process) at sustainability if we have to ‘become’ (goal) sustainable (Kallio, Nordberg, and Ahonen 2007; Ford 2001).

This kind of fragmented and economic focus has also resulted in various social problems like water conflicts, displacement of native people, and inequitable allocation of water (Shiva 2002; Gleick 1998; Easter and Hearne 1995). Conflicts over water are currently taking place within certain countries, in different regions in a country and within different societies. The conflicts are between groups identifying water as a commodity who are in favour of privatization; and those who value the role of water as an ecological necessity. Conflicts over water resources in Bolivia, between Syria and Turkey, or Egypt and Ethiopia, are a consequence of these differences in paradigms. The roots of these conflicts lie in exploiting natural resources in order to satisfy the greed and way of life of 20% of the population of the earth, which will affect the rights of the remaining 80% of people to obtain their equal share (Shiva 2002). Mahatma Gandhi had correctly said, “The earth has enough for the needs of all, but not the greed of a few” (as quoted in Shiva 2002, xv). Destruction of water resources and water catchments has resulted in a wide range of ecological problems including droughts, cyclones, floods, and tsunamis; acidification of water; spread of non-native

species; increasing salinity; and unsustainable fisheries management (Biswas et al. 2004; Shiva 2002; Gleick 1998; Covich 1993).

Therefore, by the end of the 20th century many scholars have suggested a need for a new intelligent, holistic, decentralised, collaborative, and participatory approach to water resource management that replaces 'top-down' hierarchical structures and technological solutions (Pahl-Wostl et al. 2007; Gleick 2000; Cortner and Moote 1994; Covich 1993). Similar statements have come from the 1977 *Mar del Plata Water Conference*, the 1992 *Dublin Statement*, Chapter 18 of the 1997 *Agenda 21* from Rio, the 2000 World Bank Report entitled *Global Water Partnership,* and, more recently from the 2003 GWP-TAC paper by Rogers and Hall on *Effective Water Governance*. All these sources have emphasised the need for an integrated approach. In order to support this kind of paradigm, it is agreed that new 'Governance structures' need to be developed that coordinate water resource planning and management at all levels of government (GWP 2006; Matondo 2002).

2.1.3 Paradigm shift in the concept of sustainable water management

Therefore, it is clear that sustainable water management is increasingly being understood as a complex interaction of natural and human systems with emphasis on process to achieve desired product. There is also a growing realisation that solely technological and quantitative solutions provide a fragmented approach and, thus, are not able to solve the current water management problems. In addition the emergence of water markets deprive the poor of their democratic and human rights to water. Globalisation is converting water from a common good to a tradable commodity. This has further eroded the community management systems and given rise to inequity and injustice (Mishra et al. 2008; GWP-TAC 2004; Shiva 2002). Water crises have been a result of commercial development and the lack of appropriate management institutions. Shiva (2002, 15) has precisely said, a "solution to ecological crises is ecological and a solution to injustice is democracy".

As a result, an integrated approach has emerged from the perception that socio-human factors, the ecological system, institutional structures and economic issues need to be incorporated together (Matondo 2002). This kind of approach has taken into account dimensions of sustainability beyond the triple bottom line. The following definition of Integrated Water Resource Management (IWRM), once again reinstates the need to redefine sustainability to combine the multiple dimensions identified:

> IWRM is a process, which promotes the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.
>
> (Agrawal et al. 2000, 22)

Various international conferences and subsequent literature have emphasised the need for IWRM. These have included the International Conference on Water and the Environment in Dublin – *Dublin Principles* in 1992, the UNCED in Rio de Janeiro- *Agenda 21* in 1992, the UN Commission on Sustainable Development (CSD) at its Rio + 5 follow-up meeting in 1998, and various World Water Forums. All these contexts have elaborated certain guiding principles for IWRM which can be summarised as follows:

1. Freshwater is a ***finite resource*** and needs to be conserved for sustaining natural and human life and development;
2. A ***holistic and integrated approach*** is required to consider interaction with other natural resources and integration of heterogeneous information related to water in terms of quantitative and qualitative knowledge in order to integrate multidisciplinary perspectives in water management;
3. A ***co-ordinated institutional framework*** must extend from national to local level government agencies and across to community based organisations. This needs development of new forms of governance structures that avoid centralised management and relocate power and responsibility to grass-roots organisations;
4. Real ***Public participation*** involves decision-making and responsibility for this;
5. ***Equity*** must be addressed by recognising inter-generation, intra-generation and gender rights of access to adequate quantity and quality of water for well-being; and
6. An ***adaptive learning*** approach must be taken to monitor, evaluate, and improve the water management systems.

(Jakeman et al. 2006; Agarwal et al. 2000)

Thus, it is evident that IWRM corresponds closely to the principles of sustainability. Overall there seems to be a shift from the 'hard' technological, politically-driven and centralised approach to a 'soft' decentralised, participatory approach, matching the user's needs (Pahl-Wostl et al. 2007; Gleick 2003). This does not mean that the 'top-down' approach is a total failure, but an effective approach needs to involve the community of the place under consideration at the appropriate stages and in an appropriate ways (Bohnet 2004; Jones 1999; Francis 1999).

2.1.4 Role of communities in water management

The word 'community' is used in everyday language but its definition is hard to pinpoint given the wide-ranging disciplinary interest in the concept. Sociologists in particular have used it in numerous ways, as the notion of community is fundamental to the study of society. Its meaning has been debated by many scholars including Durkheim, Weber, Tonnies, and Simmel (Cohen 1985). Christenson, Fendley and Christenson Jr. (1989, 9) have defined community as "People that live in a geographically bounded area who are involved in social interaction and have one or more psychological ties with each other and with the place in which they live". As social scientists attempt to define the concept of community, for people who live in communities there may also be a variety of interpretations. The sense of 'community spirit' can be very strong or sometimes formal membership in a particular community may not be important. People can be bound together simply in joint activity towards a common goal (Heskin 1991). Other groups are bound by overlapping criteria of kinship, friendship, caste, religion, rivalry, familiarity, age, gender, education and wealth, which can guide the socio-cultural and economic interactions of their lives (Husain 2009; Cohen 1985). Sometimes even certain administrative and political constraints demarcate a specific group of people as 'the community' (Sangameswaran 2008; Agrawal 1999).

One significant aspect in understanding the concept of community is the concept of 'culture'. This is the most complex and contested concept revealed in literature. Acknowledging the wealth of multi-disciplinary literature that focuses on the concept of 'culture', and recognising that comprehensive knowledge of this literature is beyond the scope of this study, this research singles out three significant and inter-related aspects of culture from the literature that are simultaneously concerned with sustainability. They are:

1. Values, beliefs, aspirations, attitudes and understanding;
2. Expressions of these values into practice, which are continuously produced and developed; and
3. Intangible and tangible manifestations of these values.

(Hawkes 2001)

Thus, culture encompasses both the values on which a society is based and the means and results in which these values are expressed in the day-to-day life of that community. In other words, culture can be seen as an 'integrated adaptive system' (Keesing 1974) that establishes and emphasises the interrelationship between the values and practices. In many communities this interrelationship of values and practices is extended to link life, land and the community,

developing a holistic approach to life and to achieve a balance (Posey 1999). Thus, culture is the basic need of a community, “it is the bedrock of society” (Hawkes 2001, 3).

Overall, a community is not a homogenous group but a complex whole which is based on shared expectations, values, and beliefs among individuals, ways of life, and also between a community and its natural environment. Community structure comprises social, economic, and political situations and interactions within itself, and between itself and its surroundings, both natural and neighbouring communities, that undergo change over time (Moose 2003; Sekhar 2001). Such existing structures develop dynamic power relations within the group, affecting the levels of access to power and also to resources (Husain 2009; Leach, Mearns and Scoones 1999). Institutions, therefore, need to be redefined to address social inequalities which have been revealed in recent studies as ‘tragedies of commons’ and ‘tragedies of commoners’ (Husain 2009; Smith 2008; Mishra et al. 2008; Agrawal 2001; Kothari U. 2001).

It has been acknowledged that local communities usually understand their surrounding natural environment, as they have adapted to it over time and hence also have contextualised solutions to problems (Afreen 2008; Moose 2003; Shiva 2002; Berkes, Colding, and Folke 2000). Weber (2003, 211) said that this movement was a result of a popular belief that “sometimes local people can take care of their own problems and their own facilities ... It is our community. It is our responsibility”. This emphasises that local communities are an able source of informants and participants for dealing with issues related to their immediate physical environment. The model generated by Thering (2000) (refer Figure 2.9) from her study of the ‘participatory process in community planning and design’ demonstrates the dynamics of community, showing how a shift in the community’s understanding of the structure and function of the natural world and its science, changes that community’s understanding of its own structure and the function of its social world in terms of values and goals, and its world view. This emphasises that local communities are an able source of informants and participants in dealing with issues related to the natural environment. Thus, it also illustrates the influence of these relationships on the societal values and behavioural norms which are significant in the process of participation in water management.

NOTE:
This figure is included on page 41
of the print copy of the thesis held in
the University of Adelaide Library.

Figure 2.9: Paradigm dynamics (Thering 2000, 192)

This collective understanding of the concept of a community confirms that community participation is vital for sustainable development. The concept of community-based natural resource management (CBNRM) has gained momentum since the Rio Earth Summit in 1992, where the importance of community participation for sustainable development processes was strongly acknowledged (Bohnet 2006; Luz 2000).

Community participatory management, as opposed to a centralised 'top-down' system, refers to shared specific interests and concerns about specific natural resources for the process of decision-making. All the stakeholders, such as government bodies and the community, as well as the environment, will benefit if the negotiation process between them is successful (Borrini-Feyerabend and Tarnowski 2005). It is often assumed that common interests and homogeneity in culture and ethnicity will lead to better management of resources (Agrawal 1999). However, the process of involving the local community needs to address the local social, cultural, and economic dynamics which have a significant impact on the process of water management (Sangameswaran 2008; Bohnet 2004).

From a landscape planning perspective, a holistic approach with collaboration of the local actors and stakeholders is very significant. Luz (2000, 157) has particularly stated that "if social and emotional factors are not integrated with landscape ecology, nature conservation and landscape planning, only half the task is accomplished". On a similar note, a socio-ecological framework has been proposed by Bohnet (2006), which is based on the multiple relations between different stakeholders involved in the process; that is, relations within the

community, between the community and the natural environment, and between the community and the local planning authority. This framework demonstrates "how and when community participation in the planning process would be most effective" (Bohnet 2006) (refer Figure 2.10) at the three stages in landscape planning. This framework would contribute to a better understanding of complex planning issues, different forms of community association with the landscape, and improve community's capacity to plan their own landscape. However, in this model, participation is restricted to discussion and consultation for the conceptual modelling of landscape, and community is not involved in the final decision-making process, or in implementation and monitoring of the project. This partial participatory approach reduces the sense of accountability and interests of the community in the overall process.

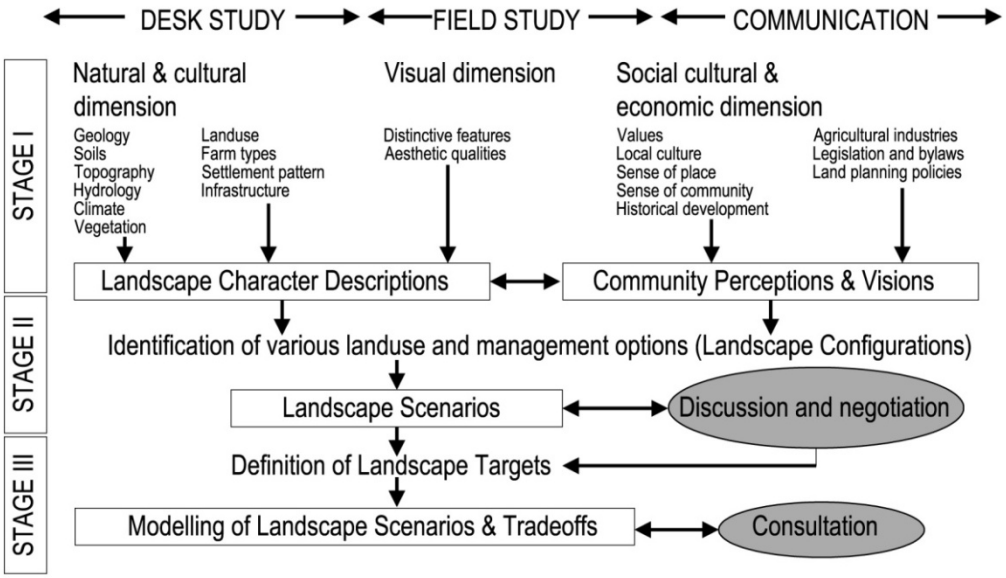

Figure 2.10: Socio-ecological framework for sustainable landscape planning (Bohnet 2006)

Consequently, to increase participation by the government as well as by the community, research needs to be carried out to investigate benefits from participation (Bohnet 2006; Rajankar and Dholke 2006; Gadgil, Berkes, and Folke 1993). These benefits are difficult to measure and vary from individual to individual and context to context. For example, for local people the greatest value might be the preservation of their culture and livelihood; the environmentalist or Non-Government Organisations (NGO) may favour ecological gains; and the government bodies might favour economic advantages. However, unless participatory frameworks are institutionalised and become an integral part of the local and regional planning process, it would be difficult to convince the local community to participate in resource management (Bohnet 2006; Matondo 2002; Kothari 2001).

These developments in the concept of community participation (Pahl-Wostl et al. 2007; Hofstede 2003; SIWI 2000; Agarwal et al. 2000) have promoted the emergence of Integrated Water Resource Management (IWRM) as a response. This involves the incorporation of some 'bottom-up' elements into the 'top-down' approach that achieves integration of socio-cultural, ecological, and economic factors. This means that the interests of more than one stakeholder are linked and thus they benefit from co-operation with each other (Matondo 2002).

The interests of different stakeholders at various levels have been compared to human needs at various levels by Melloul and Collin (2003). They demonstrate that unless the basic needs of individuals in the community, and the community as a whole, at the local level are satisfied, it is difficult to achieve the participation and interests of the higher level stakeholders such as planners and politicians for sustainable development. In this case the interests of the local community and its individuals greatly depend upon their socio-cultural and economic associations with the water resource.

Thus, to achieve better participation it is first necessary to understand the concerns and the socio-cultural and livelihood relations of the community with the water resource (Jones 1999). Unfortunately, what might be of concern for one group might not be same for others (Borrini-Feyerabend and Tarnowski 2005). For example, the development plan for a tourist destination at a water reservoir may favour the tourism industry but might adversely affect the community which depends on the water for its livelihood. At the same time the heterogeneity within the community also needs to be considered, as interests within the community might differ and change when circumstances change (Sangameswaran 2008; Moose 2003; Agrawal 1999).

A second consideration is the difference in the capacities of the participants which are required for successful resource management (Borrini-Feyerabend et al. 2002). As Kothari (1995) has remarked:

> Communities lack the resources to tackle threats or ecological issues at a regional scale and in many places have lost their traditional ethos and institutions; government agencies lack the necessary micro-knowledge, on-the-spot human power, or even often the necessary mandate when other agencies over-rule them. With rare exceptions, neither local communities nor governmental agencies are able to face on their own the onslaught of commercial forces, or able to check the destruction caused by some of their own members.
>
> (Kothari 1995, 11)

A third issue is the dynamic and complex ecological system associated with the water resource and limited knowledge about its functioning (Borrini-Feyerabend and Tarnowski 2005). Lack of complete understanding of the interdependence and interplay of different ecological elements makes it difficult to assess the effects of participation and consequent impacts on those systems. Another complexity to this is that ecosystems are constantly evolving, responding to the continuously changing conditions of climate, migration of new species, extinction of species, new diseases and other sorts of conditions.

In addition, a fourth issue, and an extremely significant consideration which is often overlooked, is the role of knowledge possessed by local communities. The Indigenous knowledge and practices of water resource management are unique and rooted in local history and local conditions (Jackson 2005; Jackson, Storrs, and Morrison 2005; Borrini-Feyerabend and Tarnowski 2005; Sillitoe 2000; Berkes 1999). However, their relevance in the constantly changing context continues to remain in conflict with the adaptation and incorporation of Indigenous knowledge in modern water management practices. Thus, their inclusion needs considerable further exploration. Integrating Indigenous experts in the 'collective planning' of the water resources would be a significant step towards culturally attuned sustainable planning (Afreen 2008; Sillitoe and Barr 2004; Ford 2001; Berkes 1991).

2.2 Indigenous communities, sustainability, and water management

2.2.1 Understanding the link between Indigenous communities, knowledge, and sustainability

Ellen and Harris (2000, 25) have defined Indigenous knowledge as, "Knowledge belonging to a group of people local to a given situation". Indigenous knowledge has been developed as a result of generations of experiences, careful observations, and trial-error experiments over a period of time and within specific cultural groups, and environmental and social settings (ICS 2002). Dei has usefully defined Indigenous knowledge as 'common sense knowledge':

> Indigenous knowledge includes the cultural traditions, values, beliefs, and worldviews of local peoples as distinguished from Western scientific knowledge. Such local knowledge is the product of indigenous peoples' direct experience of the workings of nature and its relationship with the social world. It is also a holistic and inclusive form of knowledge.
>
> (Dei 1993, 105)

It is important to note that 'Indigenous knowledge' is one of several terms associated with this type of knowledge. Other widely used terms in the literature are 'traditional knowledge', 'traditional ecological knowledge', 'Indigenous environmental knowledge', 'folk knowledge', and 'farmer's knowledge'. For this research, the term 'Indigenous knowledge' is used in the following sense, which is described by the Study Groups of International Council for Science (ICS) in their report:

> Traditional knowledge is a cumulative body of knowledge, know-how, practices and representations maintained and developed by peoples with extended histories of interaction with the natural environment. These sophisticated sets of understandings, interpretations, and meanings are part and parcel of a cultural complex that encompasses language, naming and classification systems, resource use practices, ritual, spirituality and worldview.
>
> (ICS 2002, 9)

Given these extended histories of interaction, this knowledge can be described as adaptive to changing situations (Tella 2007; Sillitoe, Bicker, and Pottier 2002; Sekhar 2001). Owing to its adaptive nature, this knowledge has been proposed to be the key to sustainable social, environmental, and economic development (Sen 2005; World Bank 1999):

> Indigenous knowledge is an integral part of the culture and history of the local community. We need to learn from local communities to enrich the sustainable development process.
>
> (James D Wolfensohn, President of World Bank, 1998 cited in Gorjestani 2000, 1)

Indigenous knowledge reflects many generations of experience and problem solving by humans. Consequently, it needs to be understood that Indigenous knowledge has its own strengths and weaknesses and all types of this knowledge may not be relevant in a development context (Sillitoe, Bicker, and Pottier 2002; Antweiler 1998), due to both its culturally as well as locally situated character. Furthermore, these traditional practices involve a complex system of empirical, spiritual, social, and physical components providing a holistic view (Sillitoe 2007; Colding and Folke 2001; Ford 2001). To deal with the complexity, Barrera-Bassols, Zink, and Ranst (2006) have conceptualised a model where Indigenous environmental knowledge systems (IEKS) are shown as a complex cultural ensemble of beliefs (*Kosmos*), cognition (*Corpus*) and management practices (*Praxis*) within a natural and cultural context (refer Figure 2.11). This is called the K-C-P model. In such a framework, it is difficult to isolate one component, for example water, from its entire ecological system, and propose development policies for this component in isolation from the rest of the system (ICS

2002; Agrawal 1995a). Therefore, the complicated nature of Indigenous knowledge at a particular place needs to be identified in order for its consideration for sustainable development.

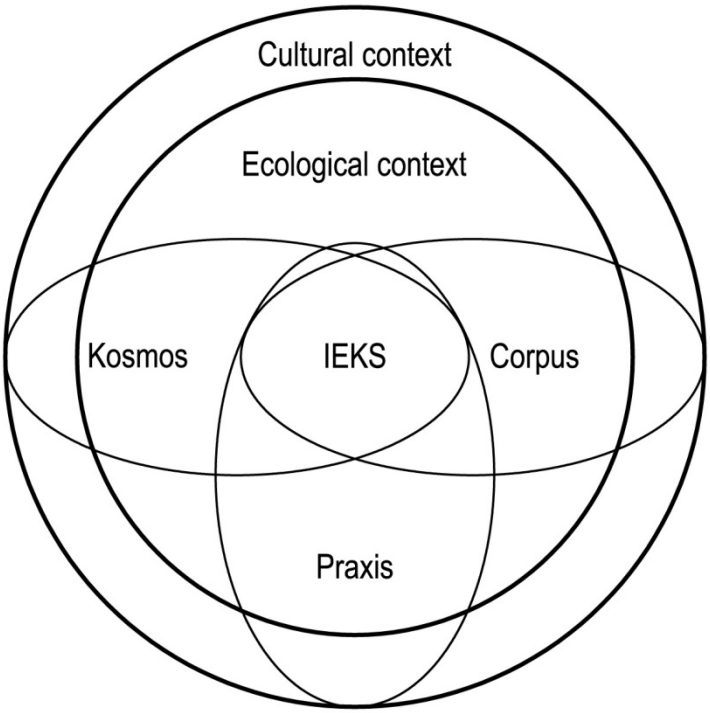

Figure 2.11: Indigenous environmental systems and their three domains – the K-C-P model (Barrera-Bassols, Zink, and Ranst 2006, 124)

Historically, various religions across the world have taught about the interconnection between the human-cosmos relationship. Sacred preaching's and laws have directed our actions in humanising nature to satisfy human needs. The *Ghats* of Varanasi and Banaras, sacred groves in Kerala, Pyramids of Egypt, sacred water holes of Australia, sacred mountains of Navajos, and many such examples across the world reveal an understanding of nature and subsequent design and management processes that helped conserve these places. Some of these places are ecologically sensitive, and the process adopted by our ancestors, have helped restore and conserve these areas. These humans considered themselves as part of the environment, understood their dependence on the natural features, and hence participated in conserving their environments. Therefore, it is important to understand this relationship in the field of resource management and sustainable development.

The expression of a 'human-nature relationship' has varied in different cultures but the interpretations of these still remain the same. For example, the Hopi Indians of the North American southwest regard their land in a holistic way:

> The land was not tangible property to be owned, divided and alienated at will. It was their Mother Earth from which they were born, on whose breast they were suckled, and to whose womb they were returned in a prenatal posture at death. Hence, the Indians did not see themselves apart from all other physical forms of life. They regarded themselves as part of one living whole.
>
> (Molyneaux 1995, 37)

This quotation clearly highlights the relations between people, land, water, and plants and expresses a holistic view towards ecosystems. A similar philosophy has been taught in *Vedic* culture in India. The culture of the *Vedic* people represents a form of nature worship. According to the *Vedic* beliefs and myths all the natural forms – water (in the form of spring, river or sea), rocks (as hills, mounds or mountains) and trees (small plants, forests) – are regarded as visible manifestations of the divine spirit (Chhaya 2000; Dutt 1980; Kosambi 1965). They saw the gods of the *Rig-Veda* as active forces of nature, only partly personified as imagined supernatural persons (Kosambi 1965; Mookerji 1956). These philosophies were translated into practices in the form of sacred landscapes, planning principles of *Vastushastra,* and *Mandala.* It is evident that our ancestors were environmental conservationists as they lived in a system in relation to nature and within its limits. Understanding the importance of the environment led to the subsequent development of myths, rituals, and so on associated with a sacred place, for the protection and conservation of the place.

Lord Buddha also preached similar principles focusing on the harmonious inter-relationship between humans and ecology. Buddha's philosophy of interdependence within the "nature-human-social matrix" transcends the human-centric approach and registers and ecological vision (Bilimorian 2001, 5). The idea can also be seen implemented by Emperor Asoka who followed Buddhism and the institutionalised conservation of plants and animals in this kingdom.

At the same time, the inter-relationship between various resources was also well understood and its importance was addressed sensitively. The best example to explain this inter-relationship is the land-water interface which has been eminent in most of the cultures. In India, step-wells, *kunds*, temple tanks, and *ghats* along with their practical role, acquired sacred status. The Indian sub-continent is mostly semi-arid, hence water harvesting and conservation was a foremost requirement, and hence several tanks were built to fulfil the needs year round. High religious values were imbued to them, which ensured the maintenance of these structures. These kinds of associations helped to maintain the human-nature relationship and to protect the resources for the society.

For a landscape architect and planner, understanding these associations provides an appreciation of planning in culturally-responsive environments. Landscape architecture has been considered as a "bridge between science and humanism, and between aesthetic and technology" (Preece 1991, 54). Ian McHarg (1971) advocated the evaluation of natural processes and the application of ecological principles and championed the value of this approach in ecological design and planning. This approach advocates the understanding 'nature as a process' and 'interpretation of the social components' (McHarg 1971).

In addition, a landscape architect is very much interested in reflecting the cultural representations in the physically manipulated land (Corner 1992). Landscapes are thus the results and representations of cultural interpretations. These are termed as cultural landscapes which are significant reminders of the past events, people, and their history of evolution. In addition to understanding the geology, soil, and climate of a place, it is also significant to understand the process of evolution of the place where the local community grows in response to local environment (Alexander 1977). Thus, understanding the landscape is very significant in the process of resource management. The study of resource management, where interactions between nature and human are foremost, would help create landscapes which will enable a culture to share and also understand the past and the future – the very origin of community. The ecological approach, popular in the field of landscape planning, observes three significant points, namely: working with nature; landscape as a process; and involvement of users (Ruff 1982; McHarg 1971). This planning approach would definitely improve the management of resources and ecosystems.

Similar emphasis on understanding of the inter-connections between nature, society, and science has been stated by systems ecologists like H.T. Odum, Eugene Odum, C.S. Holling and R.L. Kitching. Systems ecology theory stresses a holistic approach to the study of ecological systems of which humans are a component. It is especially concerned with the way the effective functioning of the ecosystem and environmental processes can be influenced by human actions. Furthermore, it has been argued by Wallington, Hobbs, and Moore (2005, 5) that conservation of natural systems require research and management to come together in the context of "human modified landscapes". Indigenous knowledge is the practical knowledge and experience of people who still have a direct link to the 'soil' and their immediate environment (Agrawal 1995b). It is evident that this traditional knowledge is developed in the immediate context of the natural environment and is intricately interrelated with the livelihoods of people. Moreover, it is a 'dynamic' entity that undergoes constant adaptation to the changing context as well as to the needs of the community (Sillitoe 2000; Agrawal 1995a).

Indigenous knowledge develops in 'harmony' with nature and its practices are understood as based on sustainable use of natural resources (Mebratu 1998; Agarwal 1995b; Ghai and Vivian 1992; Sen 1992). Furthermore, the most imperative message to be drawn from the Indigenous practices is the 'holistic vision' which is intrinsic in all their beliefs and also one of the critical tenets of the concept of sustainability (Mebratu 1998).

So-called modernists saw Indigenous knowledge as an obstacle in the development process rather than an opportunity to 'build upon' (Dixon, Barr and Sillitoe 2000). At the same time, other scholars have associated the recognition of Indigenous knowledge, and of its consequent decline with the exercise of external power (Slikkerveer 1999; Agrawal 1995a; Scoones, Melnyk, and Pretty 1992). Modernist and Marxists theories of development which were 'introduced' have clearly failed and this has resulted in a shift towards 'participatory' and 'decentralised' theories of development (Agrawal 1995). However, there is still little emphasis on the significant shifts in existing power relationships involved in this process which are very important to be understood for enhanced development (Agrawal and Ribbot 2000; Slikkerveer 1999; Agrawal 1995a). In the last couple of decades where 'western' technology and institutional models have failed, local knowledge, technology, and practices are increasingly considered to be a solution for various environmental problems and a key to sustainable social and economic development (Sen 2005; Gorjestani 2000; Agarwal 1995a; Scoones, Melnyk, and Pretty 1992; Warren 1991; Brokenha, Warren, and Werner 1980).

Characteristics that distinguish Indigenous knowledge can be identified in various literature sources (Barrer-Bassols, Zinck, and Ranst 2006; Sen 2005; Kamata 2000; Berkes 1999; Ellen and Harris 1996; Banuri and Apffel-Marglin 1993). Those that are specifically significant to sustainability are as follows:

1. It is ***local, situated*** knowledge rooted in a particular cultural context. It is based on a ***set of experiences*** of the people living in those communities.
2. It ***evolved as a complex*** web of social-cultural systems.
3. It is ***experimental***, generated from trial and error methods in actual life.
4. It is mostly transmitted ***orally*** and through demonstration.
5. It is ***learnt through repetition***, which aids in retention and reinforcement.
6. It is ***constantly changing***, being constantly produced as a ***response to changing context***.

2.2.2 Relevance and revival of Indigenous knowledge for resource management

Extensive research has been undertaken on examining the relationship between traditional knowledge and biodiversity conservation using ethno-botanical research methods. For example, research on sacred groves highlighted ecological conservation perspectives embedded within local social-cultural frameworks (Ramakrishnan, Saxena, and Chandrashekara 1998). Further, the need to study and document traditional ecological knowledge was also stimulated in the arctic region by the need to resolve issues regarding territorial land claims (Heyes 2002; ICS 2002). These kinds of examples have stimulated researchers to study Indigenous knowledge further to enable its use in the development process.

The realization of the relevance of Indigenous knowledge in the present context is increasingly widespread. The *Rio Declaration* (1992), the documents from the World Summit on Sustainable Development in 2002, the World Health Organization, UNESCO, UNEP, UNDP and a number of other international organizations have emphasised the relevance of Indigenous knowledge for sustainable development. As Zwahlen (1996), states:

> The main strength of traditional practices for sustainable development is that they have evolved in close contact with specific cultural and environmental conditions. Certain traditional techniques have proved to be sustainable in the sense that they have given good results over a long period.
>
> (Zwahlen 1996 cited in Grenier 1998)

Indigenous knowledge systems which are based upon complex natural processes are continuously evolving with a holistic view towards their environments. Indigenous knowledge is still being used as a basis by respective communities for making decisions regarding the socio-cultural aspects, livelihood necessities, and natural resource management (Gorjestani 2000). The various resource management practices developed by communities over time are usually based on this detailed knowledge of natural systems. Joshi et al. (2004) categorise this kind of traditional knowledge in three forms, namely: 'explanatory knowledge' concerned with the ecological process; 'descriptive knowledge' including the components of the natural system (For example trees, soils and so on); and lastly, 'supernatural knowledge' consisting of spiritually-based explanations for the order of things (refer Figure 2.12). In the case of natural resource management the former two types are pragmatic about how the natural system works and form the basis for various management interventions. The last type forms the basis of the guiding principles or 'norms and values' allocated according to culture (Jackson 2005; Joshi et al. 2004; Sillitoe and Barr 2004). Therefore, to include an Indigenous knowledge

system which has the potential to resolve local problems, constitute cost-effective methods, while being deeply-rooted in natural systems would be critical in the sustainable management process.

Figure 2.12: Conceptual diagram of the three forms of traditional knowledge guiding natural resource management (Joshi et al. 2004)

Thus, the importance of Indigenous knowledge has been widely acknowledged in sustainable resource management. Nevertheless, there has been little attempt to incorporate it in the development process. Instead, it has largely resulted in the production of ethnographic documentation of environmental relations and livelihood systems (Ford 2001; Berkes, Colding, and Folke 2000; Sillitoe 2000). These attempts have focused on the primary sectors of the economy: agriculture, pastoralism, and the rural products sectors producing forest products such as honey bee collection, jute products, wood-craft furniture and articles, as well as medicinal plants and organic manure (Kothari 2007; Sen 2005; Posey 1999). This focus has been mainly due to the economic benefits resulting from the development of this kind of Indigenous knowledge. This is called the market-driven neo-liberal approach (Blaikie et al. 1997). For example, numerous studies have demonstrated the contribution of Indigenous knowledge to the modern pharmaceutical industry and modern health care. In a *Food for Work* program in Nepal, significant losses of food in the distribution system were reduced when the program switched to the use of local technologies and networks (Gorjestani 2000).

The International Institute of Rural Construction (IIRR 1996) has explained 'optimal synthesis' between traditional knowledge and Western science. However, this approach emphasises only the integration of practical aspects of Indigenous knowledge and neglects the intangible aspects of knowledge (Kamata 2000). Furthermore, the process described does not clearly mention the involvement of Indigenous communities in the decision-making process (Kamata 2000).

Thus, clearly, Indigenous knowledge cannot always be assumed to be a necessary resource in development activity (Kamata 2000; Blaikie et al. 1997). Nevertheless, the fact that people have developed practices and knowledge systems over centuries, adapting to the changes in the context over time, is central to the realization of the relevance of Indigenous resource management systems to successful future initiatives (Kothari 2007; Berkes and IUCN 1989). However, for the successful integration of these knowledge systems in mainstream planning, it is necessary to understand the social mechanisms of the community that lead to sustainable practices (Ford 2001; Berkes and IUCN 1989). This is because most of the traditional practices are embedded in the socio-cultural practices of the Indigenous people (Ford 2001; Berkes, George, and Preston 1991). It is evident from contemporary discussions that existing Indigenous knowledge can be utilised successfully with true community participation, starting with "what the people know" and building on "what people have" (IIRR 1996).

Warren (1991) outlines the following characteristics of Indigenous knowledge, which are relevant to resource management:

> Indigenous knowledge is an important natural resource that can facilitate the development process in ***cost-effective, participatory, and sustainable ways***. Indigenous knowledge is ***local*** knowledge- knowledge that is ***unique*** to a given culture and society. Indigenous knowledge contrasts with the international knowledge system generated by universities, research institutions, and private firms. It is the *basis for* ***local-level decision-making*** in agriculture, health care, food preparation, education, natural resource management, and a host of other activities in rural communities. Such knowledge is passed down from ***generation to generation***, in many societies by word of mouth. Indigenous knowledge has value not only for the culture in which it evolves, but also for scientist and planners striving to improve conditions in rural localities.
>
> (Warren 1991, 1) [My emphasis]

These characteristics are similar to those discussed in the previous section, namely local, situate knowledge; complex; experimental – based on experiences; transmitted orally; and

constantly adapted to changing context. They highlight the significance of Indigenous knowledge for resource management if we wish to introduce a participatory and sustainable planning process. The primary dimension which distinguishes this knowledge from the 'western' knowledge system is that the latter is a centralised system in contrast to the former which is more scattered (Warren 1991). Several advocates of Indigenous knowledge claim that it is not just an immediate solution to everyday problems but a complex system of ideas, perceptions, non-technical insights, and innovative capabilities related to natural phenomena (Agrawal 1995a, 422; Thrupp 1989a, 139).

These distinctions give convincing reasons for the incorporation of Indigenous knowledge in resource management. This conclusion was originally highlighted by Brokensha, Warner, and Werner in 1980 for the first time, stating that:

> Development from below is for many reasons a more productive approach than that from above. An essential ingredient is indigenous knowledge. To incorporate indigenous knowledge in developmental planning: is a courtesy to the people concerned; is an essential first step to successful development; emphasises human needs and resources, rather than material ones alone; makes possible the adaptation of technology to local needs; is the most efficient way of using western 'Research and Development' in developing countries; preserves valuable local knowledge; encourages community self-diagnosis and heightens awareness; leads to a healthy local pride; can use local skills in monitoring and early warning systems; involves the users in feedback systems. These positive reasons- together with the negative reasons such as the likelihood of failure without using indigenous knowledge – constitute a strong case for incorporating this knowledge in development programs.
>
> (Brokensha, Warner, and Werner 1980, 7-8)

The major distinction between the Indigenous and Western knowledge, in regard to resource management, can be summarised as the former being more locally situated than the later which adopts a centralised and generalised approach.

Thus, while there are different arguments distinguishing the two knowledge systems, there is simultaneously an emergent consensus that for sustainability, there is an immense need to integrate both traditional and scientific knowledge's to develop 'knowledge negotiated' (refer Figure 2.13). Many scholars have acknowledged that all development attempts would fail in the absence of inclusion of community knowledge in the process (Bicker, Sillitoe, and Pottier 2004a; Posey and UNEP 1999; Agrawal 1999, 1995; Blaikie et al. 1997; IUCN 1991; Brokensha, Warren, and Werner 1980).

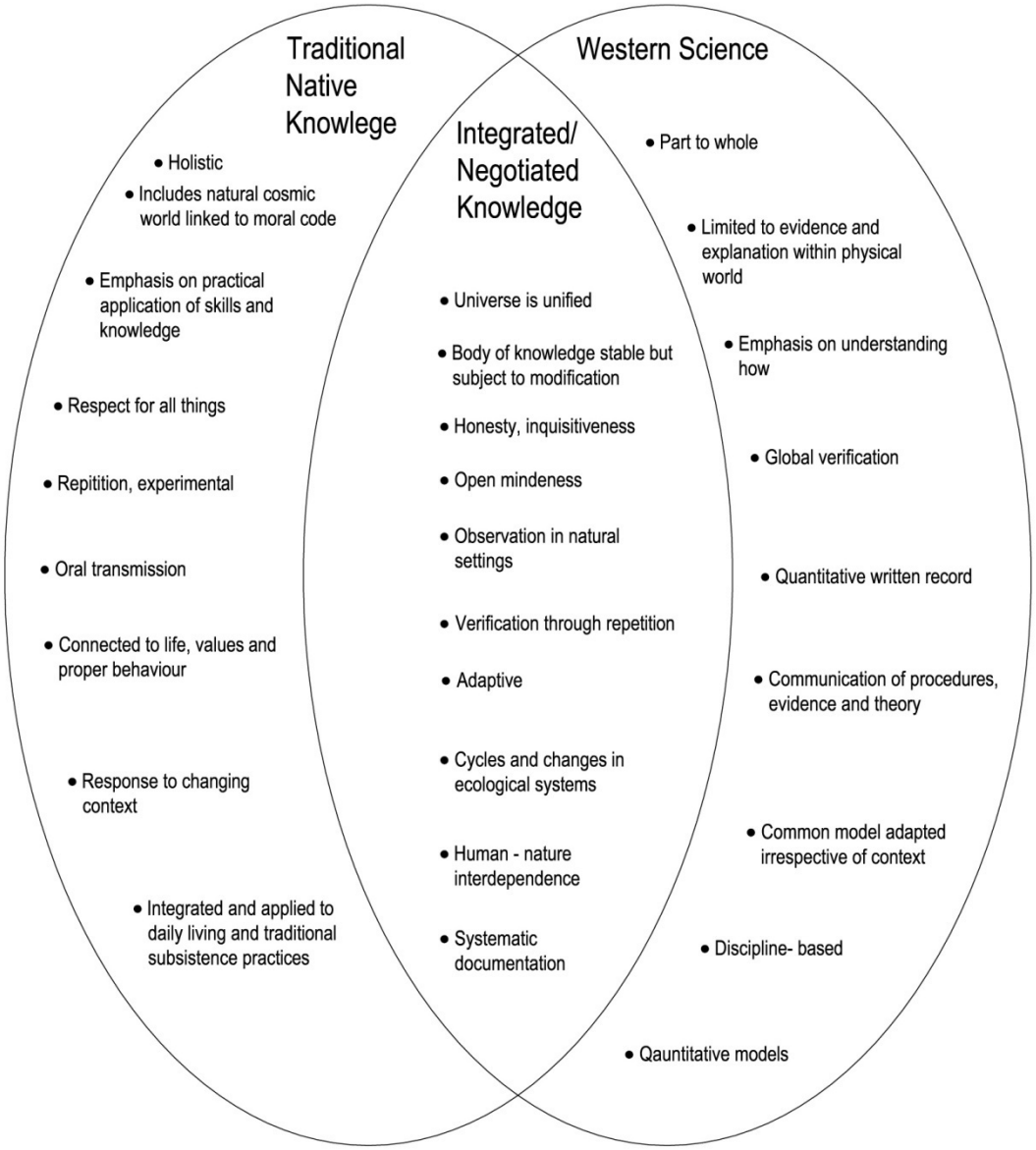

Figure 2.13: Integrating Indigenous knowledge and scientific knowledge on natural resource management

The realization of the importance of Indigenous knowledge for sustainable development has promoted a few international agencies, and countries to recognize this relevance and to encourage its use. The ICS and UNESCO, for instance, have proposed the following principles to be followed during planning and development:

1. Ensure the full and ***effective participation*** of traditional knowledge holders during all stages of elaboration of sustainable development policies, plans and programs, alongside the scientific and technological community;
2. Acknowledge and ***respect the social and cultural bases***, including the authority structures within which traditional knowledge is embedded;

3. Recognize the ***rights*** of traditional people to own, regulate, access, and ***share*** benefits of their unique sets of knowledge, resources, and products;
4. Ensure that traditional knowledge holders are fully ***informed*** of potential partnerships and that these are only entered into with prior informed consent;
5. Promote models for environmental and sustainable governance that ***incorporate*** principles of genuine partnership and collaboration between scientific and traditional knowledge; and
6. ***Promote training*** to better equip young scientists and Indigenous people to carry out research on traditional knowledge.

(ICS 2002, 19) [My emphasis]

On the basis of these principles, a few efforts have been made for the revival of Indigenous knowledge. In Cameron, Texas, the US National Cancer Institute has initiated a contract with local government for the use of plant species with potential for anti-AIDS chemicals. This prevents the exploitation of forest resources, and the money obtained is used for community development projects (Posey 1999). In Uganda, the historical institution of traditional birth attendants has been used successfully to control the rate of maternal mortality at childbirth, together with doctors trained in modern science (Musoke 1999 cited in Gorjestani 2000). In India, the *Biological Diversity Act, 2002*, was passed to provide a framework for the protection of Indigenous knowledge, although it has not yet met the desired results (Gadgil 2000; Gadgil, Berkes, and Folke 1993) and this is discussed in detail in Chapter 5. Indigenous people themselves, and NGOs working closely with them, have worked out a number of practical measures for the effective utilization of Indigenous knowledge. However, it is important to note that Indigenous knowledge cannot be saved and used in isolation from its holders, and further it cannot be used and developed without its natural and physical environment (Kothari 2007).

In addition to these principles, the United Nations system has developed a legal and policy framework that advocates full and effective participation based on the UN Development Program on Human Rights Based Approach (2003). This approach is premised on the principles of universality and inalienability, indivisibility, interdependence and inter-relatedness, non-discrimination and equality; participation and inclusion; accountability and the rule of law (UN Development Programme 2003). Another significant initiative is seen in the Australian Government's National Water Initiative which recognises the relevance of Indigenous people and their knowledge to manage its water resources (Cullen 2006). However, there are some challenges which may affect the degree to which Indigenous people will benefit from this. Firstly, this would need constant evaluation and monitoring of

management and planning processes to suggest that the needs and perceptions of Indigenous communities are well represented (Jackson 2007). Secondly, there is very little guidance provided to regional bodies for proper involvement of the Indigenous groups (Jackson 2007; Connell et al. 2005). Thus, to overcome these challenges, policy-makers, Indigenous people and researchers or NGOs will need a higher levels of collaboration.

Given this review of the relevant literature, it is evident that Indigenous knowledge is very relevant and related to the concept of sustainability and needs to be integrated in the planning process. From Table 2.2 it is evident that historically Indigenous practices were bounded by the principles of sustainability, although the term was coined much later. The characteristic features of Indigenous knowledge are identical to the principles of sustainability. Hence, sustainability is not a new concept. It has been practised by Indigenous communities to live in co-ordination and within relevant ecological limits.

Principles of Sustainability	Characteristics of Indigenous knowledge
Integrated and multidisciplinary approach	Holistic view
Ecological integrity	Unique response to a specific environmental and socio-cultural context
Good governance and institutional structures	Local-level decision-making
Equity- inter and intra generational and gendered	Does not believe in individualistic values
Participation and empowerment-capacity building and social learning	Cost-effective
	Participatory
Adaptability	Transferred and developed from generation to generation in changing context

Table 2.2: Comparison of sustainability and Indigenous knowledge principles

2.2.3 Indigenous water management practices and sustainability

As demonstrated earlier, existing Indigenous water management systems appear to have been little valued in modern development projects for sustainable management of water resources (Borrini-Feyerabend and Tarnowski 2005; Sillitoe, Bicker, and Pottier 2002; Berkes, Colding, and Folke 2000). The current water law systems created by the non-Indigenous societies foster economic benefits from the water sources, which are often incompatible with traditional values and uses (Getches and Wetering 2005). Furthermore, the subjective and

intangible values underpinning Indigenous systems are difficult to translate into Western environmental management frameworks which are highly quantifiable and technical (Jackson 2005).

It has been recognised that this incompatibility has resulted in a lack of appreciation of the potential contribution of Indigenous water management knowledge. The report from a session organised by UNESCO on *Water and Indigenous people* at the Second World Water Forum held in Hague in 2000, concluded by saying:

> It is clear that Indigenous / tribal peoples, their unique systems of values, knowledge and practices have been overlooked in the world water vision process. There is an urgent need to correct the imbalance of mainstream-thinking by actively integrating Indigenous women and men in the subsequent phases starting with the framework for action.
>
> (UNESCO 2006, 6)

Despite numerous frameworks and methods proposed by various organisations and theorists for effective engagement, Indigenous communities still find themselves excluded from the policy-making, decision-making, implementation and evaluation processes (UN Permanent Forum on Indigenous Issues 2005; Jackson, Storrs, and Morrison 2005). With a similar goal, in 2001, the UNDP adopted a framework for the engagement of Indigenous people in the sustainable development process, and acknowledged that this was critical in preventing conflicts over resources, and also in enhancing democratic governance. This recognition was supported by the Third World Water Forum in Japan 2003 which strongly supported the equal participation of Indigenous people in resource management and stated that this should be enshrined in every national legislation and policy. However, despite this wide recognition, a discouraging situation still persists. Indigenous water resource management practices and their potential contribution to the current 'top-down' and market-driven management of water resources are not widely practised. Indigenous systems are generally seen as something from the past to be phased out (Nakashima 1992).

In order to increase their probability of being incorporated in modern practices, the important features of Indigenous systems need to be understood. Water has always played a central place in the life of Indigenous communities and is a key to their sustenance and development. Indigenous water management practices and techniques have evolved over time adapting to the changing context because of the community's realization of the importance of water in their lives. These management practices are deeply rooted in the local context and in the community practices which have developed as a result of complex socio-cultural practices (IUCN 1991). In the past these practices often helped to manage the water

resource efficiently and ensured the community sustenance for centuries. Hence, understanding the local context in terms of the social, cultural, and economic history and development of the area is vital for understanding these systems (Sillitoe and Barr 2004). Clearly, it is difficult to generalise a framework for the integration of Indigenous knowledge into mainstream planning processes, and consequently detailed study of particular, situated knowledge in its natural setting is needed.

It has been established that, in general, Indigenous people had a holistic environmental approach to water resource management that considered land use planning, livelihood dependency, the climate, religious and cultural practices and also the ecosystems that depended on the water resource for their survival (Jackson 2005; Toussaint 2001; Berkes 1999; Agarwal and Narain 1997). According to a recent discussion on Indigenous water rights:

> Aboriginal peoples have never drawn a distinction between the land and the waters that flow over, rest upon or flow beneath it. The land and waters are equal components of 'country', all that require care and nurturing, and for which there are ongoing responsibilities.
>
> (Lingiari Foundation 2002 cited in Jackson, Storrs, and Morrison 2005, 106)

Management practices were generally decentralised, tailor-made for a particular context, and managed by the people themselves with collaborative efforts from higher state authorities such as landlords, heads of state and aristocrats (Ford 2001). However, these are basic features of all Indigenous systems and, therefore, an individual study and understanding of an Indigenous system of a specific place will be needed when that Indigenous system is to be considered for integration.

Furthermore, it should be noted that Indigenous knowledge systems are fast disappearing because of the pressures of modernisation that threaten the very socio-cultural base of the system (Agrawal 1995a). Further affecting the continuity in the use of Indigenous knowledge is the persuasive propaganda by governments and its officials which present huge dam projects as solutions to water problems, and also the changing attitudes within the community towards their knowledge and systems (Jayanesa and Selkar 2004; Kerr et al. 2000). Although the 'hydraulic missions' contributed towards infrastructural development, energy and food generation, and water supply to urban areas, they have left far greater impact on the local social and environmental scene causing displacement of tribes and loss of ecological systems (Molle, Mollinga, and Wester 2009; Shiva 2002). As water resources come under increasing threat and are subjected to the development process, it is vital that the

interests and values of Indigenous communities in water resources be recognised in planning and management.

2.2.4 Paradigm change – a new approach

If we are to fully acknowledge the relevance, interests and capacity of Indigenous people in relation to water resource management, and realize that neither technical solutions nor local-community participation alone can provide appropriate solutions for current water crises and for future sustainable development, new reforms in water resource management are needed (Smith 2008; Jackson 2005; Gleick 2003; Figueres, Tortajada, and Rockstrom 2003; Tortajada 2003; Easter and Hearne 1995). This will require the integration of the Indigenous knowledge and practices with more formal technical knowledge and an understanding of the perspectives of all the stakeholders. This process is beginning to initiate a change in approach towards distinguishing Western science and Indigenous knowledge. The new approach seeks to provide mechanisms that will value community-based knowledge systems within the global scientific knowledge generation. It also aims to change the attitudes of the respective national and state governments, and to recognise the knowledge resource generated by its own community but often ignored (Warren n.d.; Ford 2001).

Many Indigenous communities across the world have also decided to contribute directly towards achieving sustainable development. The *Johannesburg Declaration,* drafted by the representatives of Indigenous people at the World Summit on Sustainable Development in 2002, clearly identifies the development of water alliances and networks with Indigenous communities worldwide to protect water. Indigenous representatives also came forward to oppose water trading, which affects not only the water resource but also ecosystems. Thus, there has been development from just understanding *what* is the value of Indigenous knowledge towards considering *how* it can be used to ensure equitable benefit sharing of the resources with the contributing communities (Slikkerveer 1999, 169). Furthermore, in the context of the role of Indigenous communities in the process towards sustainable development, concern for equitable partnerships marks a move away from the previous 'top-down' technology transfer approaches (Molle, Mollinga, and Meinzen-Dick 2008; Sillitoe and Barr 2004; Sillitoe et al. 1998).

The paradigm shift proposes incorporation of traditional knowledge in the form of 'co-management' which aims to use information from both Indigenous people and state agencies in resource management (Maganga 2003; Harmsworth 2002; Ford 2001). This emphasises the need to redesign state policies and create innovative governance and

management structures to facilitate and empower Indigenous communities to determine their own future with the objective of facilitating inclusion of their knowledge in the planning process towards sustainable development (Jackson, Storrs, and Morrison 2005; ICS 2002; Agrawal 1995a). This emphasises the need for development of 'new knowledge systems' for better understanding of Indigenous knowledge and 'new systems of action' for effective engagement and contribution of community knowledge (Santha 2008; Bicker, Sillitoe, and Pottier 2004a, 2004b; Kamata 2000; Pretty 1995). Also there is a need to design resource management institutions to support community-based initiatives to meet the sustainability goals of long-term availability of water resources, with continued equity and quality.

The most important concern is to establish a bridge across the divide between power and knowledge. This would mean redefining the asymmetries of power and control over the resources and their management to include traditional knowledge, and hence it would pose significant political and ethical dilemmas (Agrawal 1995a). In this process, the local social and cultural institutions of power, meanings and representations in local Indigenous knowledge systems would have to be understood, respected and incorporated (ICS 2002). The collaboration is not only intended to be at the local level between the relevant community and the scientific community but to be expanded into upper levels of institutions including the various authorities, and inter-government agencies, as well as industry (ICS 2002).

Effective participation needs development of the social capacities of the Indigenous or local communities for integration into the development process (Pahl-Wostl et al. 2007; Gorjestani 2000). Furthermore, the capacities of government officials at various levels and even of the NGOs would need to be addressed, as it is necessary to make policy with regard to their engagement with Indigenous communities (UNDP 2001). It should, however, be noted that capacity-building requires a significant amount of time (Jackson, Storrs and Morrison 2005) and it is also highly dependent upon funding conditions, which are not usually available.

Jackson, Storrs, and Morrison made a few relevant suggestions to improve understanding about Indigenous knowledge and its influence on the water management process. They suggest:

1. Support for community-based initiatives.
2. A multi-disciplinary and trans-disciplinary[2] approach (to understand the complexity of Indigenous practices).
3. Innovative regional management structures that create an institutional framework to provide a link between the top-down and the bottom-up approaches.

(Jackson, Storrs, and Morrison 2005, 107)

In recent developments, in order to share perspectives on Indigenous people's knowledge and interests in mainstream water management, a forum was held at Gulkula, in north-east Arnhem Land, Australia. The International Water Experts Forum was held during the Garma Festival in August 2008.[3] The Forum, which resulted in the *Garma* International Indigenous Water Declaration, articulating the rights of Indigenous people over water resources and stated that they must be fully involved in water management planning and operation processes. Another significant outcome of this Forum, along with the Declaration, was a set of recommendations for adoption of Indigenous water knowledge and interests. Most recently on the 24th March 2010, the *Indigenous Water Policy Statement* was launched at Parliament House in Darwin, which was developed by North Australian Indigenous Land and Sea Management Alliance (NALISMA) through its Indigenous Water Policy Group. The policy reinstated: the rights of Indigenous people to water to maintain their spiritual relationship; to participate in the operational process; and their right to approve any commercial use of water on their territories. This policy marks a significant step that gives a clear statement on how the Indigenous people wish to engage themselves in the water management process.

In brief, there are some initiatives to understand Indigenous management practices. There has been international recognition of Indigenous knowledge and its relevance for efficient water management. Further, there are also policies and declarations demanding full Indigenous participation in the operational process. However, the extent to which this has been implemented and actually practised is minimal. The discourse still lacks a model framework or a set of guidelines for integrating Indigenous knowledge and practices with modern planning and management strategies.

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2 Whilst there is increasing interest amongst scientists in integrating their endeavours across disciplines, some researchers and Aboriginal land managers are seeking a form of interaction and integration across cultures which exhibit 'parallel, coexisting, but different, ways of knowing' (Langton 1998, 8).

3 This forum was attended by the researcher which helped to get some first-hand perspectives from Indigenous people across the world and their interests in water management. The Forum was jointed hosted by NALISMA and United Nations University and support from the Youth Yindi Foundation and the Gumatj people of north east Arnhem Land.

Conclusion

From the above discussion it is clear that an integrated and multi-disciplinary approach is needed for management of water resources for sustainable development. Community participation is recognised as vital for a successful integrated water resource management. The literature indicates that participation is now part of the rhetoric in international water policy documents. Nevertheless, reasons for the failure of current community participation initiatives are numerous: lack of recognition of the context; distrust between the government, the local authorities, and the acting agencies; lack of a holistic approach; lack of community capacities and availability of funds. These issues highlight the need for improvement in participatory practice and for acknowledging the role of Indigenous communities and their historically-defined stake in water management. The literature also indicates the current lack of effective participation by Indigenous communities in water resources management. To address these aspects requires understanding of Indigenous hydrological knowledge of an area and its historical and contemporary significance (Jackson 2005). A related gap in the literature pertains to the institutionalizing of Indigenous community participation in policy, decision-making, and management processes.

Rather than adding to the existing wealth of material on sustainability and participation, this study seeks to provide an analysis of Indigenous community participation as part of an overall framework for sustainability. It aims to develop a framework for effective Indigenous community participation for sustainable management of water resources. This is aimed to be achieved through a comparative study of three different approaches to water management at the 'grass-roots' level by Indigenous communities in the semi-arid region of India. The focus is on developing the best possible way and the most appropriate levels for engaging the Indigenous community in water resource management.

Chapter 3. Theoretical framework

Introduction

This chapter has two purposes. Firstly, it builds on the previous literature review to develop the theoretical foundation needed to analyse the case studies in this research. Secondly, it develops the analytical tools to guide the case study analysis. To achieve the second task, this chapter discusses concepts such as governance structures, decentralised institutions, and sustainability models of community participation, following the chronological evolution of these concepts, in order to justify the nature of the analytical tool proposed.

In doing so, this chapter analyses the progress of 'sustainability' as a concept up to the actual implementation process of water management. It outlines the significant need for new governance and institutional structures to achieve effective participation. The study describes the levels of participation, and applies this discussion to Indigenous communities. The discussion also brings forth some of the deficiencies in contemporary participatory theories, which affect the effective involvement of Indigenous communities. This research seeks to identify the characteristics of effective Indigenous community participation and also the factors that relate to this effectiveness from the perspectives of Indigenous participants, facilitators, and government representatives. In doing this, it also discusses the relevance of the social-cultural context, gender, personal interest as well as the educational level and economic status of Indigenous participants that might influence the effectiveness of co-management and participation.

The discussion will further draw together arguments made in this and the preceding chapter to provide the analytical tool for this research. Firstly, it develops the 'Cyclic management model' (refer Figure 3.10) for the steps necessary in the management of water resources. Secondly, it proposes a set of criteria across the various themes identified during this discussion which are subsequently used to evaluate the water management process in the identified case studies.

3.1 Rethinking sustainable water resource management

For the last quarter of a decade there has been a shift in approaches to water management. From the discussions in the previous chapter it is evident that mere infrastructural development, management, and distribution approaches are not sufficient to solve the looming water crisis. Gleick (2002, 373) has called these centralised systems "hard path" approaches, and has suggested a shift towards a "soft path" that focuses on

decentralised systems, efficient technologies and policies, and investment in human capital and low-cost community practices. In addition, there is growing awareness that water strategies and institutional frameworks should be developed by each country individually to address its own specific context and not merely copy or adapt from developed or other nations (developed or otherwise) and the latest international thinking (Franks and Cleaver 2007; Belaidi and Renaud-Hellier 2006; Tortajada 2003). Clearly there is a need for developing a framework for governance, management, and decision-making for the sustainable management and use of water resources, by moving from the level of understanding the concept to its effective practical implementation. Thus, this section brings together discussions on the governance models needed for the decentralisation of management systems and the institutional structures needed for effective water management.

3.1.1 Governance

Governance has been traditionally associated with government, and with the exercise of power by political leaders. The term is used interchangeably with 'government' and 'management'. Government stands for the administrative structure through which state affairs are conducted and management involves the actual actions of the government. Governance thus forms a wider system, of which government and management are a part, which mediates people's interests. UNDP has defined governance as:

> The exercise of political, economic, and administrative authority in the management of a country's affairs at all levels. Governance comprises the complex mechanisms, processes, and institutions through which citizens and groups articulate their interests, mediate their differences, and exercise their legal rights and obligations.
>
> (UNDP 1997, 2)

Based on such a definition, it is evident that good governance requires adequate representation of community interests and the facilitation of legal community participation in the process. Another definition which is particularly relevant here is given by Harpham and Boateng (1991, 67), who defined governance as "the notion creating more 'action space' between government and civil society where the issues of transparent processes, accountability and community participation are taken more seriously". Resource governance involves dynamic power relations embedded in political and negotiation processes. It is closely related to the distribution of power in the process of decision-making in regards to rights to water and its distribution. However, despite several theoretical concepts and a few case studies of 'good governance', there is a lack of understanding of how governance actually

works in practice (Franks and Cleaver 2007).[1] Moreover, there is problem of communication between heterogeneous work groups in terms of their literacy, social capacity, social and economic status and also in relation to their ways of life, values and beliefs (Husain 2009; Mishra et al. 2008; Sangameswaran 2008; Hawkes 2001). It is also critical to know "who governs" as this has a direct impact on improving public participation and decision-making processes (Centre of Sustainable Development 2006, 30).

Further, from various scholarly arguments it is evident that water problems are mostly due to inept management and governance (Molle, Mollinga, and Meinzen-Dick 2008; Franks and Cleaver 2007; World Water Assessment 2006). In the Millennium Development Goals (MDG), for example, there is a wide international consensus on the need for 'good water governance' or 'sound water governance' as a significant element of the efforts in accomplishing water and sanitation development targets (Franks and Cleaver 2007; Perret, Farolfi, and Hassan 2006; WWC 2006; UNESCO 2006). Rogers and Hall (2003, 9) have identified that "inclusiveness, accountability, participation, transparency, predictability and responsiveness" are the "essential conditions for good governance". UNDP and IFAD (2006, 49) proposed similar operating principles for effective governance including "open and transparent, downward and upward accountability, participation, inclusive and communicative, coherent and integrative, and equitable and ethical". The concept of governance provides a way of understanding the links between different stakeholders and their interests and also to analyse how these links are further developed and continue to work (Franks and Cleaver 2007). These relationships between the stakeholders would organise a society in a way to manage its own activities. Rogers and Hall (2003, 16) usefully define water governance as "the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society". This definition builds on the general concepts of governance and at the same time emphasises the complex nature of the systems and the various political processes of power and negotiation.

The earliest literature in this field proposes a path of sustainable water usage to achieve the goals of sustainability. Gleick (1998) initially proposed the following criteria for sustainable water planning:

1 Governance and institutional reforms in Chile, and Mexico have modified their original hierarchical government system to incorporate participatory and decentralised water governance. These kind of changes are also evident in Australia (National Water Initiative), New Zealand and Latin America. For a detailed discussion of these reforms refer Rogers and Hall (2003).

1. Basic water requirement will be guaranteed to all humans to maintain human health
2. Ecosystem health
3. Standard of quality
4. Long-term fresh water renewability
5. Data collection and availability
6. Institutional mechanism for reducing conflicts, and
7. Democratic decision-making

(Gleick 1998, 574)

However, these are not recommendations for action; rather they lay out specific goals to be achieved at the end of a sustainable management process. This provides an example of the difficulties associated with an understanding of the term sustainable development as a goal and not as a process. Another interesting set of dimensions associated with sustainable water resource management is given by Schielen and Gijbers (2000). They identified the key elements of water resource management for sustainable development as:

1. Integration – of disciplines, approaches, and tools;
2. Collaboration and participation – of all stakeholders involved at all stages;
3. Sharing of knowledge and information.

(Schielen and Gijbers 2000)

Both of the above frameworks have much in common. Both contain a focus on *governance* and *institutional framework* and *participation*. From these definitions the main issue which arises is the development of mechanisms and institutions to facilitate effective citizen participation. The question remains broadly unanswered in terms of theory and practice as it is site-specific and consequently needs to be resolved in the specific context (Molle, Mollinga, and Meinzen-Dick 2008; Heller 2007).

This study argues rather for a focus on an appropriate 'process' to achieve sustainable goals in a site specific context. A further consideration is that participatory or co-management approaches bring together government and non-government stakeholders in order to plan for their resources. A detailed discussion on community participation follows in the next section, but it is acknowledged that for stronger negotiations between stakeholders there is a need to separate the role of government as facilitator for these negotiations and as provider of the negotiated outcomes (OECD 2001).

Another promising understanding of effective management of water for sustainable development identifies three interrelated research agendas for resource governance (Meppen,

Bellamy, and Ross 2005; Dale, Bellamy, and Leitch 2001). The focus of these studies emphasises that effective governance must:

1. Seek strategies for sectors to develop their own planning and management capacity;
2. Facilitate better collective (multi-sector) understanding of the social, economic and physical processes within a particular context;
3. Develop strategies to support stronger institutional arrangements that facilitate negotiation between various sector interests.

(Dale, Bellamy, and Leitch 2001, 168)

According to this research focus, it appears that the different sectors associated with water will develop their own planning strategies. Thus, this provides a fragmented approach. This contradicts the basic purpose to develop an integrated approach to water management. At the same time this approach focuses on the need for a *context specific* understanding, and for negotiations between different sectors (Meppen, Bellamy, and Ross 2005). Although it does not specifically mention community participation, it argues for negotiations between various stakeholders including the local community groups.

This emerging concept of 'governance', which is focused on effective development and implementation of policy strategy and specific decision-making in response to its context, is encouraging and enables greater focus on the implementation of sustainable strategies. In response to these arguments Meppen, Bellamy, and Ross (2005) have attempted to design a 'Governance Model' of water resources derived from the Ecosystem model (refer Figure 3.1). This model demonstrates three essential components of a governance system:

1. Substantive: Providing a legislative framework to guide the negotiation process.
2. Participatory: Sharing of knowledge from diverse disciplines including Indigenous communities.
3. Deliberative: Stakeholder-based planning through effective communication and negotiations.

(Meppen, Bellamy, and Ross 2005, 168-169).

This model facilitates tailored approaches to different geo-political, ecological, socio-economic and cultural circumstances (Meppen, Bellamy, and Ross 2005). Contemporary governance depends on the quality of relationships between the different stakeholders, their capacity to negotiate and take action (Meppen, Bellamy, and Ross 2005; Rogers and Hall 2003; Meppen 2000). Furthermore, to understand the complexities within a given community it would be necessary to hear from all related stakeholders to ensure equity, efficiency and also to ensure environmental sustainability. To facilitate these outcomes, the responsibility of government

should be to provide an overarching institutional framework for this resource governance and collaborative action.[2] The framework should address the society's specific needs. Therefore, the role of government should become that of an enabler to support social learning rather than to direct the process towards outcomes (Meppen, Bellamy, and Ross 2005; OECD 2001).[3] The governance model emphasises the inclusion of Indigenous communities, to share their knowledge and experience in the process of decision-making and implementation. The presence of an overarching legislative framework supporting collaborative action and leading to social capacity-building will eventually lead to effective implementation.

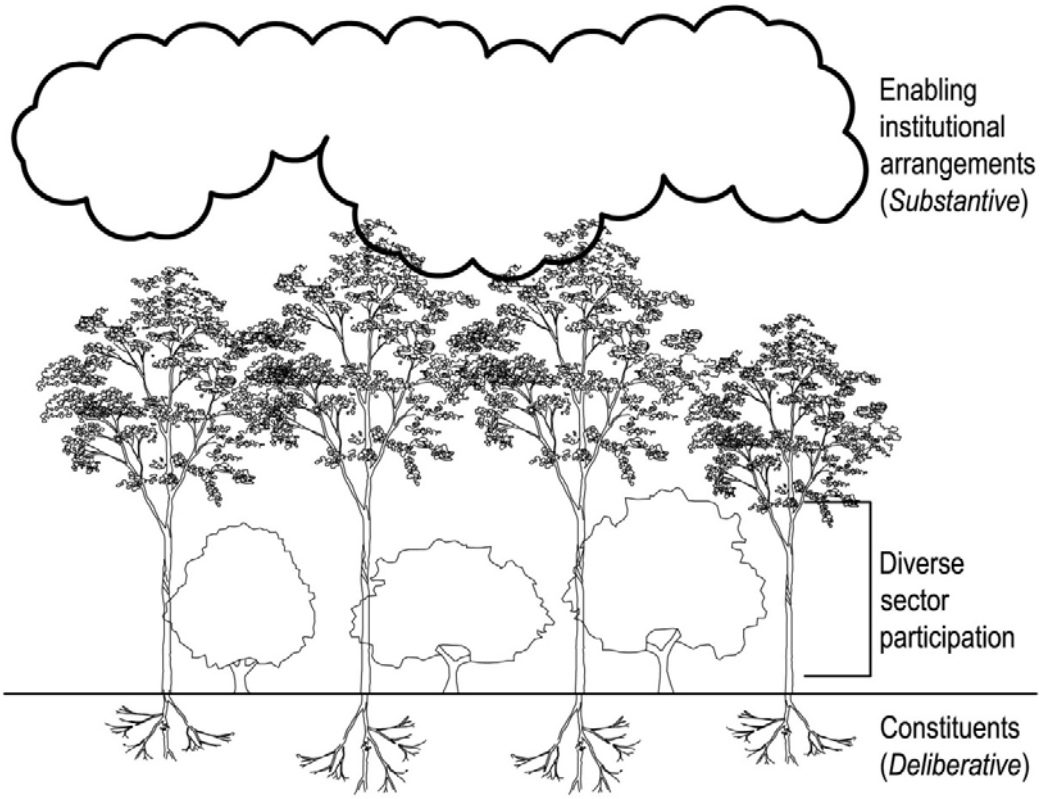

Figure 3.1: Effective and adaptive water governance system (Meppen, Bellamy, and Ross 2005, 169)

In spite of the increasing importance of water governance, there is only a small body of literature that moves beyond the theoretical principles of 'good governance' to understand what processes are desirable in the effective relationship between various systems of governance (Mollinga 2005) and how these process steps lead to water management in practice (Smith 2004). Furthermore, there is little understanding of precedent governance structures, that is, 'customary laws' and their role in management of water resources

2 Resource Governance is defined as "the interplay among institutions, legislation, information, communications, power, perceptions and interests that are currently shaping our responses to environmental issues and consequent decision-making" (Meppen, Bellamy, and Ross 2005, 171).
3 Social learning is discussed in detail in section 3.3.3.

(Maganga et al. 2004; Maganga 2003; Kothari 2000; Berkes, George, and Preston 1991). However, it needs to be understood that most of customary laws are unwritten, made and applied by traditional authorities (village elders or chiefs) and determine the principles underlying the various customs and practices of the community (Maganga et al. 2004). Such practices are governed by socio-cultural rules and ethics, which are a result of communal decision-making, and are enforced by community elders or headman. There is a need to build upon the strengths of customary water laws (whilst recognising their weaknesses), and to develop new water governance structures through a 'bottom-up' approach (Maganaga 2003; Kothari 2001).

From the above discussion it is evident that the need to develop diverse stakeholder participation is increasingly being recognised. The simplified 'Governance Model' proposed by Meppen, Bellamy, and Ross (2005) helps to organise the complex and dynamic relationships needed for effective water management, at the same time building upon existing Indigenous systems. There is a need for decentralisation and development of local governance structures that promote participation and equity (Perret 2006). It is through this kind of arrangement and process of negotiations that a socially constructed decision will emerge, moving towards the identified sustainability goals. However, in the current situation in India, with the absence of this kind of 'Governance Model', any kind of participation or negotiation is being formed on contested ground. As a result, some fundamental questions remain in the Indian context, and will be addressed in this research. These are:

- Who is the community representative in the decision-making process?
- Whose knowledge guides the process or the decisions?
- Who makes the final decision?
- Who accepts accountability for a decision?
- Who implements the decision and takes responsibility for implementation and maintenance?
- Who funds the project?

These fundamental questions focus on problems of community participation and representation for sustainable water resource management. The efficiency of the process depends upon its approach to address the needs and concerns of the local community. To address these, Melloul and Collin (2003) have proposed a pyramid of community water resource management needs, parallel to Maslow's (1937) pyramid of 'Human Needs' (refer Figure 3.2). The key assertion in both of these models is that only when the basic needs are fulfilled can the needs at higher stages be effectively addressed. This further asserts the need for effective participation at local level if water resource management is to be sustainable. It is

evident from these studies that the community involved needs to be educated to make them aware about their needs and rights. Furthermore, close co-ordination and harmony in decision-making between resident communities and regional, national and international management is also imperative (Melloul and Collin 2002). In this respect, a fundamental criterion is to understand the institutional structures in such a governance system, and this will be addressed in the next section.

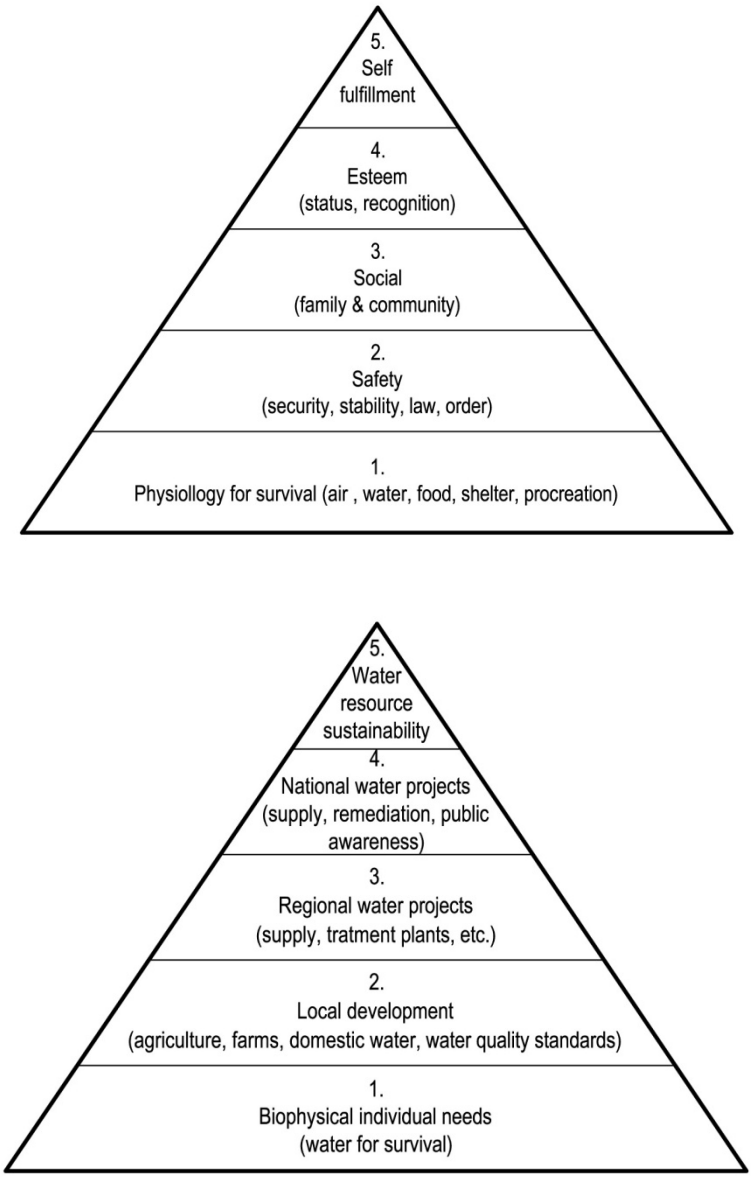

Figure 3.2: Maslow's pyramid of human needs and hierarchy of water management needs (Melloul and Collin 2002, 386-387)

3.1.2. Institutions

From the above discussion it is evident that 'institutions' play a significant role in governance systems for water resource management. A detailed and clear understanding given by North (1991) has been especially useful in contextualising the role of institutions in resource management:

> Humanly devised constraints that structure political, economic and social interaction ... consist of both informal constraints (sanctions, taboos, customs, traditions and codes of conduct) and formal rules (constitutions, laws and property rights) ... [which] ... evolve incrementally, connecting the past with the present and the future.
>
> (North 1991, 97)

Merrey et al. (2007, 196) define the term 'institution' as "social arrangements that shape and regulate human behaviour and have some degree of permanency and purpose transcending individual human lives and intentions". Thus, institutions constitute a set of rules devised by humans to define and delimit the set of available choices and provide structure to everyday life (North 1990, 3-4). These definitions underline the concept that the behaviour of the people involved in these institutions is guided by the institutional structure itself. Institutions are continually evolving within changing contextual and social needs (Merrey et al. 2007; Saleth and Dinar 2004). Therefore, institutions have a significant role in facilitating water management at a local level and developing co-operation between various stakeholders.

Despite the acknowledgment of institutions as critical, there is a considerable variance in the way they are understood. Firstly, there exist two types of institutions: Formal and Informal, as mentioned by North (1990). Different government organisations, laws, regulations, and policies dealing with different aspects of water management form the 'Formal' institutions. There are also 'Informal' institutions that refer to the socially constructed rules and norms in a specific context. Some theorists consider 'Informal' institutions as a translation and extension of 'Formal' institutions (Saleth 2006; Ferragina, Marra, and Qualgliarotti 2002). However, it needs to be understood that 'Informal' institutions are embedded within the 'Formal' institutions and at the same time they are complementary to each other (Saleth and Dinar 2004; North 1990). Merrey et al. (2007), Meinzen-Dick and Pradhan (2002) identify this as institutional pluralism where there are overlapping legal rights over the water which affect effective water management (refer Figure 3.3). Therefore, it is essential to understand the links between the two concepts to promote co-operation and collective action. Secondly, there is a hierarchical structure operating at local, regional, and national levels as the institutions consist of various components which are functionally linked. There is a strong need for

coordination among all these components, Formal and Informal institutions, and a structural link between the various levels, for efficient adaptive planning and management of water resources (Pahl-Wostl et al. 2007; Saleth 2006; Viessman 1990). Lastly, as institutions are embedded within a broader environment which is governed by social, cultural, economic, and political factors, there are various exogenous (structural features within the institution) and endogenous (factors from the environment) features that influence the function of the water institutions.

Figure 3.3: Overlapping legal rights over water (Meinzen-Dick and Pradhan 2002, 4)

These features have been discussed in Saleth and Dinar's (2004) categorisation of water institutional structures into legal, policy, and administration components. Figure 3.4 indicates aspects of each component and the multiple functional links between them. The most significant of these are the policy aspects of decentralisation and participation which strengthen the administration components by focusing on pricing and contributing to water markets and privatisation. These internal dynamics within the institutional structure influence the institutional change. These are referred to as the endogenous influences for institutional change. However, the level of community participation and the decision–making process is not very clear from this structure. Furthermore, water institutions perform in a complex interactive context characterised by exogenous factors, for example, the natural hydrological system, local political systems, social and cultural values, and economic factors, which also influence

the process of institutional change (Sangameswaran 2008; Saleth and Dinar 2004; Agrawal 1999). It is really important to understand the practices of the various actors involved in the institutions (both formal and informal) in a specific context to really understand the institutional functioning. It is the links between these factors that has the greatest influence on the nature and process of institutional performance.

Figure 3.4: Water institutional structures (Saleth and Dinar 2004, 102)

Different theories of institutional change are proposed from different perspectives. One set of theories is based on an evolutionary concept which elucidates institutional change as a result of social, cultural, and economic factors, whereas others support institutional change as a result of market driven economic processes (Saleth and Dinar 2004; North 1990). The former evolutionary concept considers changes in the decision-making process as a result of political and judiciary processes, where economic gain is not a necessity. In addition, these shifts could be encouraged by interactive effects of resource endowments, cultural conditions, and technological developments (Ruttan and Hayami 1984). In contrast, the market-based theories relate to the increase in benefits and property rights. A third conjecture involves bargaining theories which focus on the mechanisms of political and social negotiations (Saleth 2006). While these theories are generally useful to clarify how different factors affect water institutions in isolation, analytically they are not capable of explaining the

complexities of factors operating simultaneously. Furthermore, the factors contributing to these theories are exogenous and do not comment on the deliberate or self-building of institutions.

In addition, Ostrom (1990) proposed a theory of 'collective action', through which the institutions evolve in the context of natural, cultural, social, and economic environments and develop complex links between these variables. Ostrom focuses on 'crafting' institutions which are suitable to function in a given context and also need formalisation to meet their ends. Institutions in the case of common property resources and community-based organisations, evolve and are rooted in the local communities and certainly guided by existing norms, customs, beliefs, and historical precedents. Thus, Ostrom's theory is most relevant to this research on community-based resource management organisation, as this study aims to understand the community efforts of three Indian villages in developing new institutional structures and how their decision-making processes are affected by these dynamics.

In relation to governance and institutions, the appropriate scale of management is an increasing concern. From this understanding of the concept of sustainability, it is evident that there need to be initiatives from both 'top-down' and 'bottom-up'. "Sustainability relies on a well-informed, sensitive leadership and on community-wide support" (Macgregor 2000). This approach was further manifested in 1992 in the *Local Agenda 21*, which emphasised the significant role of local authorities in accomplishing sustainability. However, the key concern in regard to scale and also to sustainability itself is the involvement and participation of the local community (Quesne 2004; Macgregor 2000; Agrawal 1999). Purvis and Grainger (2004) argue that understanding of place, space and spatial scale is most important to understand sustainable development and its application. However, there has been a lack of interaction between the applications of the concept at different geographical levels and also between local, regional, and international spatial scales. These authors have supported ideas of 'place-based approach', 'hierarchical division of responsibilities', and 'active co-operation' for sustainable development. Similarly, Soussan (2004) argues that the 'participatory paradigm' within sustainable development policy can only be effective as far as the legal, policy and institutional frameworks are in place to allow for successful 'grassroots' activity.

It is evident from these discussions that there is an increasing emphasis on the need for decentralisation of power and local management. These discussions further emphasise the concepts of accountability, entitlement, and legitimacy of the representation in the participation process (Quesne 2004; Macgregor 2000). The following discussion highlights the necessity for decentralisation to effectively devolve the control of water resources to community institutions.

3.1.3 Decentralisation

In response to the problems arising from the failure of earlier attempts to manage water successfully in most developing countries, greater emphasis has been laid on the decentralisation of decision-making, extended participation of water users in the decision-making, policy implementation, and management systems of water resources (Agrawal and Ostrom 2001; Agrawal and Ribot 2000; Easter 2000; Cooper 1991). Decentralisation of water management, which is the focus of this study, not only involves efficient service delivery, but also requires recognition of diverse stakeholder interests and devolution of real power over decisions regarding their resources. Agrawal and Ribot (2000, 5) have precisely identified decentralisation as a means to achieve "just political governance – the desire that humans should have a say in their own affairs". This indicates a clear realisation that all parts of the water management system, especially at the local level, do not require government participation, and at times financial constraints have forced governments to develop decentralised institutions like the Water User's Association (WUA) and private firms to provide water related services (Easter 2000; Easter and Hearne 1995). Thus, the process involves transfer of power to the local groups or stakeholders which are most affected by any kind of decision being taken and implemented. Decentralisation in its early understanding referred to the allocation of power to private corporations or agencies to make all the decisions and management processes regarding water resources. This is termed 'privatisation' and cannot be considered as real or just decentralisation. However, this idea has been largely accepted and practised and has resulted in greater reliance on pricing, water trade, and private sector partnerships. This has further aggravated the conflicts due to inequities in access to water (Agrawal and Ribot 2000).

Most of the literature focusing on common-property has favoured the decentralisation process due to its potential to achieve higher efficiency, greater equity, and improved resource management (Agrawal and Ostrom 2001; Agrawal and Ribot 2000; Ostrom 1990). Webster (1992, 129) has further argued that decentralisation means that "the state can be more responsive, more adaptable, to regional and local needs than is the case with a concentration of administrative powers". This focuses on the downward accountability of the administrative agencies as well as of local actors who are empowered to make decisions. Thus, a higher level of participation of all stakeholders having interest in water, with power to make decisions and implement them, and their accountability towards the wider community, are all critical for decentralisation to function efficiently and provide equity.

The main goal of decentralisation in the case of resource management has often been to encourage the participation in decision-making of people who are directly affected and also who share benefits obtained from the resources. A community-based management approach supports this and suggests a major role for local communities in decision-making. Therefore, there is a clear need to understand the constitution of local organisations, to ensure the appropriate representation of the community. Local organisations may be an outcome of grass-roots initiatives or externally induced by government bodies (Uphoff 1982). However, it is widely acknowledged that grass-roots participatory initiatives develop in the context of implementation of decentralisation policies of the government, or as a result of its subsequent failure (Borrini-Feyerabend and Tarnowski 2005; Shiva 2002; Agrawal and Ostrom 2001). A few theorists also suggest that 'top-down' national planning can provide an over-arching coherence to the numerous 'bottom-up' planning approaches of various communities to achieve a balance between the social, cultural, economic, environmental and institutional dimensions of sustainability (Smith 2008; Grainger 2004).

The primary questions posed by this study are related to how the Indian national government's decentralisation policy performs at the implementation stage and what factors contribute towards this implementation. This research is important in terms of the widespread acknowledgement of the need for decentralised and participatory approaches to natural resource management. A variety of participatory management systems can be found in recent studies which can help understand how local participation can achieve effective decentralisation in management of natural resources. The next section discusses theories in literature which contribute to the proposed framework, and describes the factors which underlie the decentralisation process. This study attempts to examine the structure of the local participatory institutions, and using the analytical framework investigates the extent to which participation actually occurs in the water resource management process in the three case studies. At the same time, while studying three different community initiatives of participatory water management at the grass-roots level, it aims to undertake a comparison across the three to comprehend the similarities and differences.

3.2 Community participation theories and resource management

The previous discussion on institutional structures and decentralised governance indicates that community participation has become central to theories of resource management, democracy, and community development. At the same time, it needs to be understood that participation comes in different forms. Participation is a complex concept that encompasses a rich combination of factors: the interest of social actors; the appropriate

selection of the participants depending upon their capacities to make just claims; interaction with others; and all these elements working together in a specific context. Participation has become an important argument for dealing with problems in the management of common property resources. Understanding the complex nature and functioning of resources, the participatory approach has become an integral part of the sustainability process. However, there still exists unresolved issues between government authorities, experts and the common people about the way in which decisions are taken regarding resource management (Cooke and Kothari U. 2001; Fischer 2000). The community role in resource management is emphasised due to their better understanding of the environment (Weber 2003; Sekhar 2001). Their ability to provide solutions based on their local knowledge makes them competent participants in the management process.

Over a period of time a number of other terms have been coined that resemble the concept of participatory management. Examples are: the community-based management approach (Messerschimidlt 1993; Western, Wright and Strum 1994); co-management (Sen and Neilson 1996; Berkes 1991); grass-roots ecosystem management (Weber 2003); collaborative management (Borrini-Feyerabend 1996; Poffenberger 1990a); and, joint management (Borrini-Feyerabend and Tarnowski 2005; Fisher 2000; Poffenberger 1990b). For the purpose of this research, the term 'community-based', 'participatory management', and 'co-management' have been employed interchangeably. These various terms are used by researchers to describe a range of management systems that involve the decentralisation of control over natural resources from the national and state governments to local community organisations. The following section examines the concept of participation in resource management using conceptual frameworks found in the community participation and co-management literature. Secondly, it discusses the various definitions of the concept of participation to determine some key factors responsible for effective participation.

3.2.1 Levels of community participation

There have been various conceptual frameworks put forth to identify appropriate levels of community participation. The research by Arnstein (1969), Berkes (1991), Connor (1988), Sen and Nielsen (1996) and the South Lanarkshire Council (1998) are considered relevant for this study. This literature has been selected based on its representation of the evolution of the concept. The various levels of participation, proposed in these studies, are interpreted to highlight issues concerning 'real' form of participation. The levels of participation are differentiated on the basis of various criteria that are developed during the following discussion.

Arnstein (1969) is perhaps the seminal work in this area. She developed a model that differentiates eight rungs on a 'Ladder of citizen participation' in decision-making. This ranges from limited opportunities for participation at the lowest rung to situations of citizen control and the exercise of controlling powers on the top-most rung. Later adaptations of this ladder categorise similar typologies. For example Berkes (1991) and Pretty (1995) apply a scale of 'information' or 'manipulation' to 'citizen control' and 'partnership', in which the role of people varies from passive function to more stronger initiatives. Berkes (1991) proposes a modified seven category typology of participation (refer Figure 3.5).

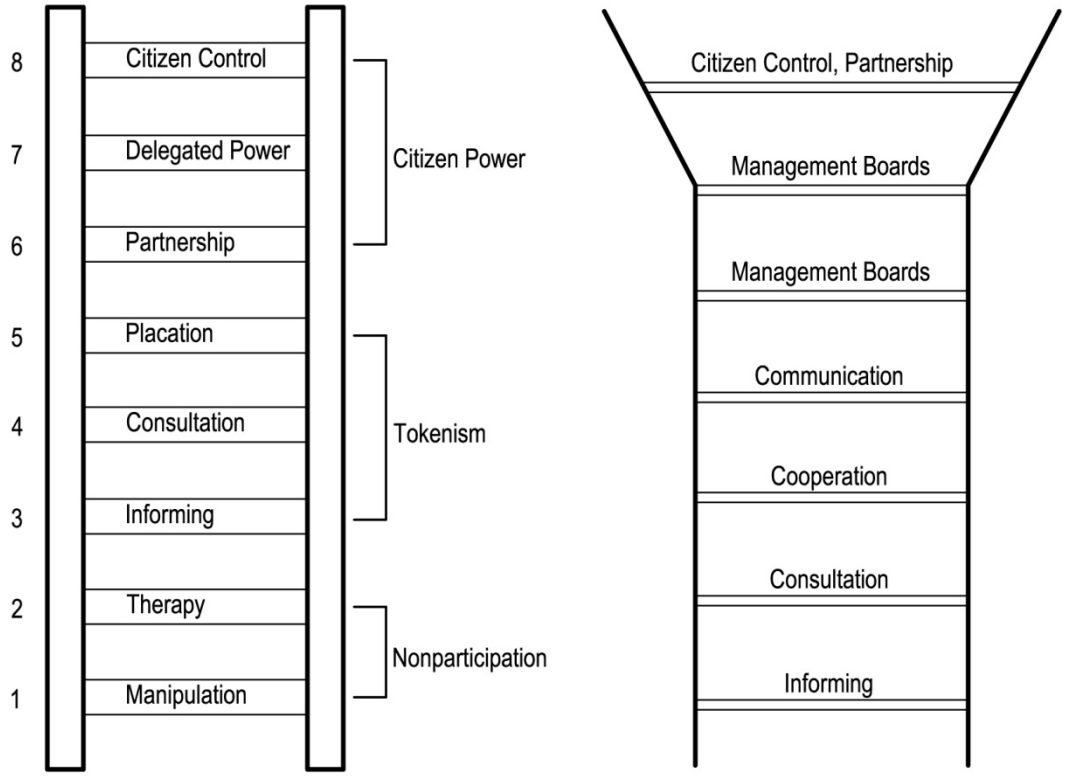

Figure 3.5: Ladder of citizen participation (adapted from Arnstein 1969, 218 and Berkes 1991, 36)

However, in these models, the lower levels of both theories describing information sharing and consultation are contested levels of participation, as there is no guarantee of the information being used for decision-making. However, an attempt is made to redistribute power among participants at the higher levels of the rungs, namely 'citizen control', 'partnerships', and 'management boards' and the concept of co-management is linked to this redistribution of power and responsibility and decision-sharing.

Connor (1988) has attempted to divide the 'New ladder of citizen participation' into different sections (refer Figure 3.6). One section focuses on the planning process that deals with negotiations between all the stakeholders, namely, government, industry, and the people. The

other section highlights the decision-making process through litigation, mediation and joint planning. However, this categorisation still restricts the community engagement to feedback and consultation. The final decision-making power rests in the domain of government and represented leaders. The criterion of 'who represents' is important and certainly affects the decision-making. Therefore, this cannot be taken to be a valid form of participation. It is evident that this 'ladder' model of participation is one-dimensional and hierarchical. The key variable is 'power relations', which remain unchanged at the top rungs and only transformed at the bottom ends.

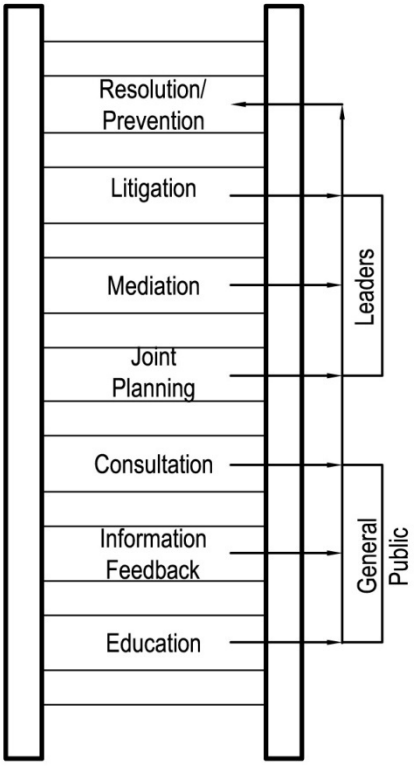

Figure 3.6: New ladder of citizen participation (Connor 1988, 252)

There have been other attempts to categorise community participation, each of them proposing a range of participatory approaches. The World Bank (1996, 3) addressed the traditional government planning and management approach as the "external stance", contrasting it with the "participatory stance" wherein decision-making power is shared with the local people. The prevailing terms 'top-down' and 'bottom-up' imply that true participation occurs only when power for decision-making is shared with the local people. Carr (2002), on the other hand, proposed that, for sustainable management of resources, the approaches at both ends of the spectrum need to be integrated.

This integration relies on a shared understanding of participation, which attempts a "renegotiation of power between expert outsiders located at institutional centres

and local people" (Goodwin 1998, 483). Therefore, there is valorisation of 'local knowledge' and continued belief in the capacity-building and empowerment of local people through participation. However, importantly, Goodwin (1998) makes the contrast between 'instrumental' participation in a project defined by outsiders, and 'transformative' participation initiated by local people that changes power and social organisation. In the case of water resource management, 'instrumental' participation aims to gather data on local knowledge and decisions by the project initiator, whereas a 'transformative' type might result in higher levels of participation and greater commitment by the community towards water conservation and management through sharing of knowledge, and even in the development of new structures. The second form of transformative participation is a significant development in the participation concept.

There have been some other approaches which propose a further and wider spectrum of levels of participation. Sen and Nielsen (1996), rather than proposing levels of participation, have suggested five types of co-management depending upon the role of government and users (refer Figure 3.7). This enquiry explores whether participation typologies can be used to assist in determining which level of participation is appropriate in a particular context.

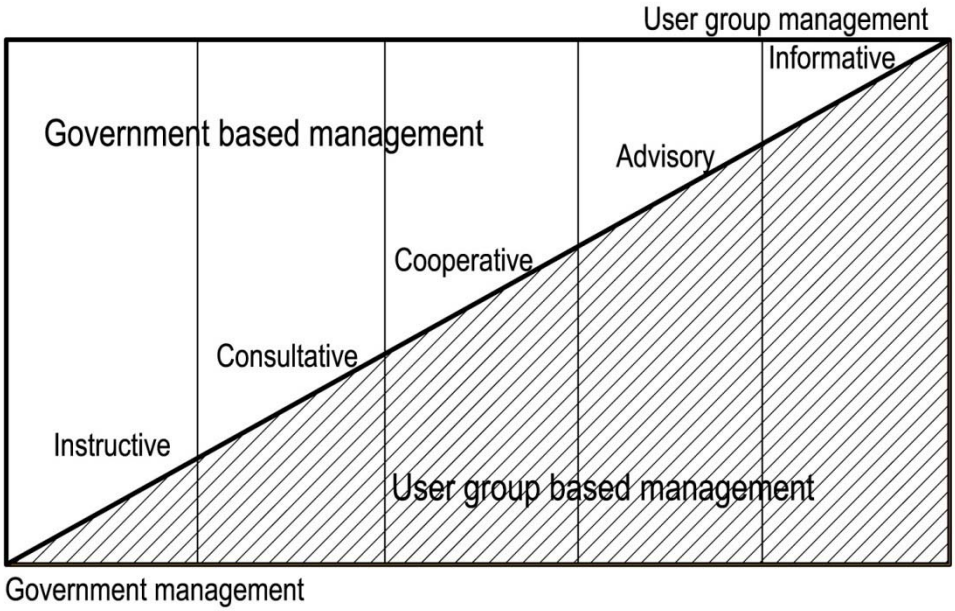

Figure 3.7: Levels of participation (Sen and Nielsen 1996, 407)

Then, working from a local government perspective, the South Lanarkshire Council in Scotland developed a "Wheel of Participation" in 1998 (refer Figure 3.8). This wheel is another attempt to identify different types of participation rather than present any form of

hierarchy. This means that depending on the intended purpose and situation, a particular approach could be chosen. Under this scheme, there is a structured move from the extreme of no community input, with the council taking all the decisions, through consultation and participation to citizen empowerment, where the community make their own decisions on issues that affect them (Davidson 1998). This participatory wheel emphasises the legitimacy of different degrees of engagement (Davidson 1998). However, in both these categorisations, although the hierarchical nature is rejected, the model does not address the exact roles of government and community in decision-making, nor the exact stage of the management process at which community participation needs to be addressed. Most significantly, the model does not highlight the mechanism for involving the community at higher levels of decision-making.

Figure 3.8: Wheel of participation (Davidson 1998, 14)

A further development by Rowe and Frewer (2000) has identified participation typologies based on communication flows between stakeholders and the nature of participants. Their model is based on the sharing of information between stakeholders and constitutes a) communication, b) consultation, and c) participation. This typology, like the previous ones, does not fully address the issue of decision-making. Furthermore, this model is

like an evaluation tool to investigate the participation process on the grounds of information sharing. Then a similar typology by Johnson et al. (2004) identifies types of participation at different stages of a research project based on who makes the key decision in the innovation process. However, this grouping focuses on participation in research and development projects and there is little evidence about its practical implications for resource management.

Developing these ideas further, Lawrence (2006) built on Goodwin's (1998) model of 'informative' and 'transformative' models, emphasising the idea that participation should lead to transformation of communities by creating change in their values towards personal learning and development and their relationship to nature. This model, instead of representing the restricted centre-versus-local typological patterns, demonstrates the dynamic interaction between people in the form of different stakeholders, environmental values, and governance structures, all contributing to decision-making.

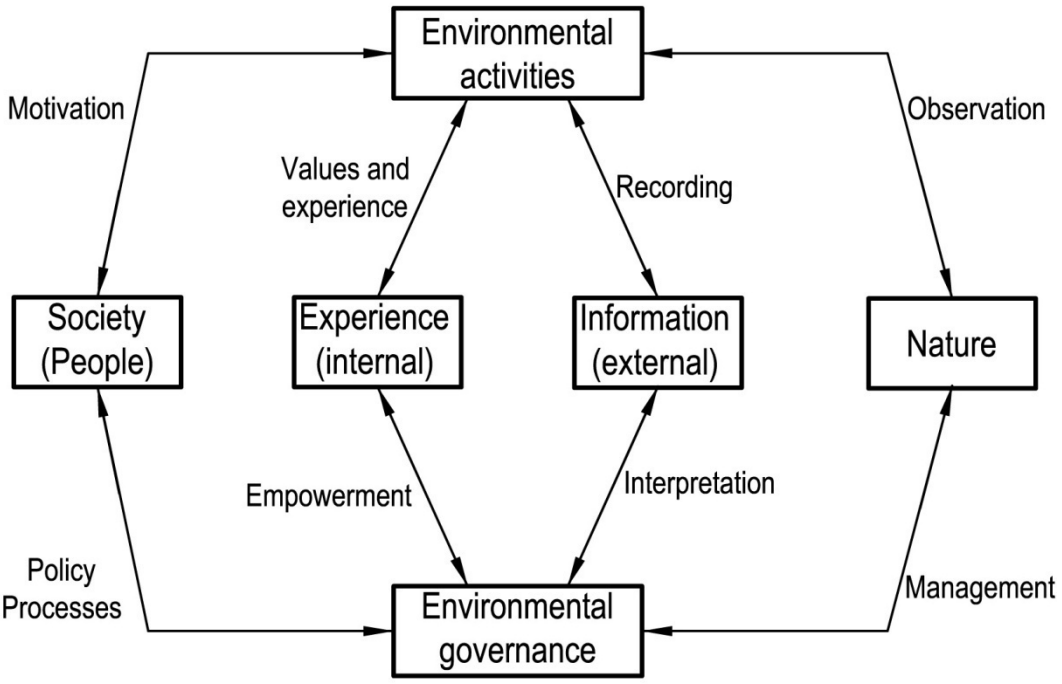

Figure 3.9: Dynamic interaction between various stakeholders for transformation of communities (Lawrence 2006, 294)

However, this model does not address the links between society and nature, and addresses participation as a fusion of data and experience derived from personal activities (subjective – upper link) and decision-making (objective/ operational – the lower links). Lawrence (2006) stresses the need to focus on people and their knowledge in order to have a stronger sustainable relationship with nature and directed by a good environmental governance structure.

Alternatively, there have been recent attempts to develop typologies on the basis of operational objectives of participation. Lynam et al. (2007) distinguish between 'diagnostic' and 'informing'; and 'co-learning' and 'co-management' concepts, based on modes of knowledge-sharing and use in decision-making about natural resources. Tippett, Handley, and Ravetz (2007), on the other hand, reconceptualised the rungs of the ladder into five major processes of participation in planning:

1. Inform
2. Design
3. Consult
4. Deliver
5. Monitor/ review

(Tippett, Handley, and Ravetz 2007, 19)

These authors propose that all these processes are necessary for meaningful participation. This attempts to focus on 'active involvement' for a community to develop new ideas and concepts and to identify problems by themselves rather than only commenting or providing information on issues developed by 'outsiders'. Conceptualising participation as a continuous process offers the opportunity for all stakeholders to participate at different stages of management. Thus, the management process is intended to be an interactive, cyclic process which may involve different stakeholders at various stages of the process.

The numerous typologies discussed above identify the various participatory methods available for selecting a particular purpose in a specific context. Further, they highlight the forms of control and power articulated by participatory approaches. However, before further discussion on power, knowledge, culture and social control, some potential challenges need to be reviewed. These challenges have been identified by the different studies discussed above, and they are summarised below:

a. There is a lack of distinction between each of the levels, and a lack of clarity in the use of terminologies. A co-management agreement may include each of the levels from the lower-most to upper-most rungs (Borrini-Feyerabend 1996).

b. The lower levels of participation may fail to be appreciated by the Indigenous communities as they do not represent power sharing between equals. The terms 'Consultation', 'Instructive' and 'Communication' are unlikely to be accepted as real forms of co-management (Berkes 1999; Gorjestani 2000).

c. The differences in perceptions of the different stakeholders involved are neglected, particularly regarding the appropriateness of the level of participation (Berkes, Colding, and Folke 2000).

d. At the advisory committee level, as proposed by Berkes (1991), if the advice proposed by the community is not taken into consideration at the policy-making and implementation stage, then this stage is nothing more than consultation (Borrini-Feyerabend 1996).

e. Levels of participation change depending upon the scale of the project as well as during the various phases of the project (Singh and Lal 2001).

f. The levels represent a hierarchical process but ignore the importance of the spatial and organisational scales. They do not explain whether these processes and structures should be established at the governance level, the management level, or both. The 'Governance Model' proposed by Meppen, Bellamy, and Ross (2005) provides greater clarity in this regard. The framework provides for a better co-management process with sharing of power through the distribution of responsibilities between stakeholders.

g. The redistribution of power from an existing central institution to marginalised groups might result in unconstructive relations between the two (Kothari U. 2001).

Thus, these challenges in accepting any of the models of participation discussed above must be overcome for Indigenous participation and emphasise the need for improved participation for well-informed decision-making of resource management. The benefit of using a 'Wheel' as a model for participation rather than a 'Ladder' is that an appropriate level of community involvement is reached. The various typologies of the 'Wheel' allow for power-sharing in decision-making as well as the responsibility and accountability of stakeholders. However, the success of the decisions strongly relies on the 'process' of participation that leads to the decision (Reed 2008, Mostert 2006). It the context of resource management, participation should be re-conceptualised as a process. As Gleitsmann, Kroma, and Steenhuis (2007, 143) point out, participation is a "process that makes concerned efforts to bring all voices into deliberative decision-making at all points in the decision-making process". Each of the stages of the process, namely: problem identification, option assessment, decision-making, planning a strategy, implementation, monitoring and evaluation (Tippett, Handley, and Ravetz 2007; Mostert 2006; Pinkerton 1989) would need active participation of relevant stakeholders. The participatory process should clearly determine who participates, when, and how, in the complete management process.

Through this analysis of participation typologies and the previous literature review of sustainable water resource management, a conceptual framework for Indigenous participation in water resource management is beginning to emerge, and is discussed in the next section. However, differences in the use of the term 'participation', a process of decentralisation, challenges any singular definition. The interpretations of the diverse participation typologies are presented in the following section.

3.2.2 Understanding participation typologies

A variety of international, environmental, and Indigenous movements have led to the development of participatory approaches to resource management. From an international perspective the *Brundtland report*, *Agenda 21*, World Water Forums and the *Kyoto Protocol* are evidence of the realisation that governments or planners can no longer address water problems in isolation. This has led to the development of an integrated approach that requires them to work in collaboration with other stakeholders. In India, the development of the *People's Biodiversity Register* in 2002 was an important step towards decentralisation of power in the move towards participation.

There have been widespread perspectives of the term 'participation' related to particular contexts. Berkes (1991, 6) broadly refers the term to "various degrees of integration of local and state level systems". Although this highlights co-management as an alternative system to the 'top-down' management system, it still fails to speak of Indigenous communities as equal partners. Therefore, to develop a successful model of co-management for Indigenous communities, it is necessary to understand the various interpretations and applications of the term. From the following discussion it will be clear that no single model of co-management will provide a complete solution to the water resource dilemma. However, it will help to determine some key factors that are required for effective collaboration between the state and local governments, and the Indigenous communities. Each of the terms analysed below represent how the various stakeholders relate to each other and how the process works in practice.

Dual Management

Dual management means some form of agreement between the government and the people. In this manner, the ownership rights of the resources rest with the government, and the right to use is by the people. This definition, however, has two problems. Firstly, the concept of 'ownership' might be a cause of conflict between the government and the local

community. Indigenous communities might recognise 'ownership' as conferring right to access and use a resource according to the protocols of customary practice (Berkes and IUCN 1989). Secondly, this term fails to describe the specific responsibilities of both partners. There is uncertainty regarding the actual operation of this relationship, and the resolution of any conflicts between the partners.

Co-operative Management

In his ladder of participation, Berkes (1991) introduced the term 'co-operative' as a specific level of co-management.[4] He described 'co-operative management' where the ability of the community to participate meaningfully is recognised. However, Berkes does not provide details on the specific level and nature of the participation at which the community input is expected. Sen and Nielsen (1996) identify co-operative management as existing between parties agreeing to have equal-status in the decision-making process, while retaining their individual identity and independence. However, it is difficult to have partners with equal abilities, and to bring two unequal partners to an agreement. For example, when a government agency as one partner has access to expertise, funding, facilities, and statutory powers, and an Indigenous community as another partner has limited access to resources, it is difficult to bring equivalent participation. Therefore, it has been widely advocated that the capacity-building of both the Indigenous community and the concerned agency officers is imperative for more effective co-operation in the management of resources (Pahl-Wostl et al. 2007; GWP 2006; Sillitoe and Barr 2004; Berkes, George, and Preston 1991).

Collaborative management

In contrast, collaboration theory emphasises power-sharing in the decision-making process. Gray (1989, 12) asserts "Central to the notion of collaboration is the concept of shared power". According to Borrini-Feyerabend (1996), collaborative management refers to partners who agree to share management functions, rights, and responsibilities for a territory or a set of resources. Other researchers, Wood and Gray (1991, 146) suggest that "collaboration occurs when a group of autonomous stakeholders of a problem domain engage in an interactive process, using shared rules, norms and structures to act or decide on issues related to that domain". This definition incorporates certain elements that are likely to address the aspirations of Indigenous communities, including:

4 Refer to Figure 3.5 in section 3.2.1.

1. Recognition by the management of the local or traditional systems.
2. Parties to the collaboration retain their complete autonomy or share a part.
3. Parties in collaboration agree on the norms and structures by which the relationship is to operate.
4. Parties to the collaboration address the issues in a particular domain to effect change.

These criteria address the need to formalise co-management institutions, as asserted by Berkes (1991), by formation of structures and written arguments, and agreements to the means to operate collaboration. Thus, it also provides an opportunity to overcome the issue of inequity in power. However, there are two other criteria which need to be considered, that is, to have a common language and the capacity for the 'interactive processes'. There needs to be a shared language between the Indigenous community members and other stakeholders like government officers, private partners, NGO representatives, and also non-Indigenous community members. Language and capacity in terms of literacy and social capital are also significant for a meaningful participation.

Community-based resource management

The concept of community-based resource management has its foundation in the theories of social scientists such as Mancur Olson, Elinor Ostrom, and Arun Agrawal on common property resources, which have highlighted the role of a local community and its organisation in effectively managing its natural resources (Agrawal 1999; Ostrom 1990; Olson 1965). However, it is not a completely new concept as resource management has been practised in various parts of the world by traditional communities for many decades, in response to the natural, social, and cultural constraints.[5] The concept was revisited and encouraged during the 1990s due to various analogous factors such as the failure of 'top-down' centralised resource management and planning, subsequent emphasis on participatory methods during the neo-liberal development, and an emerging focus on the development of social capital (Agrawal 1999; Agrawal and Gibson 1996). The main argument behind this concept was that communities possess the local knowledge to live in harmony with nature and so they are best able to use and manage their resources (Gadgil et al. 2000; Guha 1999; Agarwal and Narain 1997). However, some research has suggested that the 'traditional communities' which previously had a harmonious relation with their environment might not

5 Many traditional communities like the ancient Sumerians, Amerindians of Canada, Hopi Indians, *Aryans, Gonds* and *Kohlis* in India, different tribes in South Africa, communities in various parts of South-east Asia (Fiji, Solomon Islands, Indonesia) and also various Aboriginal communities in Australia adopted a holistic view that linked the environment and the human population in a web of relationship and developed resource management practices for long-term conservation of resources.

have the same potential in a vastly changed context such as pertains today (Agrawal 1999; Baviskar 1996).

This type of management often emphasises self-governance, autonomy and self-rule which does not truly suggest co-management. However Berkes and Folke (1998) suggest that most community-based organisations actually work within and are linked to higher levels of legal and administrative systems.

> Even those Indigenous groups with well-functioning local management systems are dependent on the central government for the legal recognition of their rights and their protection against outsiders.
>
> (Berkes and Folke 2000, 8)

Thus, Indigenous communities have a predominant role in the decision-making process but within existing government frameworks. This seems to be the highest form of participatory management system.

In this way it can be seen from recent scholarships that various difficulties have been identified associated with community-based natural resource management. The first, which has been explored in the previous chapter, is regarding the fissures within the community as a result of caste, religion, economic status, and gender, which would affect the CBNRM due to differences in the beliefs, values and aspirations of different participants (Hussain 2008; Agrawal 1999; Leach, Mearns, and Scoones 1999; Agrawal and Gibson 1996). Moose (2003) further argues that government-initiated (state or national) CBNRM models are often developed from a utilitarian and economic view, and tend to separate the social and cultural aspects related to resource management.

Adaptive co-management

The need to constantly adapt to the changing context (social, cultural and environmental) has led to an increased amount of attention being paid to adaptive co-management in the last decade (Armitage, Marschke, and Plummer 2008; Olsson, Folke, and Berkes 2004; Ruitenbeek and Cartier 2001). The approach is characterised by the commitment to constant improvement through the process of monitoring and evaluation. Carlsson and Berkes (2005, 65) have asserted that "an alternative approach is to start from the assumption that co-management is a continuous problem-solving process, rather than a fixed state, involving extensive deliberation, negotiation and joint learning within problem-solving networks". Consequently, Folke et al. (2002, 20) have defined adaptive co-management as "a process by which institutional arrangements and ecological knowledge are

tested and revised in a dynamic, ongoing, self-organised process of trial-and-error". Ruitenbeek and Cartier (2001, 8) have defined it as "shared rights and responsibilities of stakeholders and to learn through actions" occurring within a long timeframe.

The significant aspects highlighted in the above definitions are the sharing of responsibility to manage resources, the development of inter-connected institutional structures, and ongoing learning processes. They offer considerable appeal to the complex systems theory approach which considers nature as continuously evolving resulting in non-linearity and self-organisation (Berkes 2004; Holling 2001). Similarly in these definitions the community organisations are seem to be able to evolve over time through the ongoing feedback learning process either self-organised or with little support from external agencies (Ruitenbeek and Cartier 2001). However, Berkes (2004) argues that if adaptive co-management is introduced through policy interventions, it may cause system failure. He further argues that the local or community based organisations need to be recognised through legislations and the development of support structure to enable the local institutions to work effectively by capacity-building.

The present study responds to the issues discussed in the above section dealing with the importance of community-based resource management, the shortcomings and challenges of participatory approaches in practice, and the role of community institutional structures. This research is intended to focus on the *process* through which community-based management organisations are structured and operationalised. From the above theoretical discussion, various components important for the process of co-management are synthesised to lead to the development of a conceptual analytical framework to evaluate the *process* of participation in the selected three case studies.

3.3 Elements for effective participation

The discussion in the previous section indicates that there are certain elements that are critically important for effective participatory process. Participation in resource management is described in various ways, therefore, it is not possible to make practical generalisations. However, it is possible to synthesise the common elements across the literature. The social and cultural contexts of the participants will determine their respective attitudes and perceptions and will in turn affect the type of participation. The first criterion is related to the presence of an effective institutional structure with adequate links across horizontal and vertical levels, with simultaneous recognition of the historical structures and hierarchy. A related aspect of this is distribution of power in the decentralisation and

participation process. The second factor is the scale and stage of the project at which community participation occurs. This would involve the community from the initial stages of problem identification, to exploring solutions, taking responsible decisions, implementation, and lastly monitoring and evaluating the project. The third element is about community interaction to integrate diverse interests, and knowledge to lead to a well-informed decision based on consensus or collective understanding. The fourth significant element is who is represented in the complete process, and the accountability taken by the representative for the decisions and implementations. In this regards, the capacity building of participants must be considered for undertaking shared actions. Finally, this whole process should be an ongoing learning process to adapt to the continuously changing context.

These considerations suggest that participation is very complex, sensitive to community relationships, and workable in a specific context. These characteristics have been discussed consistently in the literature review in the preceding and current chapter. Table 3.1 below brings together all these elements associated with the Indigenous engagement in water resource management. The characteristic of governance structures, decentralised community institutions, integration of various knowledge systems, and need for adaptive learning or ongoing responsiveness have been discussed in earlier sections. The remaining features are discussed in following sections.

Elements	*Description*	Key References
Decentralised institutional structures	Devolution of decision-making to local organisations through legal, policy, and administrative structure with links across various scales, and levels; and recognition of informal institutions	Meppen, Bellamy, and Ross 2005; Borrini-Feyerabend and Tarnowski 2005; Agrawal and Ribot 2000; Shiva 2002; Kothari U. 2001
Participation in decision-making	Transparent, context based, well-informed and equity based decisions reached through integration and social capital building	Borrini-Feyerabend and Tarnowski 2005; Plummer and FitzGibbon 2004; Kothari 2001; Berkes, Colding, and Folke 2000; Sen and Neilsen 1996
Integration	Inclusion of multiple stakeholder interests, knowledge systems (Indigenous and technical) to develop a shared understanding	Plummer and Armitage 2007; Sillitoe 2007; Ford 2001; Berkes and Folke 2000; Brokensha, Warner, and Werner 1980
Representation and accountability	Actors from various stakeholder groups representing their respective interests taking responsibility and downward accountability for their decisions	Plummer and Armitage 2007; Cooke and Kothari U. 2001; Agrawal and Ribot 2000;
Ongoing responsiveness/ Adaptive learning	Continual improvement in planning strategies through evaluation and feedback to adapt to changing contexts	Meppen, Bellamy, and Ross 2005; Olsson, Folke, and Berkes 2004; Ruitenbeek and Cartier 2001; Berkes, Colding, and Folke 2000;

Table 3.1: Elements of an effective participation process

3.3.1 Participation, power, and knowledge

In the previous discussion on various forms and interpretations of participation, it is evident that the concept of power is a dominant issue. Power is a multi-faceted concept and therefore cannot be defined in a succinct manner. Power in the case of current water management systems is considered to be with Government authorities or high level institutional structures, while the community is seen to be subjected to this power. Therefore, there has been a continued need for community participation and local empowerment. This has led to recognition of the importance of sharing power over the resources to manage them effectively.

Interpretations of power in participation literature as a quantitative commodity to be possessed, can be analysed in the various participation theories discussed in section 3.2. Arnstein (1969, 216) in her ladder of citizen participation discusses “redistribution of power

between citizens and power holders", which indicates power as a capacity that needs to be shared or allocated between different stakeholders. Goodwin (1998) reinforces the concept of power as capacity by suggesting negotiation of power distribution between experts and local people. This implies that there needs to be a shift of power from the authorities to less empowered groups. This shift has also been advocated in the *Local Agenda 21* as the transfer of authority to manage resources to the locals. A structuralist view in this regard has been adopted by Chambers (1997, 58), who conceptualises a dichotomy between the powerful "uppers" and the powerless "lowers".

This dichotomy further supports the assumption of this research that power to make decisions about the natural resources is situated at the high levels in current institutional structures. This perception is reinforced by the continuous call for decentralisation of power to the local level, emphasizing 'local knowledge' and 'empowerment'. Foucault, however, argues from a cultural and anthropological perspective that

> Power must be analysed as something which circulates, or rather as something which only functions in the form of a chain. It is never localised here or there ... Power is employed and exercised through a net-like organisation.
>
> (Foucault 1980, 98)

Thus, Foucault's analysis of power disrupts the above dichotomies of central/ local or powerful and powerless by suggesting all individuals can be agents of power (Kothari U. 2001).[6] Kothari U. further emphasises the dynamic and contextual nature of power by suggesting that:

> Macro-spheres of authority are not necessarily the only focal conductors of power ... and in this conception knowledge is culturally, socially and politically produced and is continuously reformulated as a powerful normative construct.
>
> (Kothari U. 2001, 141)

Applying these dynamics for this context, Agrawal and Ribot (2000) have identified four types of domains in which power is exercised by actors, which are crucial for the understanding of meaningful decentralisation. They are as follows:

6 A full discussion on power, the origins of the concept, and different theoretical perspectives on this concept is beyond the scope of this research. This study aims to understand power as it relates to the participation process in water management institutions. For arguments on various theoretical principles of power in this process refer to Hillier (2002), Flyvbjerg (2001), Kothari U.(2001), Caputo and Yount (1993), Foucault (1988, 1982), Lukes (1986), Foucault and Gordan (1980) and Weber (1947).

1. The power to create rules or modify old ones,
2. The power to *make decisions* about how a particular resource is to be used,
3. The power to *implement and ensure compliance* to the new or altered rules, and
4. The power to *adjudicate disputes* that arise in the effort to create rules and ensure compliance.

(Agrawal and Ribot 2000, 7)

They suggest that transfer of these institutional decision-making powers to the lower levels of political-administrative hierarchy would achieve decentralisation to some extent. However, it needs to be considered that all these four categories are complementary to each other, as power to make decisions about the use of resources would be meaningless without the power to enforce these rules and ensure compliance.

It is thus evident that power relations are complex and differ according to individuals and situations. In this research, consideration of power relations in participatory water management particularly refers to an in-depth understanding of the cultural and power dynamics in a particular context. Participation in resource management involves government agencies and community groups. Therefore, power in this case can be viewed as the dynamic relationship between the two. Also there needs to be equal power sharing within the community and between the groups (for example Government, community and NGOs) for developing effective participation. Consequently, redistribution of power significantly depends on the capacity of the individuals involved who get to exercise power and the accountability relations to which they are subject. Social capital is generated when good inter-community relationships, excellent conflict resolution practices and high level of trust are developed within a community and also extend to external groups. Thus, it can be regarded as an approach towards adaptive management (Folke et al. 2005; Olsson, Folke, and Berkes 2004; Baland and Platteau 1996). The efforts or the interactive processes undertaken to develop these relationships are described social learning. Understanding these terms informs the development of the model for effective water management through community participation.

3.3.2 Social capital

An important concept in the development of new paradigms of water management is ‘capacity building’ or ‘social capital’. The previous discussion has established that effective water management requires collective action of different agencies, scientists, interest groups and also the community. As Berkes and Folke (2000) argue, resource management is, in reality, management by people. Therefore, for sustainability, understanding of the social organisation of the community is vital. However, involvement of a community in planning and

decision-making for effective water management involves building the capacity not only of the community, but also of the high-level decision-makers, water managers, and civil society bodies to learn about their interdependence and diversity and how to achieve effective communication (Pahl-Wostl et al. 2007; GWP 2006; Cooper 1991). Thus, social capital can be described as the ability of people to work collectively to overcome differences. In other words, positive community interaction produces social capital that becomes a support for the community to draw from for further action (Coleman 1990).

Social capital is thus considered as “a by-product of other social activities” (Putnam 1993, 170). Knight (1992) suggests that institutional norms developed as a result of conflict resolution over distribution of resources are a form of social capital. Thus, Knight refers to the organisations and social associations that a community builds independent of State (for example Government) frameworks or other external entities that increase productive potential (Roseland 2000). This pattern of inter-relationships and effective participation between stakeholders is based on trust and shared knowledge (Putnam 1993; Coleman 1990). Putnam’s (1993) work focuses on the horizontal interactions within community groups. He illustrates fundamental relationships between norms, social values (especially trust) and social networks. In contrast, Coleman (1990) discusses the aspects of power and domination in vertical hierarchical structures within the group, as well as between different groups. Social capital is an outcome of both levels of interaction.

Social capital is characterised by trust, obligations and expectations within a group structure or social structural network, and also by the efficiency of information channels (Knight 2002; Coleman 1990; Ostrom 1990). Trust within a group and between groups is a prerequisite for the development of higher social capital, which facilitates better co-operation and confidence in collective activity. Furthermore, Coleman (1990, 106-107) states, "the trustworthiness of social structures allows for the proliferation of obligations and expectations”. Putnam (1993) further argues that higher social capital is found in groups who share common ethnic values. In this respect it should also be considered that communities may have common negative values which might affect the capital building. Bourdieu (1985) has been very influential in developing an understanding of the relationship between trust and social capital, which he saw as a personal resource that individuals gain through association with a group for shared action. Bourdieu saw social capital as an opportunity as well as a reward acquired by people through membership in certain community groups. It should be also noted that high levels of social capital developed through interactive processes contribute significantly to community welfare.

From an Indian perspective, Kothari (2006) comments on the need for trust and information channels as important elements of social capital. Pathak et al. (2006) further assert that internal community stratification owing to caste, gender, religion and traditional value system, can be overcome by effective capacity building programs. Thus, the social networks outside the community groups can be of significant help in overcoming these challenges and social capital can be seen as related to the role of State government and NGOs. In India, there is very little evidence of capacity building by the State; however, several examples of NGO initiated programs could be found (Pathak et al. 2006; Chakravarty, Badam, and Paranjape 2006; Sharma 2003; Shah and Raju 2001; Kothari 2000). A parallel line of thought also recognises the capacity building of those government staff who are positioned to implement the participatory approaches (Sillitoe and Barr 2004; Baumgartner et al. 2004; Chambers 1997). This would help to create a better collaborative environment if the government authorities would have the willingness to listen to the local people and understand their perspective and local knowledge.

3.3.3 Social learning

The above discussion ascertains that social capital is built when people take efforts to learn what is customary and adequate in a natural, socio-cultural and institutional setting. The process through which social capital is generated due to interactions between social groups is important in developing effective participation in water management. Social learning is an interactive and ongoing process supporting the enhancement of a collaborative approach and resulting in improved *'relational qualities'*, such as improved conflict resolution and co-operative agreements (Pahl-Wostl et al. 2007). Understanding these interactions is important to this research, which focuses on the development of an effective model of community participation.

Social learning can be termed as a mechanism through which people in a community develop a high level of trust (as a component of social capital), which is necessary for any effective decision-making and conflict resolution in relation to any form of resource use. This knowledge gained through experiences and validated in practice in turn guides community actions towards resource management (Friedman 1987). Changes in water resource management essentially require social learning, which certainly needs changes in social structure, culture (the set of beliefs, values and knowledge), and institutions (Pahl-Wostl et al. 2007). Development of a social learning system is needed to develop an innovative institutional arrangement (Friedman 1976). Milbrath (1989), in this regards, advocates the need for a "learning society" that can "learn its way out" to develop a participatory model. He

describes the social learning process as a way to make cultural transformations and effect a shift from central control to effective participation and community control. The process is considered to be continuously evolving, providing the community and all stakeholders with the ability and knowledge to manage resources effectively.

This social learning process appears to relate to the concept of adaptive management which is described as a continuous process of interaction, reflection and improvement of the way in which we manage natural resources. Social learning can improve this interaction process to better understand the varied interests of stakeholders in the resources. In summary, the interactive process of social learning builds social capital, knowledge, values and skills amongst community members, resulting in a "learned society" where the community participates effectively to control its resources with equity in power sharing and resource utility for sustainability.

3.3.4 Representation and accountability

From the previous discussion on theories of decentralisation and community participation, it is seen to be imperative that community-based decision-making process requires accountable representation. John Lonsdale has said that:

> Rulers claim to be responsible to their people; people try to hold them to account. Accountability is thus the measure of responsibility.
>
> (Lonsdale 1986, 127)

This kind of representation is lacking in the current 'top-down' approach to resource management where the decision-making is taken over by an elite group of Government officials and the local groups are excluded from the process. Fair representation does not mean mere physical inclusion of community members in the institutions by also considering their views in the process (Reed 2008). It is also argued that diverse interests within communities which are stratified by the caste, religion, gender, economic status and livelihood basis must be well represented (Husain 2008; Sangameswaran 2006; Agrawal 1999). Bellamy and Johnson (1997) have argued that disparities in power location and wealth between citizens can have a negative influence on representation. Similarly, representation by the most influential community members (owing to their social, cultural and economic status) will perpetuate the under-representation of other marginalised groups (Curry 2001).

Thus, representation from various strata in a community is important to achieve equity and fairness in decision-making. With respect to Indigenous communities in India, there are a number of barriers to their equal participation. The communities are significantly

complex, divided by various layers of hierarchy based on caste, religion, landholding and livelihood dependence (Sangameswaran 2008; Kerr et al. 2000; Baviskar 1996). These differences develop and replicate power relations within the group and between the groups, imparting authority to one over the other to enforce their views on the community (Leach, Mearns, and Scoones 1999). Thus, appropriate institutions, along with social capital building, are necessary to facilitate representation from the marginalised groups who are dependent on the resources for their survival, and to ensure sustainable management (Agrawal and Gibson 1996). In addition, there needs also to be mechanisms to hold the representatives responsible to the wider community.

3.4 Synthesis towards an analytical tool

This chapter has served two purposes. Firstly, it builds on the literature review in Chapter 2 to develop a theoretical foundation necessary for the analysis of the case studies. Secondly, it develops an analytical framework for conducting the comparative analysis. Based on the arguments made in Chapter 2 and 3 the development of a conceptual framework of criteria for sustainable water management is a difficult task, given the wide spectrum of areas concerned (Wheeler 2004; Gleick 2003; Becker and Jahn 1999). This conceptual framework structures the problem related with current water management and identifies five essential interconnected components, namely: Governance and institutional structures; Participation in management process; Integration; Representation, accountability and ownership; and Ongoing responsiveness and efficiency, for the analysis of existing water management practices. This framework will assist in analysing the management process in each of the case studies. The desirable characteristics of each of these components are also developed to evaluate the management process.

3.4.1 Conceptual elements – sustainability model

Working from the development of the 'Sustainability Model' in Chapter 2, sustainability refers to five constituent elements: social, cultural, ecological, institutional and economic. For successful development of sustainable water management, each of these elements should be addressed with equal emphasis. Since previous theories of sustainability and community participation disregard any form of hierarchical structure, a cyclic model was considered more suitable for this research. This model established the inter-connectedness of the five dimensions as a cyclic process of constant transformation. The discussion has highlighted that the dimensions are linked to each other such that change in any dimension would affect other dimensions. In particular, this chapter has highlighted the significance of

effective community participation to achieve sustainability. Participatory management is considered as another interactive cyclic process extending across the five dimensions to achieve sustainability. The process is suggestive of five stages, namely: problem identification; exploration of options; decision-making; planning and implementation; and monitoring and evaluation. Thus, the water management process is intended to involve different stakeholders at various stages of the process. Figure 3.10 below illustrates the two layers of the sustainability and participatory process in a particular context.

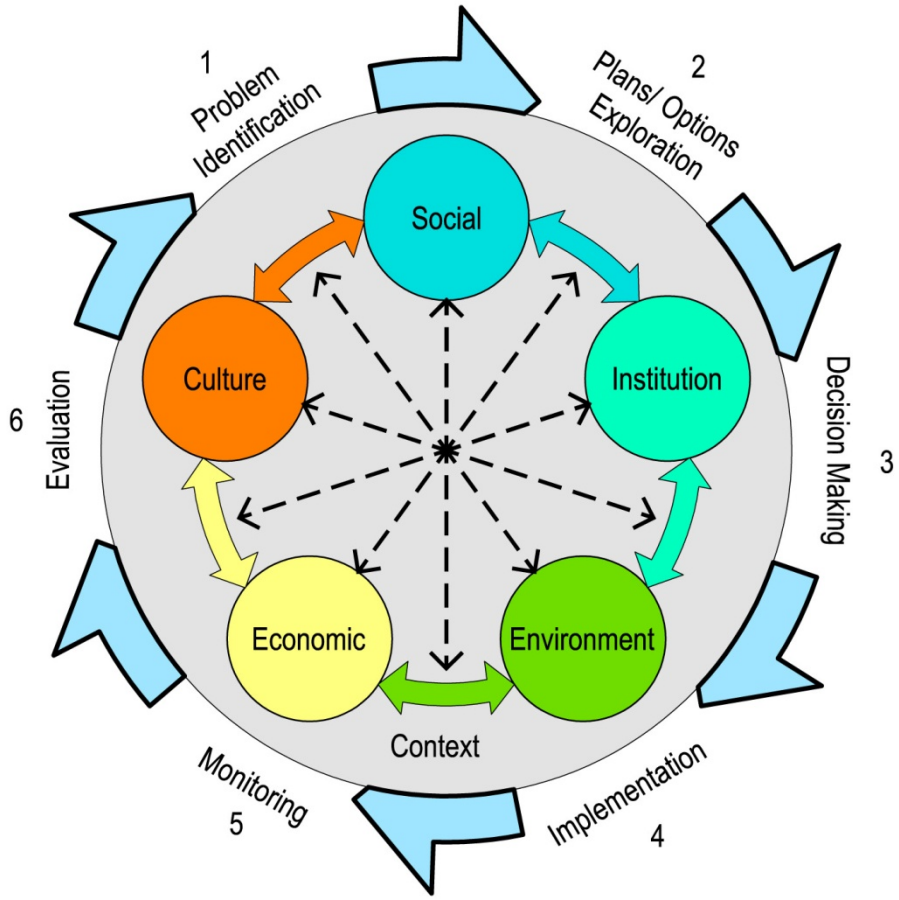

Figure 3.10: Cyclic model of sustainable participatory management process proposed by researcher

3.4.2 Operational criteria

In this way, the cyclic model has brought together the conceptual elements of sustainability considering social, cultural, institutional, environmental and economic aspects simultaneously. In addition to these, it is also important to have a clear set of criteria for the way in which water needs to be managed (Gleick 2003). Figure 3.11 below focuses on the operational criteria that address each of the established five interconnected components. These components along with their respective operational criteria add to the gap in literature focusing on the actual water resource planning and management process to achieve

sustainability. The figure illustrates the four components of the water management process that are interlinked and linking them together is the fifth component of an ongoing process of adaptive learning and assessment.

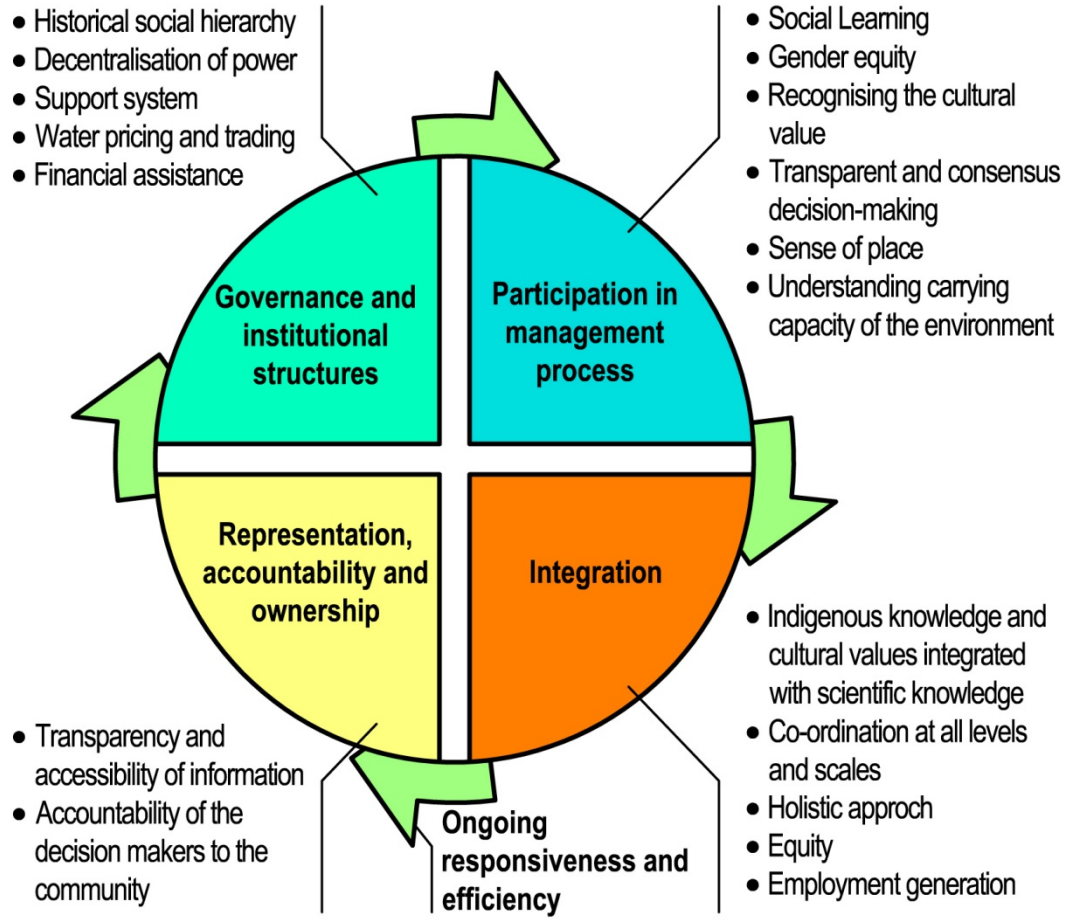

Figure 3.11: Thematic principles and operational criteria of sustainability

It is evident that the first four components: Governance and institutional structures; Participation in management process; Integration; and Representation, accountability and ownership are essential parts of the sustainable management process. For effective sustainable management, the foremost component of decentralised governance and institutional structures is apparent. The operational criteria of this component need to address the historical socio-cultural institutional systems, attempt to integrate across the vertical levels of institutions, a support system for the grass-roots efforts, and at the same time receive financial assistance for the process. A decentralised institutional structure will lead to effective participation in the water management process. This participatory process would focus on engagement of Indigenous communities in all steps of management including plan explorations, decision-making, implementation, monitoring and evaluation as soon as the

problem is identified. For effective participation social capacity building through social learning is important to recognise the cultural values, gender equity, and context specific environmental limits for transparent and consensus decision-making.

This recognition connects to the third component of integration. Integration across the institutional levels and of Indigenous knowledge with scientific knowledge and other disciplines related to social, cultural, environment and economic aspects will mean a holistic approach to water management. For this entire process to be transparent it is very crucial to address the fourth component of representation and accountability of the decision makers to the wider community. Since sustainability is considered as a process, the analysis of its continuity is also critical. Therefore the fifth component deals with the ongoing responsiveness and efficiency of the community through monitoring, assessment, and feedback. This learning process will help the community to re-adapt to the changes in the contextual setting. Thus, the process of sustainability is a continuous process which comprises decentralised governance and institutional structures, participation of Indigenous community members, integration across various disciplines and institutions, and accountable representation of all which are shaped by the context-specific social, cultural, environmental, institutional and economic features.

In summary, the ‘Sustainability Model’ and the process components and operational criteria bring together the analytical framework, to evaluate current water management practices in the study area. At the same time it needs to be acknowledged that the criteria proposed are not exhaustive. The model and the set of principles form the primary conceptual structure which has guided this research further. It is also intended that these principles will facilitate future researchers in this area to better consider sustainability as a process and to be able to assess the progress against the preferred sustainability goals. These criteria will facilitate the approach to manage water sustainably and improve understanding of the inadequacy of the current water management policies and systems.

Chapter 4. Research methodology

Introduction

This thesis seeks to understand a holistic process of water management which engages Indigenous community participation to achieve sustainability in a particular context in India. The previous chapters have highlighted the contested nature of sustainability, water management, and participation. The attributes of sustainability, Indigenous participation and water management have shaped the research process for this study and the way in which the data was collected and interpreted. This chapter begins with suggesting primary reasons for selecting a qualitative approach. The chapter then puts forward the research framework in terms of situating this research within development and research paradigms. This is followed by discussion on the case study methodology adapted for this research and measures taken for ensuring rigour and ethics compliance throughout the study. Various methods used for data collection, analysis and presentation are described in the subsequent section. Finally the criteria for case study selection are discussed, followed by a discussion of the limitations of the research.

4.1 Qualitative or quantitative approaches

The manner in which this research is undertaken and the way in which its findings are interpreted are fundamentally influenced by a research framework (Easterby-Smith, Thorpe, and Lowe 1995). This framework is influenced by a theoretical perspective developed on the basis of the research problem and what one is trying to achieve (Silverman 2005). Consequently, this study, which focuses on the interpretation and integration of an Indigenous water management system in water management practices of today, pre-supposes the need for a qualitative methodology. A quantitative approach would be better if the research aim were to make systematic comparisons of statistical data (Patton 2002) or to account for a variance in some phenomenon (Silverman 2005). However, to investigate a real life event or phenomenon in its particular context and to construct an understanding, a qualitative methodology is appropriate (Denzin and Lincoln 2005; Yin 2003).

Another difference between quantitative and qualitative research is determined by the level of generalization sought. A quantitative approach that measures, compares, and evaluates statistical data has a higher possibility of generalization from the findings (Patton 2002). By contrast, a qualitative method increases in-depth knowledge about a particular case or situation, but reduces generalisation (Denzin and Lincoln 2005; Patton 2002) because of the specificity of the situation which might not be replicable elsewhere. This enquiry accepts

that there are multiple realities and that each case has some aspects that are unique. Accordingly, for this study of an Indigenous water management system, a qualitative inquiry was employed because the settings in which these systems are developed are specific and require a detailed understanding of the context to make any recommendations. However, this researcher also accepts that some level of generalisation is possible and this could be undertaken by using the analytical tool developed through the in-depth literature review.

The other major difference relates to the 'validity' of data collected and the qualitative research claims resulting from analysis. The validity of quantitative research depends on instruments (machines, measuring tools, formula and so on) and close-ended survey or fixed choice questions (Silverman 2005). In contrast, qualitative research greatly depends on the skills and competence of the researcher (Patton 2002). An open-ended question in qualitative research provides insights into individual experiences and allows the respondent to express himself/ herself (Silverman 2005; Patton 2002). This study aims to understand the perspectives of different stakeholders relating to water management practice and the implications for the development of sustainable water resource strategies as they relate to the *Gond* and *Kohli* communities in Maharashtra. This is possible with the use of open-ended and semi-structured interviews and qualitative analysis (discussed in section 4.3). In this study validity will be established through the 'triangulation' of data sources and methods (discussed in section 4.2.4) (Flick 2006; Denzin and Lincoln 2005).

4.2 Research framework

The research framework was designed to combine two research paradigms, associated research methodology and methods. According to Syme (2005), Probst and Hagmann (2003), and Patterson and Williams (1998), such an integrated, pluralistic approach is highly suitable for research into natural resource management. By combining different approaches and a variety of methods, the research remains flexible and yet retains validity and rigour (Denzin and Lincoln 2005).

The design strategies for qualitative research inquiry vary from naturalistic to a more defined sampling of the case. A naturalistic inquiry assumes real-world situations can be studied only in their particular context and understood as they unfold naturally. A naturalistic inquiry of a particular case is appropriate here, that is, studying a water management system developed by a selected Indigenous community in their specific natural and cultural context. However, this is also a discovery-oriented approach (Patton 2002), where the research focus changes as new information is obtained during the inquiry process. It does not have pre-

determined constraints on sampling, instrumentation schemes, or findings. Therefore, using a solely naturalistic approach would not be suitable for this study as the research focus was pre-determined to study an Indigenous water resource management system in a rural and semi-arid region and its implications for present and future sustainable management practices. More directed and purposeful sampling was chosen as a design strategy because the study aimed to understand in-depth Indigenous water management practices developed as a result of a particular context and issues related to it. The selection of the research strategy further helped in focusing the research framework towards this goal.

4.2.1 Development paradigm

Because this research is concerned with Indigenous or traditional knowledge, this concept remains at the centre of the research design. Development professionals have made distinctions between Indigenous knowledge and scientific knowledge and this has major implications for this research. It is therefore essential to situate this project in one of the development paradigms. Blaikie et al. (1997, 219) define a development paradigm as "a system of thought, [which] is internally consistent with a particular view of human decision-making, a set of development goals and theoretical and normative assumptions about social change and development knowledge". These paradigms form the ideological underpinnings for development and are also interpreted in various policy statements and strategies. Furthermore, they also form the basis for administrative and bureaucratic attitudes towards the acknowledgement and incorporation of Indigenous knowledge (Blaikie et al. 1997; Agrawal 1995a).

The classic paradigm has a scientific and technically informed, universalised and state-initiated approach (Blaikie et al. 1997; Biot et al.1995). This is the 'top-down' bureaucratic implementation approach which persists today and disregards the existence of local/ traditional knowledge. While the neo-liberal paradigm favours Indigenous knowledge for its economic value, this world-view is indifferent to the 'localness' of the traditional knowledge and is encouraged to meet market demand. At the other end of the spectrum, a neo-populist position is in complete opposition to the classical paradigm and stresses the inclusion of Indigenous knowledge (Blaikie et al. 1997; Brokensha, Warren, and Werner 1980).

This research investigation, which emphasises the importance of culture and context and their influence on new emergent institutions, deviates considerably from the neo-classical and neo-liberal paradigms where cultural differences are largely ignored and generic solutions such as water trade and privatisation are advocated to resolve water management problems

(Pahl-Wostl et al. 2007). This research aligns with the participatory approach and realisation of institutions adapted to the diversity of cultural, legal, economic, and environmental conditions (Dietz, Ostrom, and Stern 2003; Ostrom 1999; Becker and Ostrom 1995). At the same time it also understands the role that scientists or technical practitioners play in the sustainability process and aims to develop an integrated framework.

While following from the development themes, sustainability planning, which is the basis of this research, needs to be situated in relation to past planning theories. For sustainability planning to be most effective, it needs to draw from a range of theoretical perspectives (Wheeler 2004). The dominant theory in the field called 'Rational comprehensive planning' which involves a linear planning process of analysing situations, defining goals, identify obstacles, develop alternatives, comparison of these, decisions on a preferred approach, implementation of this and lastly, evaluate its success (Wheeler 2004; Healey 1997). Although it is a straightforward process, it is mostly 'expert-driven' which contradicts sustainability's prime concern for public involvement and also fails to address social and environmental issues. Following the critique of rational planning, Marxist theory looked into the power dynamics involved in the planning process which contributed in understanding the social movements (Friedman 1987). However, it failed to move beyond the critique and provide any planning models.

This research can be well situated within the following three theories of participatory and communication planning, advocacy planning and institutionalism. The first theory emphasises public participation as an ongoing process through effective communication between planning authorities, government officials, facilitators, and the citizens. Advocacy theory focuses on the marginalised sections where environmental and social change needs to be addressed (Sager 2001). This also relates to the increase in the significance of Non-Government Organisations, which have become important to advocate the viewpoints of marginalised communities to the government and also vice versa (Bebbington, Hickey, and Mitlin 2008; Wheeler 2004). The last theory of institutionalism stresses the role of institutional structures in the planning process which includes the government structures (laws, policies) and also the local customs related to social and religious aspects. This theory also relates to John Friedman's 'Social learning' which emphasises an evolutionary approach and Putnam's (2000, 403) view "to create new structures and policies to facilitate renewed civic engagement". This research needs to effectively take a holistic approach and to be located within these three theoretical perspectives. By doing so it emphasises and connects the implications of each of the theories for the overall challenge of creating a sustainable management process for water resources. The discipline of regional landscape planning offers

the essential holistic approach and to understand the relationship between the three planning theories. After situating the research within these planning theories the next section argues selection of research paradigm in line with these theories.

4.2.2 Research paradigm

The principles and practices upon which community-based research, such as this Indigenous community study, is based had several implications for the selection of the research paradigm, methodology and methods. At the same time, the focus on water resource management provided another guiding line to this framework which drew from the research paradigms of Constructivist and Participatory research.

Constructivism encompasses an interpretive approach (Schwandt 1998; Guba and Lincoln 1998) seeking to understand multiple mental constructions of reality (Denzin and Lincoln 2005). This approach was chosen as it allows the researcher to explore and incorporate different perspectives held by different stakeholders including government officials of various departments (Irrigation, Water supply, Planning, Forestry, Tourism, and so on), Non-government organisations, and the local Indigenous community who are directly or indirectly related to water management. To improve community participation, their various perspectives need to be understood. Each stakeholder has their own subjective interpretation of reality and the emphasis here is on these multiple perspectives to reduce biased interpretations by the researcher. This also reduces the possibility of establishing a consensus opinion by the researcher too early in the process and developing predetermined concepts, and so it allows new viewpoints to emerge.

However, one problem with an exclusively constructivist approach is that it excludes knowledge resulting from experience. As Heron and Reason (1997, 274) have argued "the constructivist paradigm (as articulated by Guba and Lincoln 1998) is unclear about the relationship between constructed realities and the original giveness of cosmos".[1] A constructivist idea, as understood from Guba and Lincoln (1998), is based on an individual's mental construction of 'reality'; that is, personal lived experience. It is deficient in the acknowledgement of experiential knowing; that is, knowing by acquaintance and by meeting other people and sharing information (Heron and Reason 1997). This study, by contrast, is about understanding the experiential knowledge developed by Indigenous people through

1 "Constructivists Guba and Lincoln (1998) acknowledge that conceptual constructs are related to 'tangible entities' and thus appear to accept tangible or experiential knowledge. They do not, however, articulate the nature of experiential knowing and do not regard it as providing any kind of warrant for the valid use of conceptual constructs" (Heron and Reason 1997, 274).

interaction with their landscape, learning from their mistakes, interacting with other communities and sharing their experiences.

Another constraint to selecting a completely constructivist approach is its relativism. Relativists assert that general principles of truth do not exist. Each reality is valid and true, and one particular position cannot be promoted over others (Guba and Lincoln 2005). This limits the researcher in taking a stance and making recommendations for policy. However, the distinction between two types of relativism, namely: epistemic relativism and judgemental relativism, needs to be clarified. Epistemic relativism "identifies alternative forms of valid knowledge, and more importantly knowledge production" (Brown 1998, 11). This accepts the existence of different perceptions about the world and different approaches to these perceptions, and at the same time one can make a judgement about these understandings. In contrast, judgemental relativism claims equal validity across all forms of knowledge and "we cannot compare different forms of knowledge and discriminate among them" (Brown 1998, 10). In this research, where Indigenous community participation is the focus of study, epistemic relativism treats different forms of knowledge and people's different perspectives as valid. This data analysis will be used to make policy recommendations for government and other agencies about improving participation approaches to involve Indigenous communities in water resources management. Thus, a completely constructivist methodology is not adopted for this research. A combination with participatory research is preferred and so the participatory research paradigm, proposed by Heron and Reason (1997), was chosen as the second paradigm to frame this study.

Participatory research relates to the neo-populist development paradigm of the mid 1970s which prescribes community development by community participation.[2] Participatory research places us back in relation with the living world. As Heron and Reason (1997, 275) state: "we are part of the whole rather than separated as mind over and against matter or place here in the relatively separate creation of a transcendent god". Critics primarily see participatory research as:

> 1. A means to obtain qualitative data about local people's knowledge and needs to assimilate and consider this information in technical research, and
> 2. A better way of technology transfer and adaptive research.
>
> (Becker 2000, 4)

2 The Neo-populist paradigm emerged as a response to the classic and neo-liberal approach which rejected the classic technology transfer model and re-asserted populist sentiments favouring the 'ordinary people' (particularly poor rural dwellers) and respect for Indigenous technical knowledge (Blaikie et al. 1997; Brokensha, Warren, and Werner 1980).

They advocate participation to be used not only as an adaptive learning process but that it should be strategic at all levels and stages of the research process. They argue that this approach is unlikely to generate an asset of information for scientific endeavour (Probst and Hagmann 2003; Becker 2000). One of the participatory approaches is to conduct action research, which is considered to be a spiral of self-reflexive cycles of: planning a change; acting and observing the process and consequence of change; reflecting on these processes and consequences; re-planning; acting and observing again; and reflecting again and so on (Kemmis and McTaggart 2005, 563). However, participatory action research is not considered to be appropriate for the task of this research. Although, this study focuses on planning for the integration of Indigenous community practices in mainstream management of water resources, given the available time frame, imposed by this academic context, there is no intention to implement this plan, observe and reflect on it. Consequently, a mixed-method approach is proposed to be adopted.

Figure 4.1 below is a map of the research hierarchy showing the various elements of this research study and the relationship they have to each other. The Constructivist and Participatory research paradigms, the neo-populist development paradigm and the planning theory involving social mobilization and social learning, are consistent with the integrated nature of the water management system being explored. This in turn leads to the chosen case-study research informed by co-operative inquiry as a suitable research methodology. Methods flow logically, derived from and contained by the principles of community-based case-study research, the selected methodology and its potential for addressing the research questions.

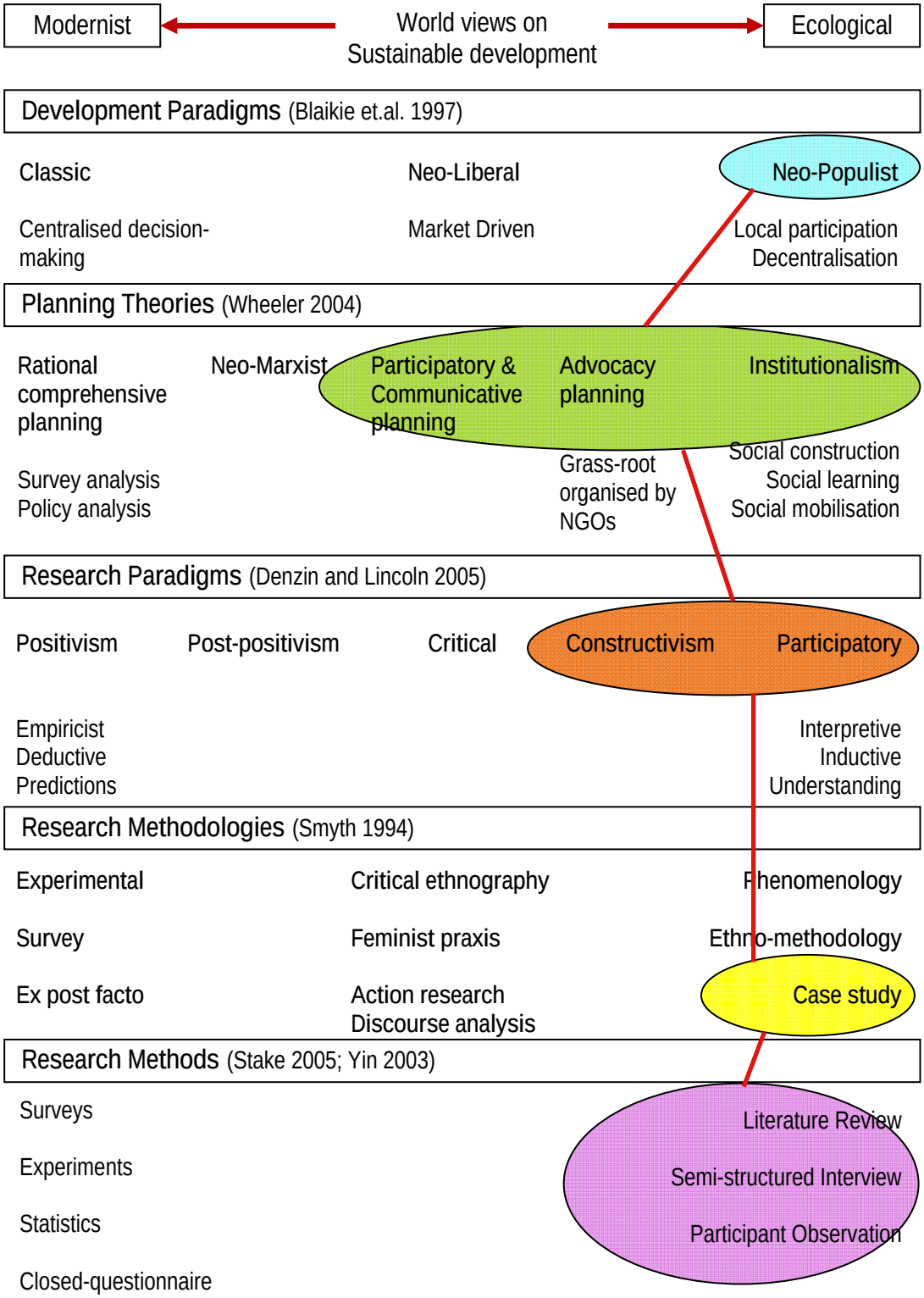

Figure 4.1 Research design [3] (Highlighted areas represent chosen research course)

3 Inspiration for this research map has been a map by Pollock-Ellwand (1997). The research design map for this research is adapted, re-designed, and charted to suite this research context.

4.2.3 Methodological standpoint

The methodology used in this study is implied by the chosen research paradigms, which has further guided the research process. Case study research combined with a co-operative inquiry is appropriate for the constructivist-participatory framework. According to Yin (2003, 2), "the distinctive need for case studies arises out of the desire to understand complex social phenomenon" because it "allows the investigators to retain the holistic and meaningful characteristics of real-life events". This methodology, informed by constructivist principles, is interpretive and explanatory of the development and breakdown of the Indigenous water resource management practices (Guba and Lincoln 1998). This is further guided by the collaborative form of inquiry through independent dialogue with the Indigenous community people, as informed by the participatory paradigm (Heron and Reason 1997). Case study research concentrates on experiential knowledge of the case (in this study the contextual Indigenous knowledge) and close attention to the influence of its social, cultural and political contexts (Stake 2005).

This research methodology fits well with this study's emphasis on a holistic understanding (Yin 1989) of the chosen Indigenous water management system that is derived from in-depth investigation. In this particular study, an Indigenous water management system in India is examined for its performance at different times in history, starting from historical, under *Maratha* and *Mughal* rule, proceeding to British colonial period and lastly post-Independence. In addition, three current practices, in three villages, of the same water management system are critically analysed and compared. This is referred to as collective and comparative *instrumental case study* research (Gerring 2007; Stake 2005). Stake (2005) defines an instrumental case study as the one example examined to give understanding about some other external interest. In this research the main aim is to understand the relevance of the Indigenous knowledge on water resource management and the implications of this knowledge and system for the sustainable management of water resources for present and future generations. Case studies provide the opportunity to critically examine a situated policy implementation process and subsequently provide guidelines for the development of recommendations for future implementation of policy (Majchrzac 1984). However, selection of case studies suitable for the present research in terms of context, similarity, efficacy and replicability also needs significant attention.

The need to identify a suitable research strategy based on the type of research question is emphasised by Yin (2003). According to Yin (2003, 7-8), case study methodology is usually suitable to answer 'how' and 'why' questions to examine contemporary real-life

events using a broad variety of relevant tools such as the review of archival and current documents, extended interviews, and field observations. The present research seeks to answer the 'how' and 'why' of the research questions stated in the introduction, and also seeks to ask a 'what' question to understand the complex phenomenon of water management. Thus, this research aims to investigate the complex and crucial phenomenon of Indigenous water management and decentralisation in the Indian context. It conducts an exploratory study to understand the natural (environmental), social, cultural, historical, economic, and institutional context of the *Gond* and *Kohli* Indigenous water management system. Further, it attempts to understand how Indian water policies are currently being implemented and what factors can contribute towards improving the water management process by engagement of Indigenous communities.

Case study research is assumed to have a few limitations and hence may be unappreciated depending on the context of the study (Stake 2005; Yin 2003). It has been identified with loosely framed and non-generalisable theories, biased case selection, weak empirical leverage, subjective conclusions and casual determinism (Gerring 2007; Stake 2005; Sekhon 2004). However, in this study the issue of casual determinism and subjective conclusions is negated by the choice of collaborative inquiry involving various stakeholders. This reduces the possibility of biased interpretations. Further, the data collection proposed to be carried out from different sources including documents, interviews, and observations, together with the triangulation of data sources and methods, establishes accuracy, validity and rigour. This study, being strongly grounded in the literature about Indigenous community participation and natural resource management, increases the possibility of generalization. Moreover, this study on resource management requires an integrated methodological approach, as stated by Bellamy et al.:

> Natural resource management initiatives need to be evaluated as a system that links the objectives and instrumental rationale of the policy or program to actual performance on the ground. Developing an improved framework and methodologies for analysing situations, incorporating institutional concerns and, in turn, informing the process of improvement, therefore, requires a systemic and integrated approach.
>
> (Bellamy et al. 2001, 408)

Therefore, this research in conducted across three case studies, each having a different management practice, using an integrated approach. The following section further explores the rigour, ethics, and validity of this research.

4.2.4 Triangulation and rigour

Considerable literature highlights the significance of rigour in case study research (Guba and Lincoln 2005; Stake 2005; Yin 2003). Some consider rigour "the key to success" (Rolfe 2006, 305); others claim that continuing rigour in qualitative case study methodology helps to provide a significant answer "to the question of whether or not the findings are sufficiently credible and trustworthy" (Anfara, Brown, and Mangione 2002, 28). Drawing on these recommendations, the present case study research was designed and conducted with the aim to maintain high quality rigour at all stages.

Triangulation of data

Yin (2003) states that, where information is being sought, findings in a case study approach are more precise and credible if they are based on information from different sources about the same fact. Miles and Huberman (1994) have discussed various kinds of triangulation methods to establish the credibility of collected data. The first is triangulation by data source which involves collection and interpretation of data from more than one respondent or source in order to substantiate the same fact. Thus, in this study, two or more respondents in the identical group were interviewed about the similar concern to reinforce the reliability of the findings. The second type used was method triangulation in which information related to the same phenomenon is confirmed through more than one method, primarily to determine any convergence in the information and hence, increased validity in research findings. Therefore in this research, data from interviews, relevant documents and field observations were cross checked. Thus, triangulation from various sources contributed towards obtaining diverse perceptions to clarify meanings, and also verifying commonalities and differences across these interpretations (Flick 2006; Stake 2005). Triangulation thus helped to understand the diversity in perceptions of different stakeholders and identify different realities, which was crucial for this study (Stake 2005).

Although credibility of the data collected was ensured by use of the triangulation method, multiple techniques were used to enhance rigour in this research. The approaches used throughout the research to maintain high quality rigour are discussed below.

Establishing rigour

There are numerous methods discussed in literature to ensure validity, reliability, and rigour in qualitative research. Table 4.1 is taken from Anfara, Brown, and Mangione (2002, 30) that describe various strategies to maintain rigour and quality of research. Creswell

and Miller (2000) have identified eight similar criteria to evaluate research quality and rigour, and Creswell (2009, 1998) recommends that researchers use at least two of these strategies in a study.

Qualitative term	Strategy employed
Credibility	• Prolonged engagement in field • Use of peer debriefing • Triangulation • Member checks • Time sampling
Transferability	• Provide thick descriptions • Purposive sampling
Dependability	• Create an audit trail • Code-recode strategy • Triangulation • Peer-examination
Conformability	• Triangulation • Practice reflexivity

Table 4.1: **Criteria to evaluate research quality and rigour** (Anfara, Brown, and Mangione 2002, 30)

To ensure credibility in the present research, triangulation was a major strategy used to validate research findings and strengthen the credibility of results. The study used a snowball technique during the preliminary field trip interviews to select case studies and identify respondents with significant knowledge of the region's water management practices. Miles and Huberman (1994, 28) describe snowball technique as that which "identifies case of interest from people who know people who know what cases are information rich". This ensured fair representation from the community groups and an adequate variety of respondents. Another strategy practised was persistent observations during the prolonged engagement in the field. The researcher being from the same region and familiar with some of the respondents due to contact during her Masters study, easily helped to develop a comfort level and encouraged them to give honest responses. Further, in-depth interviews generated extensive responses regarding important issues of concern. Repeat visits to the site and also to the respondents helped to confirm the accuracy of the data collected. In addition, member checking was practised in several interviews, that is, getting feedback on the researcher's interpretation of the respondent's views, which helped achieve accuracy and adequacy. The feedback was taken by oral translation during the second visit to the villages. This strategy

provided another opportunity to get additional information and also strengthened the ethical commitment towards the respondents and for this research.

4.2.5 Research ethics

Ethical approval for this study is a requirement of the Human Research Ethics Committee at the University of Adelaide. Accordingly an approval was obtained from the Committee before every stage of the research. This approval was received in January 2008 before the preliminary first fieldtrip and then renewed in December 2008 for the second field trip (Appendix C). The ethical concerns were targeted with 'informed consent' (Neuman 2006, 135), which was obtained from the respondents before the interview process through the standard University Consent Form (Appendix D). An information sheet was provided to the respondents informing them about the research and the purpose of the study (Appendix D). Equal opportunity was given to the respondents to inquire about the research and, if need be, to withdraw from the interview or the research project at any time. In addition, the confidentiality of the respondents was maintained throughout the research stages by coding each of the respondents.

4.3 Research methods

Methods, rooted in the methodology and research paradigm, are techniques used to gather and analyse the data related to research questions (Denzin and Lincoln 2005; Bicker, Sillitoe, and Pottier 2004b; Blaikie et al. 1997). In this investigation, the methods were chosen to be consistent with case study research and the constructivist and participatory paradigms. Since this research calls for involvement with the local Indigenous community, culturally suitable strategies were selected to build rapport with the community.

4.3.1 Data collection

The research methods for collection of data were as follows:

Archival material

This involved an archival collection of survey maps, land revenue settlement reports, provincial gazetteers and travel accounts. These documents were accessed at University Library at Nagpur, Deccan College Library at Pune, Centre for Science and Environment Library at New Delhi and some personal collections of interview respondents. These sources were the primary source of the historic information needed to understand the water management practices of the Indigenous people at a particular time in history. These

documents mainly report the experiences of British officers during the colonial period. This also helped to understand the reasons why the system was abandoned or disintegrated. These interpretations were supported by information from the key local people collected through interviews. The second types of documents were the published government reports and those from other public agencies which gave information regarding the current water management practices. These included the following: Indian government progress reports, policies and acts; Maharashtra state and local authorities planning guidelines, policies and acts; working paper series of various institutions and civil society bodies; and published articles and manuscripts from researchers. A list of documents that were studied is attached in Appendix E. Some of these documents were accessed on government websites, while some were procured from respective offices in Pune, Mumbai, Nagpur, and also the local *Taluka* offices in Tumsar (Bhandara District) and Dhanora (Gadchiroli District).

Another set of documents was reviewed prior to the intensive fieldwork, and a review of this literature was conducted in two phases. The first was done to demonstrate the researcher's familiarity with the field knowledge of water management practices and Indigenous practices under the overarching theme of sustainability. This helped to integrate and review works by other researchers, identify what is still unknown in the field, and develop new ideas (Creswell 2009; Neuman 2004). In line with the inductive and interpretive approach being taken, in the second phase literature on governance, decentralised institutions, and community participation was reviewed to develop an analytical process criteria framework for analysis of the case studies.

Direct observation and physical artefacts

A preliminary field trip to the region was made to directly observe the different structures which were used for the collection, storage, diversion and distribution of water. Local informants were chosen to give information on the site about the historical and contemporary uses. During the field trip personal observations were also made. Observational evidence is often useful in providing additional information and understanding about the phenomenon and its context and also about current limits or problems with it (Stake 2005; Yin 1998). Photographs taken at the sites helped convey important case characteristics to outside observers such as the various parts of the mechanical tank system, understanding of the context of the tanks and so on (Denzin and Lincoln 2005; Harper 2005). A separate fieldwork book was maintained to record the observations as well as for taking notes while discussing the issues with the chosen informants in the field. This record was also used as a mapping diary for certain ideas that occurred to the researcher at the time of fieldwork. The second field

trip to the selected sites was more focused. The water harvesting and distribution system in each of the villages was re-visited to observe and document the current status of each system.

Interviews

Interviews or discussions were used as the primary data collection method. The respondents were selected from three groups, namely: the local Indigenous people as the communities who constructed and managed the system; NGO representatives; and Government officials at the local level (*Zilla Parishad*, and Planning and Irrigation departments). The purpose was to obtain an in-depth experiential account of the phenomena being studied. Multiple perspectives gained helped to strengthen the understanding. It was decided to have two stages in this process of data collection. The first stage of interviews conducted during the preliminary field trip were of an unstructured nature, as they were intended to gather information on facts as well as the respondents' opinions about particular events. This preliminary interview helped to 'screen' in order to identify those respondents who had interest in the topic and had considerable knowledge to add insight to the study. The more the respondents were able to provide the latter, the more they could be considered as 'informants' (Yin 1998). According to Yin (1998), key informants are often critical to the success of case study research.

For practical reasons, such as distance and the availability of the local government officials and ex-*Malguzar,* some local participants were interviewed individually. Group interviews of the community people were used wherever possible because they provided a rich source of data in a short span of time. It has been argued that, in these contexts people stimulate each other to recall experiences and debate different points of view (Denzin and Lincoln 2000) and this occurred fruitfully in these interviews.

The second stage of interviews consisted of semi-structured interviews based on questions developed from the theoretical framework, for in-depth discussion on the topic and potential integration of Indigenous knowledge into mainstream planning and management processes. The key respondents in each of the three case studies were identified by a snowballing technique and were contacted by telephone or letter to seek their compliance to participate in the study. Later an appointment was confirmed for a personal meeting to conduct the interview. Table 4.2 summarises the number of key informants identified in the three groups of government representatives, NGOs, and community representatives. In addition to these three groups, 7 other respondents, who were not related to any of the case

studies, were interviewed to get information about the broader issues related to water management in the region.

	Mendha	Rajapur	Aashti
Government agencies	Block Office at Dhanora (2)	Block Office at Tumsar (1) Irrigation Department at Tumsar (1)	
Civil society bodies	NGO representative (2)	NGO representative (1)	NGO representative (2)
Community representatives	Individual interviews (5) Group interview (2- 25 and 15 members respectively)	Individual interviews (4) Group interview (2- 8 and 10 members respectively)	Individual interviews (7) Group interviews (1 - 5 members)

Table 4.2: Summary of respondents from case studies across three groups

The interview questionnaires were semi-structured and open-ended as this offered greater flexibility to extract in-depth information (Patton 2002). Three different sets of questionnaire were designed for the three groups but with common themes running across them (Refer Appendix E). This helped to get combined information from different disciplines across various issues relevant to water management. Although the questionnaire depicts structured questions, during the course of the interview the sequence was adapted to the respondents' flow of conversation and expertise.

The questionnaire and information sheets for the community stakeholders were translated to Marathi, the local language of the community. There was no need for translators as the researcher is familiar with this language, as it is her mother tongue. Therefore, the information gathered was first hand and the possibility of loss of some data in translation was removed.

4.3.2 Data analysis

Data analysis is a significant step in the research process, which seeks to address the primary propositions of the research and draw conclusions. Miles and Huberman (1994) have suggested a set of manipulations which can put the evidence in some preliminary order. In order to begin the data analysis for this research, the following techniques were used to order the collected data:

1. Preparing a matrix of categories and placing the evidence within it.
2. Organising information in chronological order.
3. Creating data displays - flow charts and bubble diagrams – for examining the data.

Although in this case this was helpful, Yin (2003, 111) suggests that in case study analysis, without a broader strategy, "playing with the data may potentially waste large chunks of time". Therefore, two general analytical strategies, proposed by Yin (2003), were adapted for this research in order to prioritise what to analyse and why:

1. Relying on the theoretical proposition.
2. Developing a case description.

The first strategy followed the theoretical propositions which reflected the research questions, and were based on the extensive literature review. In turn, this strategy also guided and influenced the data collection plans at the second stage of interviews, and subsequently, the data analysis strategies. Content analysis of the data collected from various government reports and policies was used to explain and understand the phenomenon being examined. The conceptual analytical framework developed through the literature review provided guidelines for the methodical drafting of the semi-structured questionnaire. Therefore, the interview transcript texts were largely the response to a single question by different respondents in one of the three groups in each case study as explained in the previous section. This facilitated the use of a "cross-question analysis" strategy (Patton 2002, 376), which allowed each individual case study to be treated as a separate study. In this method for the open ended interviews the answers from different respondents for similar questions were clustered together. The interview transcriptions were processed into groups using the word processing software programs.

A second strategy was used for sorting and organising interview responses into themes by the use of qualitative coding, and a "descriptive framework" was developed (Yin 2003, 114; Patton 2002, 376). This descriptive approach further helped to identify the causal links to be analysed in this case study (Yin 2003). Coding was used as an integral part of the data analysis process to break up the data and to conceptualise and reorganise it in new ways to build new theories or themes. Neuman (2004) and O'Leary (2004) describe coding as a method guided by the research question to uncover concepts or themes by advanced thinking to derive meaningful information from the raw data. This was an exercise to identify themes that recur through the body of a text. This research utilised the coding techniques proposed by

Strauss and Corbin (1990) and further described by Neuman (2004). The first step was 'open coding' which is the "process of breaking down, examining, comparing, conceptualising, and categorizing data" (Strauss and Corbin 1990, 61). This process facilitated the progressive building of information about the case studies.

The ideas from this information are further extended by making connections between the categories, which is 'axial coding'. This is attempted by first identifying the 'causal conditions' that is the events that developed the 'phenomena' which is the central idea of the research. This is followed by identifying the 'context' in which the phenomena occurred; facilitated by particular set of 'intervening conditions'; and eventually resulting in 'actions' and 'consequences'. This develops the basis for 'selective coding' which involves selecting the core category of the research and relating it to the already identified major themes of the research project (Neuman 2004). In this project, the core category is the Indigenous water management process and the sub-categories constitute the associated governance and institutional structures, participation, integration, representation and accountability and lastly the ongoing responsiveness. Subsequently, "cross-case analysis" (Yin 2003, 133) was performed across the three cases for comparing the textual data to create and reflect upon further themes or sub-themes. This method of comparison and exploring difference between the cases strengthened the findings and contributed to insightful "explanation-building" (Yin 2003, 120).

4.3.3 Data presentation

The results from the three case study villages are presented in different sections in Chapter 6 and 7. Wherever appropriate, tables, maps and figures have been used to illustrate the data in a graphic and illustrative manner. Because, the primary data was collected in the form of structured and semi-structured interviews, on some occasions quotations from various interviewees are used to support the analytical claims. These quotations of local community people are translated from Marathi to English to maintain consistency in writing. Ethics principles, requiring the maintenance of anonymity of field respondents, have been maintained. This has been achieved by using coding techniques. All respondents from each case study have been grouped into three main categories: the community people (local stakeholders); the government representatives; and representatives from civil societies or Non-government organisations. This resulted in eight different group codes: ALS (Aashti Local Stakeholder); ACR (Aashti Civil Society Representative); AGR (Aashti Government Representative); RLS (Rajapur Local Stakeholder); RCR (Rajapur Civil Society

Representative); MLS (Mendha Local Stakeholder); MCR (Mendha Civil Society Representative); MGR (Mendha Government Representative).[4]

However, it is also to be noted that there are common respondents across case studies in one group, and also there are some respondents who are not directly related to the case studies. In the miscellaneous category the group of respondents have been coded as LS (Local Stakeholders). A second group of respondents, belonging to various civil society bodies and academics, have been coded as CS (Civil Society). The number at the end of each code suggests the sequence in the interview schedule, for example CS3 refers to the third civil society respondent. PFO denotes the findings from the participant field observations during the field visits, group discussions, and village meetings attended as an observer. The number indicates the sequence of the visit in the total period of the fieldtrip. For example PFO2 would refer to the field observations made by the researcher during second visit.

4.4 Case study selection

Case studies are important for holistic understanding of complex phenomenon and offer this study a unique potential to comprehend three different water management practices. The case selection criteria in this study were multi-dimensional. The main criterion for selection of case studies was their location in a semi-arid region where the water problems are very high and the region is vulnerable in the context of climate change (refer Figure 4.2). At an early stage of this research it was decided to study an Indigenous water management system within a rural context with the aim to provide recommendations for solutions to the water problems faced by the rural communities. The main reason for selecting a rural setting was because of the physical existence of the water harvesting structures. In most of the urban settings in India these systems have ceased to exist. Another important criterion for the selection of a rural context was the continued presence of the communities that were once responsible for the construction and management of the system. This is a situation that is rarely to be found in an urbanized context. According to Yin (2003, 1998), in case study research, it is a strong advantage that the boundaries between the phenomenon (in this case the water management system) and its context (the natural and the socio-cultural setting of the community who managed it) are indeed not precisely distinguishable. Thus, rural case examples were ideal for this study where the phenomenon of a unique water management system and its context in the community and the natural setting largely continue to co-exist.

4 The government representative for Aashti and Rajapur are the same as the case studies are located under the jurisdiction of one Block Office located at Tumsar.

Figure 4.2: Climate change impact across semi-arid regions across the world (FAO 2008)

The case selection was also guided by the choice of the type of Indigenous water management system relevant for the study. The water harvesting and management system developed jointly by *Gond* and *Kohli communities* during the rule of the *Gond* dynasty in India in the 9th century was an appropriate choice for demonstrating the study of Indigenous knowledge and its integration with current water resource management practices. This system, although it displays vernacular engineering skills, exhibits to a great extent the significant innovative knowledge of hydraulic laws gained by the local people, which were sustained for hundreds of years. It met the needs of the community in a semi-arid region where rainfall is scarce and unpredictable and where there is no perennial source of water (Rajankar and Dholke 2006; Joshi 2005; Agarwal and Narain 1997; Chhotroy n.d.; Lawrence 1867). It was integrated into the socio-cultural life of the people and managed by the community themselves with support and encouragement from their rulers. Despite this heritage, however, the region currently faces acute water shortage problems. This was another reason for the selection of this water harvesting and management system, because it has great potential to result in some original contributions to the existing field of study of semi-arid regions (refer Figure 4.2). The management practices in each of the three cases will be

assessed in terms of their potential to satisfy the sustainability criteria developed from the literature review.

Another reason for the selection of this region is that a few attempts have been made at the grass-roots level by the community to manage these resources. This study attempts to compare these management practices to be able to provide guidelines for the sustainable management of water resources.

To summarise, the criteria for selection of case studies were as follows:

1. Location in the semi-arid regions of India,
2. Part of the historical *Gond* Kingdom,
3. Physical existence of traditional water management structures developed during the *Gond* period and currently in working condition,
4. Presence of the Indigenous communities of *Gond* or *Kohli* that were once responsible for management of the system, and
5. Current efforts to maintain and manage the system.

In line with the above criteria three villages, named Mendha, Aashti, and Rajapur, in the semi-arid region of central India, located in the western part of the Maharashtra state were chosen for this research (refer Figure 4.3). The region was historically under the *Gond* rulers and still has the water harvesting systems in working condition. Currently, the systems are subject to Maharashtra State Government policies on water management and decentralisation within the *Panchayati Raj* Institution.

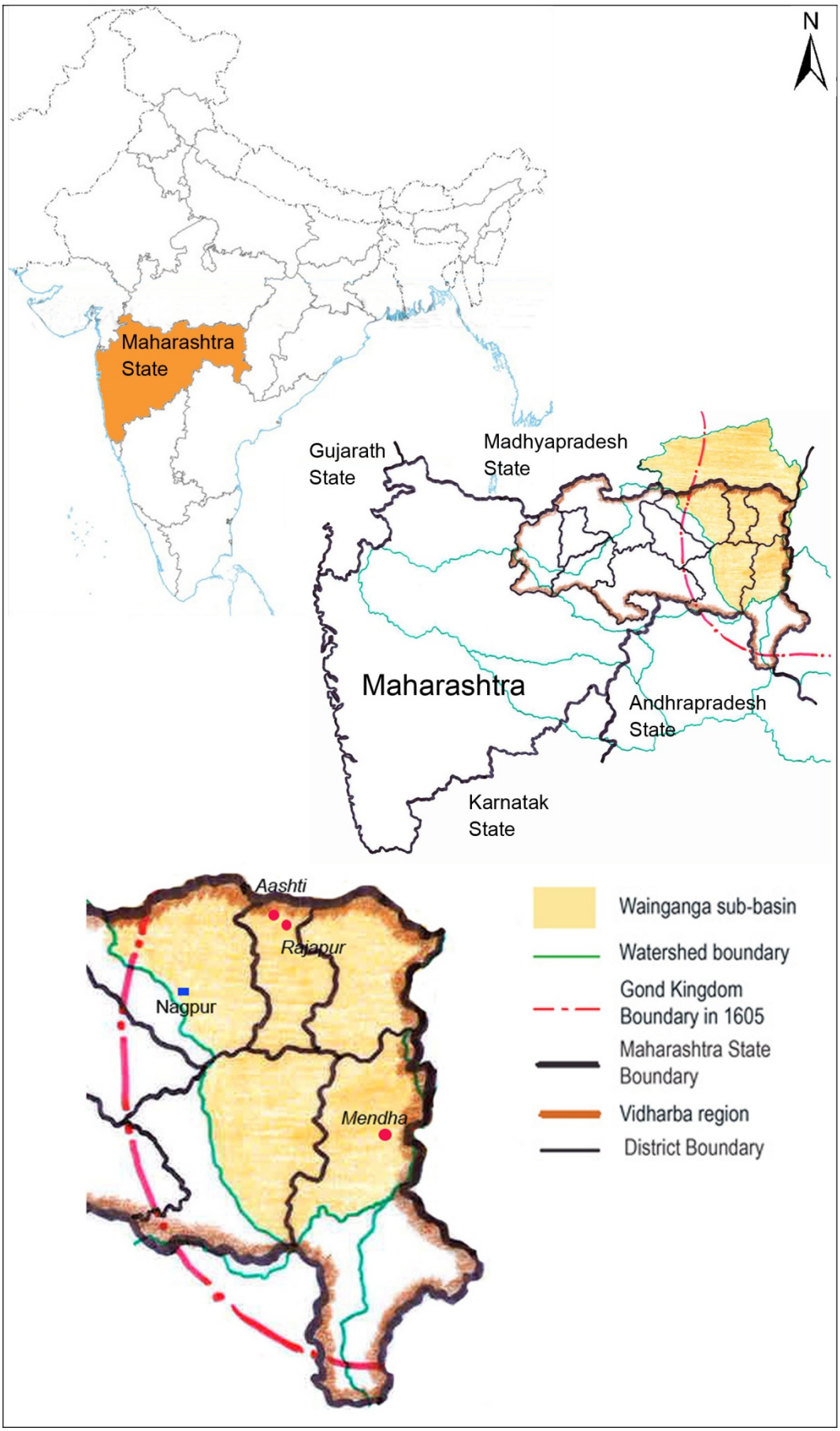

Figure 4.3: Location map of selected case studies (Map not to scale)

These case studies justify Miles and Huberman's (1994) selection criteria as they are *intense*, *politically important,* and also *typical* (refer Table 4.3). Firstly, these cases could be considered intense cases because they are "information rich" (Miles and Huberman 1994, 27). In terms of Indigenous community participation and also, due to the fact that they have a history of community engagement, exploring changes in community perceptions generated rich information. They also are politically important cases as they have in a way challenged government agencies by taking water management into their own hands. Thirdly, each of the cases are typical in terms of this contextual setting (described in Chapter 6) and also their approaches to water management in their respective villages.

Type of sampling	Purpose
Intensity	Information-rich cases that manifest the phenomenon intensely, but not extremely
Maximum variation	Documents diverse variations and identifies important common patterns
Politically important cases	Attracts desired attention or avoids attracting undesired attention
Snowball or chain	Identifies cases of interest from people who know people who know what cases are information-rich
Typical case	Highlights what is normal or average

Table 4.3: Case selection criteria (Adapted from Miles and Huberman 1994, 28)

4.5 Research limitations

Research process is not a straight-forward task when it involves Indigenous communities and water management issues. In addition, the political sensitivity of the topic made it difficult to get accurate information from all participants, especially government officials who were generally less willing to participate in the research. However, persistent efforts were made to gain their trust and as a result some of them participated but refused to record the interviews, while some continued to refuse to be interviewed.

Initially, some cross-case analysis with communities in other regions of India was also considered. For example, Alwar village in Rajasthan, Ralegaon Siddhi in Maharashtra,

and villages in Haryana. Other choices were examples in South India and Orissa with similar tank systems. However, preliminary discussion with some experts hinted that the communities in these cases were not Indigenous and some of them were located in very politically sensitive areas. It was also difficult to get information about different state policies, as these examples were located under the jurisdiction of different states. Furthermore, due to limited funding and time constraints it was not possible to visit a wider range of case studies. The research question was therefore aimed to investigate the devolution of water management practices in one particular state's policies and how effective its adoption was at a community level in regards to a particular water harvesting and management system.

Conclusion

This chapter has outlined the research course adopted for this study. The study is situated within the neo-populist theory which supports the constructivist research paradigm appropriate for this study. The researcher also clarified the reasons for choosing a case study methodology as the most suitable strategy for this research. A detailed description on the maintenance of ethics and rigour throughout the different stages of the research has also been made. The chapter also discussed in detail the various methods used for data collection from the case studies and its subsequent analysis and representation in the discussion chapter.

The next chapter presents the data collected, using the methods discussed in this chapter, from the three case studies, which is the significant stage of this research. This is followed by the analysis of the case studies and comparison in Chapter 7, which uses the process criteria developed in Chapter 3 and the analysis methods discussed in this chapter to present the findings from the three case studies.