

## Chapter 9

# Access, Equity and Hazards: Highlighting a Socially Just and Ecologically Resilient Perspective on Water Resources

M. Usman Mirza and Daanish Mustafa

**Abstract** Historically there was a general trend towards infrastructural and physical investment in supply side water related initiatives for the provision of clean drinking water and livelihood needs such as irrigation and agriculture. The critical missing link was the absence of a social/human aspect to water resources and its relation to the human society. Access to water resources revolved predominantly around the health and livelihood needs of the society. Multiple values that a society could derive from its access to water were ignored. This limited focus on access to water coupled with a growing problem of water scarcity gave birth to a new phenomenon of considering water as an ‘economic good’. This commoditization of water meant water was provided based on the ability to pay and efficiency of use, thus further alienated the social value of water. Furthermore, the link between water and society can also be viewed from a hazards perspective. With the increasing awareness of climate change and water related hazards, view of water based upon assumption of average normal conditions is no longer tenable. Building resilience and adaptation capacity to address water hazards must involve a fundamental shift towards a planning paradigm that works inwards from extremes rather than outward from means. With this background, the objective of the chapter is to review water research literature through the tri-focal lens of Access, Equity and Hazards and attempt to identify the gaps – when the water resources field is viewed through this tri-focal lens. To set the stage, the chapter will first briefly discuss the rationale for the choice of our tri-focal analytical lens before delving into the international academic and policy literature to address the aforementioned objectives.

**Keywords** Social justice • Ecological resilience • Water • Equity • Risk

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M.U. Mirza (✉)

Leadership for Environment and Development (LEAD) Pakistan, Islamabad, Pakistan  
e-mail: [umirza@lead.org.pk](mailto:umirza@lead.org.pk)

D. Mustafa

Department of Geography, King’s College, London, UK

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143

## 9.1 Introduction

Water resources research was mostly concerned with technical supply side, managerial and policy problems through the 1960s–1980s (e.g., see White 1968; Michel 1967; Wescoat et al. 2000). The 1980s brought with it the political wave of neo-liberalism. Together with the growing problem of water scarcity from the mid-1980s onwards and the ideological setting of neo-liberalism – a new phenomenon of considering water as an ‘economic good’ emerged in the 1990s (Bakker 2005). This new shift of viewing water as a commodity resulted in the commercialization of water management and governance. The commoditization of water further alienated the social value of water and instead access to water was deemed to be linked to the ability to pay and efficiency of use. Through all this transition, the actual improvement in water quality and progress towards social justice in distribution, particularly for the most needy was nonexistent. Starting with the 1990s there was an emerging concern with water under the post-cold war neo-liberal global regime to questions such as access to water for drinking and sanitation, water for environmental quality, conflict over water and irrigation water distribution (Swyngedouw 1997, 1999; Wescoat 1987; Lightfoot 1996; Bates et al. 1993; Mageed and White 1995; Homer-Dixon 1994). This chapter is an attempt at critiquing the dominant neo-liberal view of water as simply a commodity subject to the market mechanism. Furthermore, the argument presented in this chapter seeks to highlight the potential of more socially just and ecologically resilient use of water through recognition of a broader set of values of water and different paradigmatic approaches to understanding its socio-geographical distribution.

With the beginning of twenty-first century, water resources have attracted research attention with a renewed urgency. The projected effects of climate change have changed the future scenarios for all natural resources and water is no different. With the increasing awareness of climate change impacts and the associated risks involved we can no longer afford to have future planning based upon extrapolated historic average trends. The increasing awareness of ongoing global climate change and associated hazards and, realization of the finite nature of fresh drinking water resources has propelled social scientific water research into areas relating to water hazards, access to water and water distribution issues.

This literature review of major social scientific research in the water resources field is organized around the three themes of access, equity and hazards, to capture the strengths and gaps in the water literature since the turn of the century. The review attempts to point out the gaps, when the water resources field is viewed through the tri-focal lens. We shall briefly discuss the rationale for the choice of themes that define the tri-focal analytical lens and then delve into the international academic and some major policy literature that has emerged since the turn of the twenty-first century.

## 9.2 Defining the Tri-focal Analytical Lens

Access is often considered substitutable with equity. We however, interpret the concept in its expansive sense of access for satisfying multiple values and uses of water. It is a broader concept going beyond the distributive agenda of equity, towards accounting for multiple values and uses of water – normally not considered in water policy. Water has an intrinsic value with respect to its indispensability for all life, presence in nature, its sanctity and spiritual significance in most religions and its link with human cultural heritage. Access to water, hence, warrants a broader debate in a social context (Llamas 2003). Questions in this context typically revolve around the concepts of water as a common good, water's connection to human dignity, water as a basic need of life, water having cultural significance, and water as part of an ecosystem. A reductionist approach to limit the utility of water to only health and livelihood does not appreciate the multiple uses for which access to water has always been valued in human society. A root cause for this reductionist approach is the increasing consumptive demands on water resources, leading to the popular perception of water scarcity. Water scarcity agenda drives a wedge between water efficiency argument and the intrinsic value of water for the society. This intrinsic value of water reflects the link of water use to the religious, community and cultural needs a society derives from water (Pradhan and Meinzen-Dick 2003).

Equity is a distributive and a procedural concept. It is concerned about how water might be distributed between users and through which procedures. It has a normative component in the sense that it alludes to notions of distributive and procedural justice and transparency. Water is a source of life and its distribution and management should abide by the values of equity and social justice. Equity in the case of water implies the right to a minimum amount of water for basic human needs plus the assurance of procedural fairness and transparency in the provision of this basic human right (Mustafa 2013). Speaking about water management there is also a distributive angle to the question of equity. According to Bates et al. (1993), equitable water resource management should distribute water to users commensurate with their stake in it.

This inclusion of social justice as a fundamental component of equity leads us to the realm of fairness and ethics. Murray-Rust et al. (2000) conceptualized equity as fairness where a fair distribution for the society may not necessarily be strictly equal. For the purpose of this chapter, we define the notion of equity in water resources as incorporating both the concepts of fairness as in procedural and distributive justice, as well as treating water as a basic human right. Lack of equity and social justice in water distribution can be termed as the human induced aspect of water scarcity. Water scarcity is, in part, socially constructed i.e. inequitable distribution diminishing the right to water use. One of the main concerns in operationalizing the principles of equity in policy level water planning is the reliance on

conventional economic analysis and treating water as an economic commodity as opposed to a considering water in a broader social context (Syme and Nancarrow 2008). Whilst the access concern outlined above stresses the range of societal values, the equity aspect focuses on the distributive and procedural aspect of how those values are realized within a society.

Contemporary water resource planning frameworks put a premium upon normal conditions continuing into the future. This is, in part, also based on the humans socially constructed trait of discounting extreme events and averaging out risks in future planning. Water related hazards and extreme events are not as integral to the standard planning process as they should be. In this context a hazards approach calls to refocus the attention to water related extremes, such as droughts and floods, and also promotes a paradigm shift to replace the contemporary planning frameworks with frameworks treating extremes a part of the normal continuum of human environment relations. A major cause of water related hazards is climate change. Climate change has increasingly become the centre of attention for research and policy around the globe. The increasing understanding of climate related changes and the related more pronounced extreme events has led us to seriously consideration of climate impacts on human populations. One of the key areas of concern worldwide is the impact of climate change on water resources. Climate change and the associated unpredictability of temperature and precipitation will have physical effects on water quantity and quality (IPCC, 2013). Considering the volatile nature of climate change events, the aforementioned effect will also be non-linear and unpredictable (Frederick and Major 1997). There is a need to re-centre water hazards related policy and research to address the vulnerabilities likely to be accentuated in a climate change future. Despite the urgent need to address climate change vulnerabilities related to water, very little work has been done to address these vulnerabilities especially in low income countries/areas (Muller 2007). A paradigmatic shift towards hazards in water resources research will point towards newer pathways for addressing water related challenges and hazards. In this chapter we will see the largely unrealized potential of such a hazards approach to water resource planning in mainstream water research.

### 9.3 Water Social Power and Equity Problematique

The recognition of water as a basic human right has its roots in the 1970s when it emerged on the international agenda (Miroso and Harris 2012). For example in the 1977 UN Water Conference in Mar del Plata, Argentina, there was a strong emphasis on equitable distribution of water for all. In the 1980s, a general trend began towards investment in water related infrastructure for the provision of clean drinking water. The inadequacy of a dominant infrastructural and physical approach to water provision was soon realized. The critical missing link was the absence of social/human aspect to water supply (Mehta and Miroso 2004). The 1980s also brought with it the political wave of neo-liberalism. Together with the growing

problem of water scarcity in the mid 1980s onwards and the ideological setting of neo-liberalism – a new phenomenon of considering water as an ‘economic good’ emerged in the 1990s (Swyngedouw 1997; Loftus and McDonald 2001; McDonald and Pape 2002; Bakker 2010, 2003a, b; McDonald and Ruiters 2005). This new shift of realizing water as commodity resulted in the increasing privatization of water management, and decentralization of governance from the state (Kaika 2003; Brannstrom et al. 2004; Budds 2004). Through all this transition, the actual improvement in water quality and progress towards social justice in distribution, particularly for the most needy, has been marginal (Miroso and Harris 2012). It is against this backdrop – the equity problematique is gaining increased traction with respect to its practical implications and conceptual importance.

Water as a basic human right is the starting point in any discourse on the equitable distribution of water resources. Hence, viewing equity from a human rights perspective – every human has a right to get clean drinking water to sustain healthy living regardless of the ability to pay (Langford 2005). Moreover, water as a human right considers the nation state as the prime entity responsible for the realization of this basic right. Notwithstanding the propriety of considering equity in terms of a basic human right to water, it does pose some difficult questions. Coupled with the human right to water are always complexities in terms of policy questions and political consequences. Most of these complexities stem from the, so called, problem of water scarcity. According to a UNDP report (2006) water scarcity is a consequence of institutional mismanagement and should not be linked, and in effect rather conveniently, to the unequal physical distribution of water resources. Essentially water scarcity is mediated through institutional distortions, therefore the solution will also be found at the institutional level. Equity is a key concept that can help reorient institutions towards addressing socially constructed water scarcity. Hence there is a need to focus on international and local policy level debates to develop mechanisms delivering the human right to water (Parnell 2007).

The 1990s onslaught of neo-liberalism and the accompanied commoditization of water created a new tension between viewing water as an economic good and water as a human right. The shift to privatization, water markets and efficiency centred management paradigms were at the centre of the water related research discourse at the time (Serageldin 1995; Gleick 2000; Rogers et al. 2002). The purpose here is to highlight the effects of privatization of water on the notions of equity and social justice for the most needy. Privatization changes the perspective on water from being a basic human right to a human need mediated by the forces of market demand and supply (Hughes 2010). The result of distributing water based on the ability to pay has limited this indispensable resource to the more affluent urban areas and industries. Mustafa and Reeder (2009) document with an elaborate case of Belize City, Belize, the failed experiment of privatization and its inability to materialize the expected benefits in terms of better quantity and quality of water for the general population. The problem to an extent lies in the separation of nature from society under a liberal framework (Smith 1990). The commercialization of natural resources – such as water – through the introduction of market principles has prioritized and separated the economic efficiency of water from its social equity imperative (Roberts 2008).

Shifting our focus to local issue of water distribution, the discussion revolves around the concept of Hydrosolidarity. The concept of Hydrosolidarity induces, what otherwise has been neglected i.e. notions of equity, fairness, human welfare and conflict reduction in water distribution decisions (Gerlak et al. 2011). Hydrosolidarity aims to understand the dynamic of human control of water flows with the ecological consideration plus incorporating the ethical considerations of equity for the powerless. Operationalizing the concepts of Hydrosolidarity requires adapting integrated management of resources and ensuring equity of information and participation through involving a greater and diverse set of stakeholders (Gerlak et al. 2011). Despite the conceptual attraction of Hydrosolidarity, the practical application will require supportive water laws, policy framework, embedded incentives, and strong institutions (Jagerskog 2002; Wouters 2000). Water issues need to be assessed, reviewed and resolved in an overall societal and developmental context (Biswas 2008). Appropriate incentives coupled with a robust legal institutional infrastructure will be needed to actualize the positive results of Hydrosolidarity.

Taking the discussion to a more practical basis, one of the most widely cited and implemented approach to incorporate equity into water resource management is Integrated Water Resource Management (IWRM). The philosophy of IWRM constrains the definition of equity and equitable water distribution to the ultimate objective of sustainability. IWRM does not incorporate equity in a social justice perspective. According to Hefny (2009), IWRM should be underpinned by an ethical framework recognizing cultural rights from a social equity angle. Taking the discussion forward, a similar concept made popular in the 1990s, linking water to local level development and incorporating the concept of equitable distribution is 'sustainable development'. Sustainable development as an approach takes into account three major factors: social, environmental and economic (Mukheibir 2010). Demands of an equitable distribution should not only benefit (even partially) from water resource management frameworks like Hydrosolidarity or IWRM but also an approach like sustainable development – rigorously defined and politicized – which aims to link all three aspects of society, economy and the environment.

Discussions around an equitable distribution at the local level, while calling for greater participation of stakeholders, empowerment and better governance, is subservient to the differentials in social power at the local level. Michel Foucault defines power as compelling force wielded through knowledge, discourse and behaviours (Foucault 1980). Power through knowledge can define what is normal, acceptable or deviant. Power has a central role to play in equity and social justice with respect to water resource distribution. Power plays can be realized through a range of sources such as social capital, political clout, economic means or geographic position. These sources define the rules of the game and categorize what is normal, fair and just from perspective of the powerful. According to Mustafa (2002) power relations play a vital role in determining the distribution and management of water resources. Here power refers to the ability to act, dictate and influence an

outcome into ones favour. Looking from the power-equity nexus the social power differentials will have very real geographical outcomes in the perspective of equitable water resource distribution.

Exploring the literature on water, power and equity, we cannot complete the discussion without looking at gender as a key cross cutting area. There is a need to realize the basic human right to water at the local level to make a significant difference in the lives of women. Challenges impeding an equitable distribution of water for women involve local level factors such as cultural, religious, institutional and social norms. Water rights, an important ingredient of effective allocation and distribution of water resources, were a key pillar of water distribution alongside institutions and infrastructure (Zwarteveen 1997). A gendered approach to water is needed to achieve an equitable allocation of water for women.

Moving the discussion towards an international and regional perceptive, power plays are some of the most salient undercurrents determining the basic equity questions of who gets access to water resources, and to their degree of control over the resources. These kinds of asymmetric power relations and the resulting exploitations have been captured in the term hydro-hegemony. Hydro-hegemony attempts to explain how groups of powerful entities (hegemons) tend to maintain their control over the distribution of shared water resource and their ability to define the 'rules of the game' (Zeitoun and Warner 2006). Also in determining water sharing mechanisms across national boundaries, it is important for policy makers to consider the asymmetric power relations. A common theme in asymmetric power relations is the ability of the more powerful riparian to secure and sustain a favourable (inequitable) share of transboundary waters. Hence the overall unfortunate outcome of these hydro-hegemonic relations is the absence of principled and equitable sharing of water resources (Zeitoun and Allan 2008). For practitioners and policy makers to address transboundary equity issues, it is absolutely critical to understand and consider social power and its influence on sharing water resources.

This section has attempted to highlight key topics in international literature addressing the equity void in water related discourse. Equitable access to water as a basic human right is closely linked to the human right to life, health and food. Despite the immense significance of water for life; the research on the interplays of water with notions of social justice and equity is contested and emergent at best. A lot has been written about the valence and importance of the idea but a methodical attempt to embed it into an operational framework is missing. The logical consequence is the promotion of inequalities through the current forms of institutional arrangements governing the use and distribution of waters. Overall, equity concerns are being neglected at our own peril – till they become a large scale problem. This might be primarily because currently equity issues are only felt by the power less and vulnerable sections of the society. The social power realized through water is important in analyzing water sharing relations and how operational concepts such as equity are addressed to secure the rights of the most vulnerable.



## 9.4 From Livelihoods and Health to Access to Satisfy Multiple Values

Water is not a commercial product to be traded and used devoid of social values. Indeed the commercial aspect of water is itself a deeply social process, imbricate with complex patterns of historic structures and political economy. Humans and by extension the society, does not only need water for health and livelihood purposes, but they also need water to satisfy multiple uses i.e. from a social, cultural, esthetic and spiritual perspective (Pradhan and Meinzen-Dick 2003). A narrow approach to water management and governance without accounting for the multiple values, a community puts on water, will lead to outcomes with high social costs. To worsen the problem, there is a general lack of research attention on the linkages between the multiple values a society derives from water and access to water resources (Finn and Jackson 2011). This also highlights a void in the understanding of policy makers and by extension key water policy documents to satisfy the full spectrum of values realized from the access to water.

One of the primary uses of water is for health purposes. This includes clean water for drinking use and water for sanitation and hygiene uses. As part of a broader strategy to meet basic needs of the poor, for many years there has been a focus by the governments to achieve better health benefits through the provision of clean drinking water (Nicol 2000). Failure to access safe and hygienic source of water is a basic form of deprivation, and it threatens human life and undermines human dignity.

According to the World Water Development Report – giving the poor access to better managed water services can make a substantial contribution to poverty reduction (WWAP 2003). This assertion captures well the link between equity in water and complex multidimensional concept of poverty. Extending the argument we can identify water as one of the key determinants of a person's livelihood. The word livelihood here refers to the person's asset profile, risk and challenges they face and the institutional environment they survive in (Hope and Gowing 2003). The role water plays in the livelihood of the poor is mediated by the person's access to water for agriculture, food, livestock and other modes of income generation.

The above discussion gives a flavour of the type of topics addressed when we look at access. Access can be defined as the ability to benefit from a thing – water in this instance (Ribot and Peluso 2003). Despite the importance of health and livelihood benefits derived from water, the current literature is lacking in addressing a range of values the society puts on water. More broadly, access implies a concern with ability of different actors to access water for multiple uses, ranging from the obvious livelihood and health uses to aesthetic, cultural, community, ecological and spiritual values – a society expects to realize from water. This can be explained through the interaction of Foucault's concept of power with access to water. Power as knowledge, discussed in the previous section, has prioritized the health and livelihood uses of water as the ones most pertinent to wield power. This power attracting



potential of livelihood and health uses of water has neglected the communal, spiritual, aesthetic and cultural uses of water.

Water has cultural and spiritual significance for the indigenous populations who build their societies around water. Disputes about water are invariably value laden and thus cannot be mediated through recourse to scientific discourse or supply side infrastructural solutions alone (Hoekstra 1998). It is also essential not to split the relationship between land and water as done by most of the Western classifications of the natural world (Sheehan 2001). In reality water plays a very significant role in the lives, religious beliefs and cultural practices of many societies (Pradhan and Meinzen-Dick 2003). Despite the age old development of these cultural and spiritual values, only few researchers have shown interest in this aspect of water access (Strang 2004). This cultural and spiritual relationship between water and society has been understated in water related research and almost neglected in water management and governance (Pradhan and Meinzen-Dick 2003).

Water is part of an ecosystem and needs to be protected, valued and used with due care. Concerns with water do not end with the quality of water itself but also with the health of the environment it serves. Water has the ability to sustain life and hence all life depends on it. We as a society need access to water and to secure it special attention is required to protect the surrounding ecology. Taking this step further – protecting the ecology is one of the key values a society needs to satisfy for sustainable access to water – particularly for the poor.

This section has attempted to highlight the importance of a range of values associated with the access to water other than the usual health and livelihood uses. Human society and water resource related issues are linked at multiple levels. Decisions regarding water resource distribution and giving access to water for any society should consider the cultural, spiritual and ecological value of water before any consideration of commercial or economic interests (Moench et al. 2003). Water development, devoid of social values, globally results in many unrecognized side effects like destruction of local aquatic habitats, displacement of communities, severing of hydro-social cultural ties of the dependent indigenous community etc. In reality the extent to which societal values and interest are included in formal water laws and distribution mechanisms remains extremely limited. Water management and governance agencies should broaden their capacities and consider the multiple uses of water, as discussed above, while providing access to water for its users.

## **9.5 Destabilizing Normality: From Physical Hazards to the Hazards Approach**

There is a weak link, at best between water related hazards and water planning. Water management decisions consider by default the normality condition continuing into the future. This status quo has been maintained for too long and is etched into the thinking of water planners. Furthermore, the elite and powerful either live

protected from environmental hazards (floods and droughts) or have the resources to guard themselves from the negative consequences of these hazards (Mustafa and Reeder 2009). Here the concept of power knowledge can, in part, explain the lack of focus on hazards in water resource planning. Hazards and extreme events are conveniently ignored to the detriment of the powerless.

Water related hazards are composed of a population's physical exposure to risk and also its social and economic vulnerability (Wisner et al. 2004). Both physical and socio-economic vulnerabilities are important to address in developing a hazards approach (Adger 2006). The physical vulnerabilities relate with the physical location of the human population at risk and the availability and use of resources (Burton et al. 1993). In managing physical vulnerabilities, the technical and institutional factors mediate resilience to hazards. Looking from a purely physical aspect to managing hazards, the risk level of a population will only depend on its geographic characteristics. The actual composition of the society and economic conditions will not have any effect on the population's vulnerability. To build a more holistic approach, we need to incorporate the socio-economic vulnerabilities into developing a hazards approach. The socio-economic vulnerabilities relate to the social and political aspect of a human population as risk (Cutter 1996). A population consisting of the poor and marginalized will demonstrate very different resilience to hazards compared to an economically robust society (Hewitt 1983; Watts 1983). Likewise women in the society are considered to be more vulnerable to hazards due to their restricted movement and domestic roles (Fordham 2003). Incorporating both physical and socio-economic aspects of vulnerability, a hazards approach will need to address deficient knowledge, lack of social learning, substandard technology, lack of political power, underdeveloped social capital, frail infrastructure, cultural barriers, income disparities, gender inequalities and marginalized section of the society (Cutter et al. 2003; Cutter 2001; Tierney et al. 2001; Putnam 2000).

Reactive responses to water related hazards are not uncommon. To move away from a 'reactionary response' approach, efforts are directed to understand the link between human societies and critical resources such as water. The aim is to reduce vulnerabilities, incorporate adaptation and enhance the resilience of this interlinked hydro-social system. Water related hazards such as floods and droughts pose significant risks. The increased awareness of disasters and the high risks involved has prompted a general trend towards management by social-learning and adaptation in different fields, as opposed to controlling complex and unpredictable ecosystem (Pahl-Wostl 1995, 2005; Levin 1998; Hartvigsen et al. 1998; Berkes et al. 2002). Adaptation has usually been considered as a defensive mechanism in a technological sense without any social and political associations. According to Pelling and Manuel-Navarrete (2011), adaptation should be seen as a progressive phenomenon with political, social and cultural considerations for the society. Incorporating adaptation in policy should foster socio-political and economic development; improve power relations; built ecological sensitivity; cater for the interest of future generations and protect the vulnerable and marginalized members of the community. Such an approach to adaptation is absent in the mainstream water related research literature and not practiced in water resource planning and management. There is a need

to understand the complex nature of water related hazards and extreme events in order to adapt and plan better in our water resource management efforts. There is a need to think outside the box by considering alternate futures through exploratory modelling and building robust adaptation strategies based on foresight and flexibility (Lempert et al. 2003). The normality paradigm in water resource planning is no longer functional in the context of water related hazards and hence a hazards approach to water planning and governance is required to better deal with hydrologic extremes and idiosyncrasies.

Climate change is one of the key determinants of water related hazards like floods and droughts. According to Arnell and Gosling (2013), climate change impacts on water scarcity has proven to be very sensitive to the changing climatic scenarios. However, the effect of climate change on the water (hydrological) cycle has received relatively less attention in the literature (Stocker and Raible 2005). This focus needs to change to realize the critical link between climate change hazards and water availability. Climate change and associated global warming will have significant effects on the hydrological cycle globally (IPCC, 2013). Sudden flooding, prolonged droughts, coastal inundation and similar unexpected environmental events indicate the nonlinear, unpredictable and extreme nature of climate change impacts (IPCC, 2007). In the face of this unpredictability, we do not have the luxury to predict and plan for future water resource availability simply by extrapolating averages. Hence, water management and planning need to view climate change as a new reality and take into account the associated unpredictability.

The dominant approach on adaptation has focused on the social actor(s) as the primary agent responding to hazards and working towards reducing vulnerability; while the resilience approach on the other hand takes a broader systems view in building the capacity to resist change and retain the original functional form (Nelson et al. 2007). Adaptation, more holistically, refers to the capacity of a social actor or system to show resilience to a water hazard event and then adapt to prepare for future such events (Adger 2006; Folke 2006). It includes the notions of decreasing vulnerability, enhancing resilience/robustness and then transforming in response to an adverse climatic event (Gallopín 2006; Smit and Wandel 2006; Gober 2013). A hazards approach to water resource planning and management thus should incorporate both adaptation and resilience in addressing these aforementioned water hazards and related uncertainties. A key ingredient in developing a holistic hazards approach is to develop Institutional mechanisms as a complement to infrastructural developments (Muller 2007).

If we look at water resources planning from a hazards approach another important area in research literature deals with the role of social learning in adaptation. Impacts from hazards are also a function of historically determined social systems and their ability to learn and reduce vulnerabilities. This ability to learn and reduce vulnerabilities necessitates demands on social learning to be a vital component of hazards approach to water resource planning. Social learning can be defined as learning within social groups or a society through peer to peer social interaction (Haas 2004; Siebenhuner 2008). The scale of learning is societal and hence social learning usually deals with transforming societal values, assumptions and

worldviews as opposed to individual values and beliefs. The water ecology and the related climate change hazards are too complex to predict. Keeping in view the complex nature of climate change, social learning is expected to play a key role in changing and revising overall societal understanding of water related hazards and facilitate in better water planning and management (Berkes 2009; Muro and Jeffrey 2008; Pahl-Wostl and Hare 2004). Social learning changes the focus from simple prediction to a planned approach based on adaptation (Pahl-Wostl 2007). Reaching out to stakeholders at the community level is important to coordinate any water related planning. In the process of social learning, the stakeholders are empowered to step forward and take responsibility of appropriate actions in building resilience (Paavola and Adger 2006).

This section has attempted to highlight the shortcoming of a historical approach to water planning and management based on forecasting averages. The assumption of a linear trend in water resource planning does not hold true anymore. The advent of climate change has changed the world in unexpected ways. Now the importance of factoring in the onslaught of climate change is critical in adapting our responses to the upcoming water related hazard(s). There is enough evidence for us to start thinking about the inherent uncertainties and unexpected nature of climatic events. Water is a vital resource on all counts and with population pressures and an increasing problem of water scarcity, it is vital to manage efficiently and effectively the water resources available to us. In addition to managing our water resources we also need to build the capacity of an area or community to cope up with the destructive force of water. Hence to aim for better water resource management and protecting ourselves from water related vulnerability we need a comprehensive hazards approach to water (Pahl-Wostl 2007). The hazards approach will aim to build resilience and include adaptation strategies by incorporating both physical and socio-economic vulnerabilities with the ultimate aim of improved water resource planning /management and better coping with water related climate change disasters. With a comprehensive hazards approach we can better respond to the existing water related vulnerabilities and better plan for future water demands in a world with increasing populations and climate change.

## 9.6 Conclusion and Identifying Gap

The chapter has attempted to highlight key trends in water resource literature when looking from our analytical lens of access, equity and hazards. We have also used Foucault's concept of Power/Knowledge to explore the three thematic foci of Access, Equity and Hazards. The confluence of power through power knowledge is a slow process – but once the goal post, as to what is normal, is defined it is very difficult to challenge the status quo.

Understanding the influence of ‘power’ on water resource management in the context of access, equity and hazards; and following the argument made in the chapter – we have identified three significant gaps in water related literature. First, despite a significant amount of research literature on notions of equity and social justice in water resources, the concept has not been internalized or operationalized in policy. Criteria of equity have to be embedded in water resource management and governance to realize on ground outcomes. Second, there is an over emphasis on health and livelihood as the only uses derived from the access to water. Multiple values a society derives from water receives sparse attention and research foci at best. Third, hazards are dealt only as episodic events and not addressed as part and parcel of the planning process. This translates into an absence of a holistic hazards approach to water resource planning; i.e., the need to develop a resilience thinking approach and integrating proactive adaptation strategies in our response to water related climate change hazards.

First, the chapter argues for a move towards main streaming of equity issues in water resource management and a consensus on the status of water as being a basic human right. Despite the progress, we see scant efforts/a gap in terms of research on topics relating to equity in water resources and a focus on actualizing the idea of an equitable distribution. The notions of equity and social justice are of immense importance for the needy and the marginalized. Be it an individual struggling within an unresponsive political system or a nation contesting against the more powerful riparian in a bid to secure water rights; in both cases water is a vital lifeline and hence needs to be managed/governed on the principles of equity and justice.

Second, the chapter brings to our attention the gap pertaining to access to water for multiple uses and the over emphasis of livelihoods and health as the two main uses of water. Looking beyond the obvious uses of water for health and livelihood purposes there is not much emphasis on the multiple of uses, a society derives from access to water. This lack of emphasis on taking a broader view of the hydro-socio relationship has resulted in water resource planning and development devoid of any social considerations. Hence, it is important to consider the multiple values a society recognizes with water and incorporate them in future water development and planning.

Third, the chapter calls for a hazards approach to water resource management. Conservation of water, sustainable management and protecting ourselves from water related hazards are needed in a world impacted by climate change. The hazards approach defined in this chapter incorporates resilience thinking and adaptation strategies to reduce vulnerabilities of climate change associated with water. We need to protect ourselves from water related hazards and also at the same time understand the complexities induced from climate change impacts on our future water resources. To address both these needs, research efforts are required to incorporate a hazards approach to water resource management, thus reducing the climate change vulnerabilities related to water and improving planning for our future water needs.

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