

Water-borne Challenges and Impact on Livelihoods in Ganges Basin

An assessment of residents' perceptions about the role played by policies, hydro-politics and climate change; and their impact on the livelihood

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ABSTRACT

This research examines resident's perception of the role water policy and climate change play to shape their livelihoods in Ganges basin. It argues that the proximity and visibility of local factors (i.e. policy failure to control water pollution) may outweigh the relative significance of global phenomenon (i.e. climate change) in impacting livelihoods in people's view. This study used ethnographic methods to understand residents' perception framing process and their conceptualization of the negotiated livelihood impact supported by secondary literature in similar socio-political context. Study findings indicate that the local realities, entrenched subjectivities and rooted practices shape the setting in which people make their livelihood choices and interpret causations. This study also supports the view that the livelihood perception might be influenced by community opinion, and could be inherited. It concludes that the lived experiences of water pollution's frequent visuals and noisy discourses frame people's perception more than any other actor.

1. INTRODUCTION

Most of the modern livelihood studies, in their agreement or critique, relate with Chambers & Conway's (1992) explanation of livelihood in terms of “capabilities, assets (stores, resources, claims and access) and activities required for a means of living” (Knutsson, 2006). Conventional theories portrayed that the development was brought in by external interventions to ‘a set of deprivations that were perpetuated across generations, continually undermining the capability of the poor to change their own situation’ (Schmink, 1984). It perceived the under-privileged as the ones who can't help themselves and envisioned the development as an external help to shape their living. In contrast, contemporary livelihood approach introduced actor-oriented perspective of lived experiences through the lens of household and community to look “in ways that are more meaningful to their daily lives and needs, as opposed to ready-made, interventionist instruments” (Appendini, 2001; Chambers & Conway, 1992). Significant dimensions were added in this approach by contemporary scholars e.g. Amalric's (1998) emphasized on 'political arena' rather than just 'making a living' and Leach et al. (1999) highlighted the environmental entitlements and study of institutions. In the light of multi-faceted view of livelihood suggested by the development scholars, this study tries to understand residents' views on the role played by the climate change and policies in determining their livelihood choices and access options. This study particularly focuses on the surface water aspect of the Ganges basin which makes Ganges River the focal point of the study. Selection of Kanpur for the study is based on its being one of the largest towns alongside Ganges which is witnessing a huge water challenge driven by changes at socio-political, industrial and climatic levels. Sharma's case study (2000) on Ganges, which refers Helmer and Hespanhol's work for UNEP and WHO, quoted that “Pollution of the Ganga was increasing but had not assumed serious proportions, except at certain main towns on the river such as industrial Kanpur and Calcutta on the Hoogly, together with a few other towns. These locations were identified and designated as the "hot-spots" where urgent interventions were warranted”.

1.1 Politico-economic approaches with ‘Livelihood’ at the core

After the 'development impasse' of 1980s ended, it was linked to either Washington consensus or neo-Marxist theories which usually were relevant at broad level but not locally adapted to address real livelihood issues in the developing countries (Geiser et al., 2012). Chambers and Conway (1992), Scoones (1998 & 2009) and Carney (1998 & 2002) advocated focusing on the local realities and capturing livelihood perspectives through participatory approaches. New age 'actor-oriented studies' demonstrated intertwined interactions amongst the actors which provided much-needed details on local complexities (Peet and Watts 1996). Gieryn (1999) indicated that “'livelihood' has thus emerged as a 'boundary term' something that brings disparate perspectives together, allows conversations over

disciplinary and professional divides, and provides an institutional bridging function linking people, professions and practices in new ways".

1.2 Livelihood & Climate change

"Weather events and climate affect natural assets on which certain livelihoods depend directly, such as rivers, lakes, and fish stocks" (Thomas et al., 2007; Osbahr et al., 2010; Bunce et al., 2010). In view of limited adaptive capabilities, this impact of climate change could be more severe with long-lasting damages in the developing countries (Kates, 2000; O'Brien and Leichenko, 2000; Smit and Pilifosova, 2001; Mirza, 2003). Studies demonstrate that the climate changes rarely work in isolation and are typically experienced along with socio-economic, political and environmental changes bringing a compounded impact on the livelihoods (Pouliotte et al., 2009; Rebetz, 1996). In order to protect livelihoods from adverse climatic change, adaptation measures such as livelihood enhancement and environmental management are incorporated as part of developmental initiatives (Huq et al., 2003; Klein and Smith, 2003; Schipper and Pelling, 2006; Smit and Wandel, 2006).

1.3 Interplay of Perception

As the environmental discourse has taken a center-stage in last couple of decades, documenting people's perception and investigating the same in their socio-economic context is crucial for the policymakers and science experts who negotiate the way forward (Kempton, 1991; Leiserowitz, 2005 & 2006). People's perception is typically ensconced in social beliefs, cultural values and morality of ethics (Tripathi and Singh, 2013), and feeds in their decision making towards livelihood strategies. Perception on livelihoods and its determinants such as climate change can potentially expand or weaken the impact, and thereby they are critical agents in policy discourse to consider (Bord et. al, 1998; Becker et. al, 2012; Weber, 2010). Policy measures also need to account for questions of indigenous 'knowledge, politics, scale and dynamics' (Scoones, 2009).

Interplay of culturally rooted perceptions with evolving socio-political dynamic provides a view on how people conceptualize and interpret climate change as a 'tangible concern' (Crate and Nuttall, 2009). Most of perception studies of climate change, and their impact on the livelihood and sustainability have been conducted in specific local socio-political contexts rather than cross-regionally (Leiserowitz, 2005; Byg and Salick, 2009; Bunce et al., 2010; Lorenzoni and Hulme, 2009). This study will compare the results of the primary research done in Kanpur with other studies conducted in broadly similar socio-political setting. It might have limited usefulness in adding new perspectives as the setting of the research would be, by and large, similar (Brechin 2003; Lorenzoni et al. 2006).

In the backdrop of the above-mentioned foreword, this research uses mixed method approach to highlight how the residents view climate change and policies

impacting their livelihood in the specific context of water-related challenges in the Ganges basin. Most of the studies conducted so far, on this matter, largely focus on the climate patterns and impacts of environmental change on the means of production. They don't adequately represent the socio-political aspects highlighting people's perception of the impact on their livelihood in Ganges basin (Scot, 1990; Ingold, 2000; Tripathi and Singh, 2013). This study uses the opportunity to address the void and study people's view of water-related challenges causing livelihood impacts triggered by climate change and other factors. An attempt has been made to minimize the potential bias of small sample size (n=38) by basing the fieldwork on a blend of interviews, questionnaire and focus group techniques across different clusters and occupational strata. This study would investigate the following questions.

- What do people mean by 'livelihood'? Are there nuanced views based on gender, region (termed as 'cluster' going forward) or the occupation?
- What are people's perception of water related challenges and its impact on their livelihood in Ganges' context?
- What do the People view as the causes of water-related challenges: Are these caused by climate change, policy or other factors etc.?
- How do people frame their perception?

Second section of this dissertation investigates the literature review that informs the inter-play between the perception of livelihood impacts and the associated factors. The Third section highlights the geographic, socio-cultural, and ecological contexts in which this research took place. The fourth part will provide details about the research methodology and its limitations. The fifth section pertains to observations from the primary research leading into the sixth section which compares and contrasts the research findings with broader livelihood studies.

2. LITERATURE REVIEW

2.1 Livelihood Paradigms

The notion of livelihood is geographically embedded in man-land relationship and historically understood by people's capability to make a living from the individual assets, social capital and environmental resources (Carney et al., 1999; de Haan, 2000). People engage in non-linear interaction with society, institutions and environment to develop livelihood systems. Livelihoods are rooted in social reality and get influenced by the environmental and institutional dynamic (de Haan, 2000). In addition to economic capital, Chambers (1995) and Portes (1998) also highlighted other aspects of social capital such as an access to a shared network to mobilise resources or fetch critical information. Blaikie et al. (1994) termed it 'access model to maintain livelihood' which is, in application, close to Sen's "Entitlement Approach" (Sen, 1981; Dreze & Sen, 1991). Leach et al. (1999) proposed "Environmental Entitlements" for legitimate access to institutionally-guarded natural resources to build livelihoods in order to sustain shocks and stresses. Access rights, asset ownership and social justice, which are associated notions to entitlement need to be viewed in the context of institutional allowances and constraints. As entitlements make livelihoods sustainable, complex negotiation takes place between institutions, people and society to allocate and continue entitlements. Leach et al. (1999) concluded that the institutional policy-making, as a consequence of negotiation with people and society, may lead to the ecological change.

2.2 Livelihood as a construct & its interactions with the allies

2.2.1 Origin of Livelihood Research

Much like conventional approaches to development, modernisation theory and Marxist approach suggested that the people of developing countries, who are not employed in west-defined capitalist system, are 'languishing in backward sector' and, are primarily rural (Prowse, 2010; Huntingdon, 1968; Parsons, 1964). Conceptually, modernisation theory propagated the notion of reallocation of labour from 'backward' rural to 'modern' urban which dimmed the rural-urban line of separation and 'clear-cut' livelihood models. Marxists, on the other hand, believed that peasants' movements and social campaigns can discourage the mass proletarianisation and the formation of 'class' (O'Laughlin, 2002). Economic transition and social movement models, in conjunction with Hart's analysis (1973) which highlighted several income streams for the proletariat through 'informal sector', predominantly emphasised the economic perspective of livelihood. This income-based portrayal of livelihood (Francis, 2000) and multi-dimensional elaboration of the urban poverty (World Bank, 2000) was amongst the early mainstream researches. In the later years, 'Livelihood agenda' moved on from

income-based view echoing basic needs (Stewart, 2013; Streeten et al., 1982) to entitlements and capability (Dreze & Sen, 1991; Sen, 1981) and Chamber's views of isolation, powerlessness and vulnerability (1995).

2.2.2 Livelihood - Environment Interactions

Post modernists tend to interpret the relationship between livelihood and environment from political and ideological angle that leads to the construction of subjective knowledge. As knowledge has perspectives and its post-modernist construction could have agency-bias, its theoretical generalisation in the form of science might be socially negotiable (Blaikie, 1995). While this dialectic is healthy to have multiple views, contextualisation of a broad theme i.e. 'Environment' would need narrowing down to mainstream interpretations to enable policy formulation and implementation.

2.2.2.1 Environment usage – Economic perspective of Livelihood

Turner (1988) developed a usage-based, three-view environment model based on economic perspective of livelihood with ideological differences. 'Preservationist' view advocates preserving much of the nature as it is with an existential logic that man's survival is subject to ecological balance. Geography evaluates this view in terms of 'carrying concept' and interprets resource exploitation at a rate where it could self-replenish for future needs. 'Exploitationists' take a market-centric demand-supply view of environment much like everything else and propose free-wheeling demand-led extraction. They argue that resources, if over-exploited, would have a supply and price movement to balance it. 'Conservationists' straddle the two and propagate a regulated, incentive-led model of resource optimization (De Haan, 2000). Clearly, the compatibility between the livelihood and environment would be varying from ecologically-intertwined livelihood model (preservationists' agenda leading to deep-ecology) to managed livelihood model in the case of conservationists advocating a trade-off approach. With an exception of conservationists, economic perspective largely views environment as a 'consumable' for the purpose of sustaining current and future livelihoods.

2.2.2.2 Environment alignment – Participation perspective of Livelihood

Alternative approach to the classical livelihood model is premised on the residents' pro-active view and proposes that the local people should take charge of the changes they need to make to build capacity and adapt in view of their lived experiences. Blaikie (1998) calls this 'actor-led' perspective 'neo-populist developmentalism' (De Haan, 2000). It is grounded in empowering the marginalized communities, sustaining livelihoods and rooting the development in local agendas through participatory methods. Development and environment, at least theoretically, sit well with each other with a pre-condition that people have an access to resources needed to challenge the livelihood barriers. While this model seemed to explain incidents with predictable frequency where local people had good knowledge e.g. rotating herds across grasslands to manage meadow's growth,

it didn't necessarily work in 'non-equilibrium environment' such as climate change scenarios (Scoones, 1994).

2.2.2.3 Environment linked with livelihood in developing countries from water's context

Social scientists have written at length about people's perception of environment in the context of their individual traits and socio-economic status (Dunlap and Scarce 1991; Hunter, Strife and Twine 2009; White and Hunter 2009). Inglehart (1995) suggested that people from the developed countries are more likely to have environmental concerns and take actions for its protection. This view was contradicted by a number of researchers on different premises i.e. Anderson et al. (2005) suggested that "those most directly affected by water pollution were also most likely to see it as problem" and White and Hunter (2009) commented "residents of less-wealthy nations also often prioritize environmental issues". Inglehart (1995) argues that the ascendancy of environmental debate indicates transition from materialist to post-materialist phase mostly in industrialized countries. In developing countries, mainstreaming of environmental discourse is taking place where it is morphs into socio-economic problems. (Holl, Daily & Ehrlich, 1995).

2.2.3 Climate Change, Policy & Perception

Climate change and its secondary manifestations, which reflect in the form of ecological, social and economic changes, are a well-established and widely accepted reality linked to poverty and the livelihoods (Hulme, 2009; IIED 2009; Bicknell et al., 2009; Byg & Sallick, 2009). Effects of climate change can have 'disproportionate impact' on the poor (Satterthwaite et al., 2010; Alam and Rabbani, 2007; Bicknell et al., 2009) as its magnitude is multiplied by the combined force of climate change and socio-economic, political and ecological actors (Adger and Kelly, 1999; Mendelsohn et al., 2006). In view of climate change, livelihood builds on physical resources, social capital, and informational support to respond to impending threats, and sustains through the decisions taken within the environmental limitations (Adger and Kelly, 1999). Climate change and its implications are not fully explained by Science as it entails significant uncertainties intertwined with people's perceptions, preferences and decisions (Kloprogge and Van der Sluijs, 2006; Laidler, 2006; van Aalst et al., 2008). Contrary to positivist science which captures the climate changes as a neutral observer from outside the event frame, observations of local communities are context-specific and provide deeper understanding (Laidler, 2006).

Climate change knowledge is constructed through scientific research, policy guidelines, political discourses, and the policy script of global institutions in the form of development narrative (Klugman, 2002; Prasad et al., 2008; Mehta and Dastur, 2008). Most of these and other influencing forces seem to transact with one another in an ever-evolving pattern. Interpretation of climate change in view of

existing knowledge weaves perception which reflects 'local concern' (Danielsen et al., 2005) and can be examined to understand the impact of change on their lives (Laidler, 2006). Given the subjectivity, interpretational aspects as in how people build appreciation and take decision can't be modelled with accuracy (van Aalst et al., 2008). While the causes and primary manifestations of the climate change could be broadly similar, they may cause vastly different perceptions of their impact and how people should act (Alessa et al., 2008). It is partly explained by the general practice of climate-related policies being formulated on the basis of macro-level trends, statistical observations, and scientific notes.

Study of local actors, which interact with climate change and may bring contextual perspective in the policy making, has not been captured expansively in developing countries except in a few cases e.g. Vedwan and Rhoades (2001), Krupnik and Jolly (2002) and that partly explains why local factors haven't been featured in policies adequately. In view of significant implications of climate change with a requirement of localised adaptation, policies are needed to increasingly focus on taking a rounded view on sustaining livelihoods through institutional measures rooted in local realities.

2.2.4 Sustainability perspective

As the focus moves from livelihood to sustainable livelihood, a few boundary conditions need to be qualified - Satisfying the basic needs as per individual definition in shock-proof manner (Chambers, 1995), availability of resources to expand people's capacities (Sneddon, 2000; Chambers, 1995), and reasonable use of natural resources (Scoones, 1998). Sustainability is closely linked to the definition of the needs which emanate from personal and social values, and are often consumption based rather than income-based. UNDP (1998) noted that the social expectation of consumption tend to grow faster than the income which clearly means that there would be a continued pressure of collective bargaining by the communities to enhance the resource allocation. In view of the collective pressure and the resource constraints, it might push the institutions to take ecologically unreasonable or socially unjust stand which could undermine the entitlement arrangement itself. Local ecology, institutional priority and social preference could play complementary and conflicting roles at different times (Sneddon, 2000). As Sen (1981) exemplified the occurrence of drought in certain socio-political and economic conditions, livelihood threats may emerge from the interplay of environmental, socio-political and economic conditions and thereby livelihood strategies will need to take an aligned view of macro-level forces and specific institutional realities.

Post 1990s, the livelihood discourse has advanced into sustainable livelihood with environment as an integral component because large global agencies in development space have embraced it (Ashley and Carney, 1999; Carney, 1999; Amalric, 1998). Friedmann and Rangan (1993) commented that a sustainable

livelihood is effective when communities take charge of politico-environmental action to ensure their access to critical resources. It also touches upon rights-based approach to livelihood. This pathway of participation leads to multi-stakeholder approach of policy-making. Sneddon (2000) places the notion of increasing 'livelihood intensity' which helps in capacity building of the marginalized poor by restoring ecological resources e.g. water and drawing income from non-mainstream activities. As sustainable livelihood is not a homogenous dynamic, its framework-building and assessment can become broad-based by including the dimensions of identity, power over ecological resources and cross-play of gender, ethnicity, class and regionalism (ibid).

2.3 Politics in Livelihood dynamic – Institutional View

2.3.1 Structuration

As per Foucault's post-modernist work which explains the role of power and knowledge in constructing the institutions to control and Harre's work on critical realism, discourses are best used as tools to mediate amongst different perspectives (Hajer, 1995). Policy addresses the problem the best when the problem is used to define it. This interactive relationship also highlights the symbiotic inter-dependence between the institutions and other stakeholders leading to ongoing negotiations. In general, discursive closure (Hajer, 1995) processes the contesting arguments through 'Structuration' such that certain arguments survive and become stronger because of their scientific value and/or mass appeal and others are side-lined (Giddens, 1984). In a democratic setting, this process is put to use to address matters of social conflicts through deliberative process rather than using force (Hawkins, 1984; Vogel, 1986). Structuration process particularly applies in multi-stakeholder negotiation as part of policy making with one drawback that most often the poor, who the policy is intended to empower, get ignored due to lack of effective representation.

2.3.2 Coalition partners & Sanctioned Discourse

Policy is inherently political and facilitates convergence of several constituents towards making a coherent framework. Policy-making process could be dominated by the coalition-partners and could end up leading to a 'sanctioned discourse' (Allan, 2003) with pre-determined boundaries and limited space to evolve and develop its future course (Hajer, 1995). More often than not, policy discourses are influenced by coalition's self-interests in the short term rather than long-lasting socio-cultural or environmental consideration (Allan, 2003). Hajer (1995) argues against coalition partners collaborating in self-interest in 'clear-cut' fashion and suggests that the process of policy-making is arduous, complex and participated by a large number of participants at several levels. While Policy uses science in its effort to construct the problem objectively, it also needs to consider motivated arguments and short-term compulsions. Also, southern policy-making is

constrained in its ability to deploy policy options because of lack of resources which can make the policy's carrying capacity fairly limited.

2.4 Politics in Water Policy Discourse

'Politics' component in water management discourse has rather been subdued until recently. Water discourse was mostly guided on the social engineering paradigm (Mollinga et. all, 2007) which largely supported linear replication of a specific blueprint in another context. This 'over-simplistic prescription' (Merrey et al., 2007) called for governance aspects e.g. accountability and legitimacy which enabled 'Politics' to gain formal entry into the mainstream discourse. Governance featured prominently in second World Water forum which issued a statement "there is a water crisis, but it is a crisis of management. We have threatened our water resources with bad institutions, bad governance, bad incentives, and bad allocations of resources" (Cosgrove and Rijsberman, 2000). Water governance took centre-stage in the subsequent World Water Forum discussion which revised its statement to "The world water crisis is a crisis of governance – not one of scarcity".

Contrary to many researchers' notion that the politics is ingrained in, Jenkins (2001) and Ferguson (1994) took a sobering view of their relationship in the water discourse. Jenkins (2001) termed the governance as a 'technical' issue in the development discourse and treated it as a de-politicised version of politics. Ferguson (1994) and Harris (2001) suggested that de-politicised play in development establishes state legitimacy and reproduces the power. Moving away from governance versus policy debate, Mollinga (1998) noted that water politics is predicated upon everyday politics (Kerkvliet, 1990). Everyday politics (on water) is mainly about water usage and entitlements, and predominantly local. Politics of policy (Grindle, 1977) is between the states which is typically nonlinear and reinforces the notion that aim of inter-state water politics is to 'demythologise planned intervention' (Long and van der Ploeg, 1989). Water politics evolves through negotiations and compromises on triangular local-state-federal level.

2.4.1 Water Policy, Poverty & South Asian context

In south Asian context, there is a tendency of inefficient policy making and inadequate coordination amongst the ministries and government departments causing a sense of resignation to reduce the poverty (Banks, 2008). Power structure among the federal government, states and city corporations could make the livelihood dynamic complex. While water governance is a matter of state domain in India, federal government devises policies to deal with climate change. Working of city corporations, which could be autonomous such as the water corporation, "could be absolutely dependent on government grants and hence have to work within limits set by procedures of such grants" (Khan, 1997). World Bank (2007) describes City Corporation – State power negotiation as "conflicting dual

metropolitan power structure” which limits the city corporations’ efficacy to impact livelihoods.

2.5 Gender Subjectivities

2.5.1 Gendered context in Livelihood Approach

Gender analysis, from livelihood context, was methodically started in the 1980s using Harvard Analytical Framework which highlighted the resource access challenge impacting the poor women the most. It also illustrated women's exclusion from the decision making despite their sizable participation in livelihood making activities e.g. farming, small trades (FAO, 2006). Important aspects which influence the gender discourse from livelihood perspective are social structure determining the resource entitlements (Chambers & Conway, 1992), individual & collective bargaining (Kevane, 2000), human capital to enhance capacity (Sen, 1997) and social capital to avert crisis (Francis, 2001). United Nations' development fund for women (UNIFEM) reviewed the livelihood-gender linkages and presented the gender domains in the form of ‘capability domain’ (education, nutrition, health), ‘resource access domain’ (economic and opportunity resources) and ‘agency domain’ (ability to make decision and choices) (Demetriades et al., 2008) . UNIFEM's recommendation is tuned towards gender equality to begin with which targets to address the gender bias noted by Molyneux (2002) and Cleaver (2005) who commented that "women frequently engage in social and institutional life on adverse terms – they are less able to negotiate the ‘right way to do things’, to create room for manoeuvre and to shape social relationships to their advantage".

2.5.2 Gendered context in Climate change

Impact of climate change on water usage from gender perspective is well-documented. As is the common knowledge, women's usage of water is typically related to collecting water for household chores and raising small livestock, and men interact with water for irrigation or industries (Fisher, 2006; Khosla and Pearl, 2003) in most of South Asian regions. This water-specific labour-division confirms the social expectations of women in household-supporting roles while men earn the livelihood for the family.

Climate change context is gaining increasing significance. WEDO (2003) estimates that two third of global population will face water stress and for a billion of them the "shortage will be severe and socially disruptive". Also, climate change's implications in terms of frequent extreme events e.g. floods, droughts, health hazards would compound the challenges further. These changes make women particularly vulnerable in terms of denied opportunity of education or earning income, enhanced security risk and additional pressure of family support. Schmuck (2002) highlight that nuanced factors should be analysed in culture-specific context to understand different vulnerabilities of women. Terry (2009) notes that it is a

norm to project 'vulnerability' as the central point in gender discourse conducted in climate change context. This oversimplified approach ignores women's role as an agent of change and solution. A nuanced and contextual analysis would elucidate the range of women's roles, vulnerabilities and strengths (Demetriades et al., 2008). Zahur (2014) highlights the under-representation of women in policy making agencies in developing South Asian context which might encourage entrenched behaviours and expectations without much change on the ground.

2.6 Critique of Livelihood Approach

Livelihood approach's old line of thought, based in locality and actor-oriented format, has lost some of its relevance as one of the key development outcomes (Scoones, 2009). While livelihood shared some ground with the contemporary economic thinking, it didn't really sit well with globalizing economics and markets given its focus on local actors. Though the livelihood theories tried to connect with the politics, institutional apparatus via decentralisation (Ribot and Larsen, 2005) and rights based approach (Moser and Norton, 2001, Conway et al., 2002), they failed to integrate and evolve with the changes in politics. In its quest for looking local-actor based narrative, livelihood construct apparently has gone too far in localising the development discourse. When the 21st century's big question came in the form of climate change, conventional livelihood approaches could not explain how this global phenomenon can be fitted in their local template as exemplified in the cases of mobile pastoralists (Scoones, 1995) and adaptive dry-land farmers (Mortimore, 1989). Credible scale challenges to foundational livelihood theory paved way to develop wider theoretical boundaries to accommodate scale, global-knowledge and politics dimensions in order to appreciate local livelihoods through the lens of global developments.

3. BACKGROUND AND CONTEXT OF THE FIELD RESEARCH

3.1 Geological & Socio-economic context

The Ganges originates from the Gangotri glacier in the southern slopes of Himalayan ranges and passes through four countries namely India, China, Nepal and Bangladesh of which majority of land fall (862,000 square km) lies in India (Jain et al., 2007). It covers approximately 2500 km through northern and eastern provinces of India to find its way into Bay of Bengal. Ganges is joined by several tributaries in the Himalayas and in the plains which contribute 60% of its discharge. Geologically, Ganges basin is formed by collision of Indian and Eurasian tectonic plates which ended up filling the former seabed with sediments in the south of Himalayas. The Ganges carries one of the highest silt load compared to any other river resulting into the largest river delta in the world.

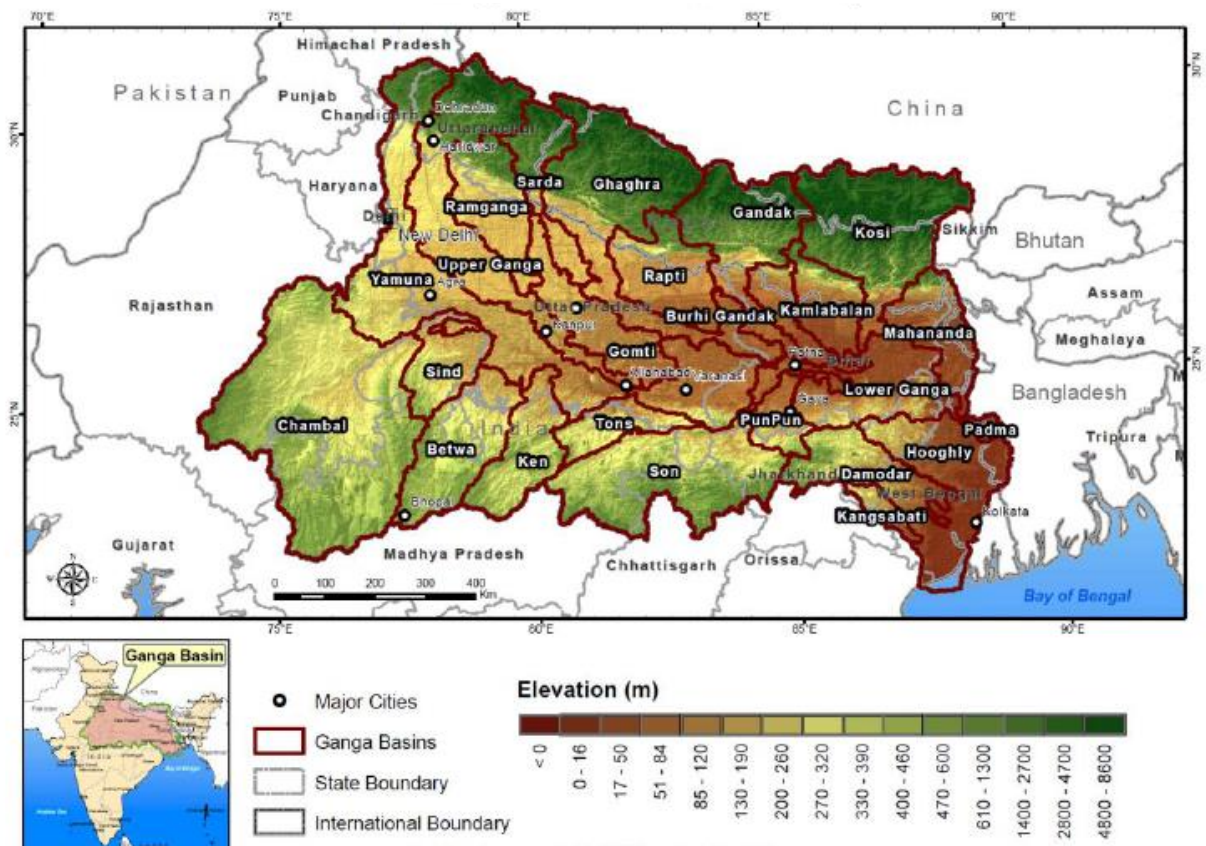


Figure 1: Map of Ganges basin (Source: INRM Consultants et al., 2013)

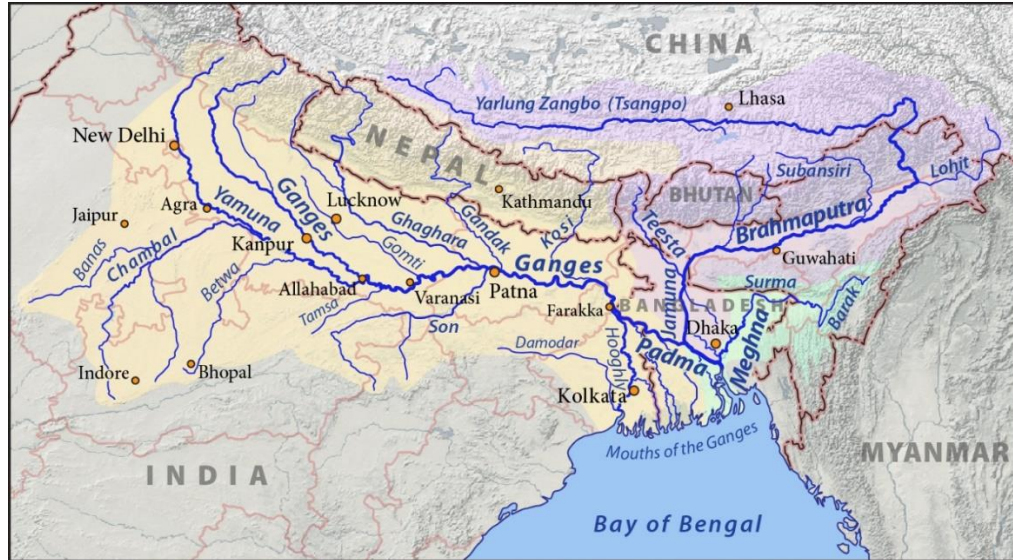


Figure 2: Ganges River Path (Source: Google/Wikipedia, 2015)

The Ganges basin, biggest river basin in India, accounts for 25% of India's geographical area, inhabited by 43% of the national population, irrigates 47% of total irrigated land and contributes 40% of the GDP (NGRBA, 2011; Tare et al., 2013; World Bank, 2014). Indo-Gangetic plain consists of alluvial sheets which support multi-aquifers and agriculture to sustain livelihoods. The Ganges basin is rich in biodiversity with the richest freshwater fish fauna, 90 amphibian species and five areas as birds' habitats which are not found elsewhere (Jones et al. 2003; WRI 2003).

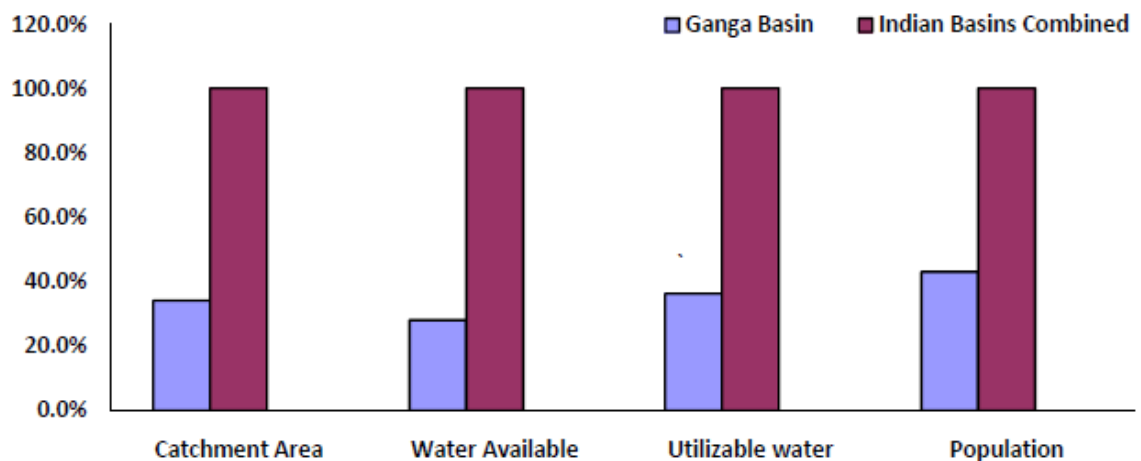


Figure 3: Importance of Ganges river basin relative to combined Indian basins (Tare et al., 2013)

Post 1947 when India gained political independence, It has come a long way in tackling poverty which has been reduced from more than 60% in 1947 to less than

35% in 2001 despite huge population upswing (Jayaraman and Srivastava, 2003; Chen and Ravallion, 2004). The decline in poverty is associated with agricultural developments primarily in India's Gangetic basin through industrial urbanisation and increasing the productivity of the small holders (Dixon et al., 2001). Despite the development in poverty reduction, the poor are still concentrated in specific pockets most of which fall in the rural parts of Ganges' plains. Contrary to general belief, poverty reduction is noted to have been more effective in low potential areas than the high potential Ganges' areas in the 70s and 80s (Fan et al., 2000).

3.2 Reports on the status of Ganges basin

3.2.1 Underused surface water & Overexploited ground water

Central Pollution Control Board, India (CPCB, 2013) estimates that less than 25% of surface water and more than two third of the ground water is used in the Ganges basin. CPCB (2013) report clearly indicates that the basin's use of surface water is less than effective and ground water resources are overused. Based data for 1994-2005 period, Moors et al. (2011) noted similar pattern in the declining trend of water availability in Ganges basin. Researchers attribute these changes to irrigation and anthropogenic use. CPCB (2013) also notes that "Due to large scale developments in the Ganga Basin, the river ecosystem is being affected adversely".

3.2.2 Pollution context

Ganges' challenge lies jointly in over-extraction and water pollution (Helmer and Hespanhol, 1997; WWF, 2007). Over-extraction occurs to support 8% of global population which lives in its basin (Newby, 1998), and pollution is primarily driven by domestic sewage and industrial effluents. Over-extraction of water has caused disappearance of a large number of amphibian and aqua fauna, and has led to lower organic soil content reducing farm productivity (Revenga et al. 2000). From pollution standpoint, domestic sewage contributes 80% of Ganges' organic waste coming from 692 towns (out of 2,300 towns in India). While industrial effluents are only 20% of the total pollution load, their damaging impact is a lot more due to higher strength of industrial wastewaters (NGRBA, 2011). More than two third of all industries, which are situated on the river itself, discharge partially or fully untreated waste into the river containing inorganic waste and insoluble heavy metal. Rogers (2013) noted in his newspaper article:

"An estimated 3 billion liters (800,000 gallons) of sewage is released into the Ganges each day, of which only a third - according official figures - is processed by treatment plants. Agricultural businesses are also draining the river basin and adding toxic pesticides and fertilizers into the river system".

3.3 Policy context of Ganges cleaning in Kanpur and neighbouring areas

Ganga Action plan (GAP) was launched by the Government of India in 1986. GAP has jointly been driven by bureaucracy, an expert's forum called Pollution control board (PCB) and local NGOs. Objectives of Ganga Action Plan included improving the water quality by controlling pollution and sustaining the eco-system through participation of the institutional and local stakeholders (GAP, 1986). Participation of relevant stakeholders is not only important to conceptualise the developmental project, it also helps in fusing the interacting rationalities (Cernea, 1985; Korten, 1986) and encourages the notion of distribution of power (Ahmed, 1995).

GAP, despite starting with a bang, fell short of expectations. Redclift (1987) and Drijver (1989) opined that the GAP was not modelled as participatory program and controlling authorities did not have appropriate skills to guide it. Institutions such as pollution boards continued, with incumbent's arrogance, sending top-down communication which only reflected the dilemma of the state in ecological matters and state-society discourse (Davies and Hossain, 1999). Disconnect of the institution and communities caused 'signalling problems' (Hart, 1988) and questioned 'institutional. In view of the failure of previous policy and the dire need to fix the problem, Government of India has set up National Ganges River Basin Authority (NGRBA) in 2009 for effective basin management, pollution control and for taking forward looking measures (Government of India, 2009).

4. METHODOLOGY

As part of the research design planning, “prolonged engagement” (Guba and Lincoln, 1994; Shenton, 2004) was initiated with a small group of five people for pilot purposes. Their feedback on the questionnaire design, interview format and timing helped tune the data gathering template and finalize the research technique.

4.1 Mixed Method Approach to gather field data

In order to make a rounded observation, this research used a mixed method including face to face interview, questionnaire and focus group. Mixed approach benefited from an in-depth insight in and around the research topic in Kanpur (Kendall, 2008) along with a structured approach to gather data to evidence patterns for “educational assessments” (Brookhart & Durkin, 2003; Harris & Brown, 2010). Biases emanating from the subjectivity in interview responses, which could lead to factually incoherent view (Silverman, 2000), have been minimized by the structured approach of the questionnaires. Complementing that, interview method helped avoid the questionnaires’ potential pitfall of non-response errors (Oppenheim, 1992) and ritualistic methodology (Bryman, 2008). Brewer & Hunter (1989) highlighted that the different methods typically tend to compensate for their 'individual limitations' when coupled. As part of the research, three focus groups were organized to validate the individual views through the lens of community opinion. Two of these were on occupational basis and one on gender line. All of them were conducted in the urban cluster where finding respondents in one place was easier. Two focus groups were conducted spontaneously and all three were conducted towards the last leg of the fieldwork to avoid any anchoring impact during individual interviews. Focus groups were useful in providing 'socially embedded' (Delyser et al., 2010) responses and insights wherein opinion was built through 'structuration process' (Giddens, 1984).

As part of this study, Interview and questionnaire responses were triangulated with focus groups’ inputs for validation. Also, responses from different occupational groups and genders were compared to understand genuine spread of perception and spot the technique bias. It was crucial “to check out bits of information across informants”, (Van Maanen, 1979) for “obtaining a variety of perspectives in order to get a better, more stable view of ‘reality’” (Dervin, 1983).

The data was collected through a detailed questionnaire with open-ended and closed-ended questions. Open-ended questions enriched the feedback with personal impressions and opinions which, coming from respondents from diverse personal backgrounds and experiences, provided varied perspectives. Closed-end questions, on the other hand, ensured that the data collection is disciplined and along the intended research pathway.

4.2 Sampling technique and sample selection

The study witnessed random sampling within identified urban and rural clusters, and income strata to narrow down the research focus, minimize the researcher bias in identifying the samples and distribute the 'unknown influences' across the sample to smoothen the research outcome (Preece, 1994). “A random sampling procedure provides the greatest assurance that those selected are a representative sample of the larger group” (Atkinson, 1995). Also, random sampling from identified cluster and strata was particularly useful in developing a "macroscopic" view based on respondents’ inputs given the limited sample size of this study (n=38). Respondents were chosen after clustering the target region in urban and rural areas (n[urban]=22, n[rural]=16) and stratifying the respondents by the lines of their occupation.

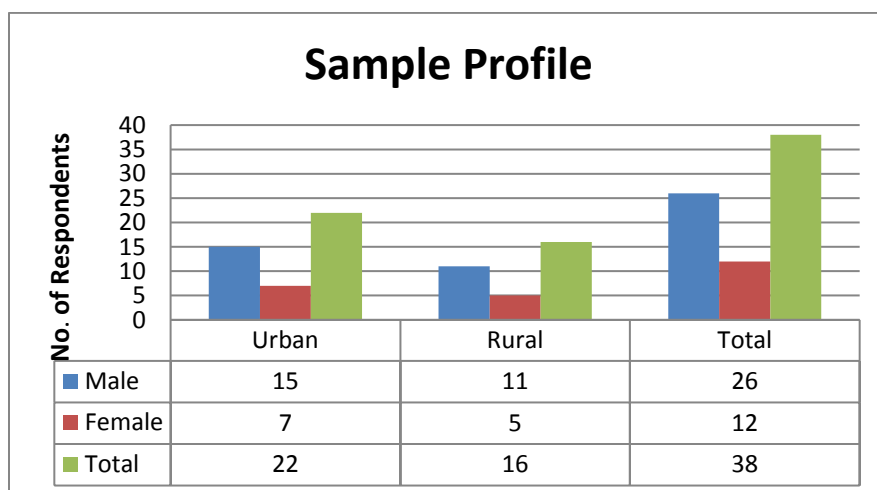


Figure 4: Sample profile of respondents in the field research

In order to get varied inputs, samples were randomly chosen from within the identified occupations with different degrees of livelihood dependence on the Ganges water including washermen (Dhobi), boatmen (Mallah), agriculturists, corpse burning team, tannery workers, scientists, academicians, municipal and water board policy makers. Fully dependent people make single income from Ganges with partly dependent people having multiple income streams. Analysis was also conducted on gender lines to understand the nuanced livelihood perceptions. 32% of total respondents were women across urban and rural clusters.

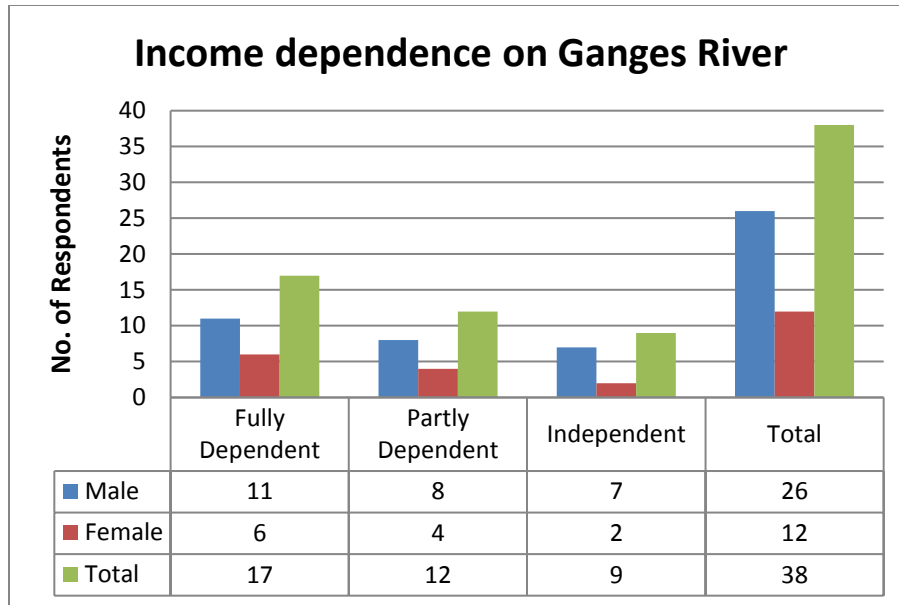


Figure 5: Income dependence on Ganges River

While most samples were selected randomly within identified clusters and occupational strata, ‘referral-sampling’ was gainfully used to get to the respondents mostly in the rural areas. Use of this approach was kept limited to avoid referral similarity bias (Kurant, et al., 2011). Particular care was taken to select only those respondents who were making significant contribution in either earning the livelihood or running the household or both. As indicated in figure 5 above, more than 75% respondents’ occupation was dependent on Ganges water for the economic aspect of their livelihood. Typically, these respondents were 35 years or above in age as indicated in figure 6 below. Keeping in mind that the audience is typically middle aged (35 years and above), 19% respondents are graduate (termed as undergraduate in the west) or post graduate as in figure 7. All respondents are married, out of which 13% are widow, widower or divorced as illustrated in figure 8.

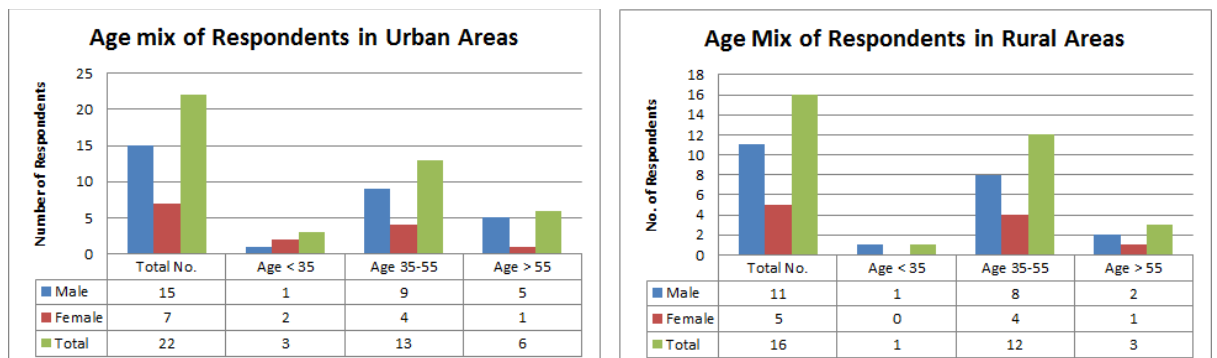


Figure 6: Age mix of respondents in urban & rural areas

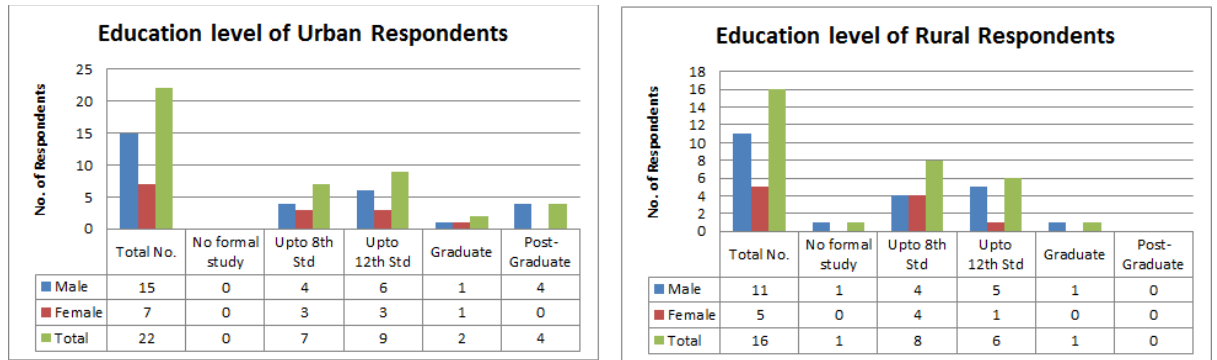


Figure 7: Education level of respondents in urban & rural areas

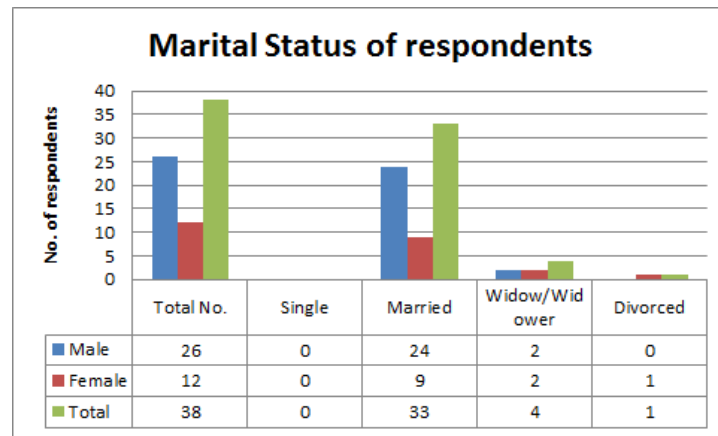


Figure 8: Marital status of respondents in urban & rural areas

4.3 Carrying out the Research

The fieldwork was conducted for three weeks in May 2015 in Kanpur. Out of total 38 responses, 25 responses were gathered through personal interviews and the rest 13 responses came from the questionnaires. An interview lasted for an average of 45 - 60 minutes whereas a questionnaire took about 30 minutes to complete. I was present in person to provide clarifications to those who filled the questionnaire as well. Focus groups took about 90 minutes each. Before starting either type of these interactions, it took approximately 15-20 minutes to brief the respondent about the purpose of research, data confidentiality, their rights and other related details. A combination of closed-ended and open-ended questions was used to structure the free-wheeling discussion to understand respondents' perception. Respondents were also asked to rank certain questions to identify a perception trend.

In the research process, effort was taken to make the respondents comfortable by speaking to them in their dialect, giving them the opportunity to decline to participate (1 prospect declined to participate in the interview, 4 prospects didn't respond to our request to fill the questionnaire and 3 prospects showed inability to

spare time despite prior appointments). Participating respondents were made well-aware that it is absolutely at their discretion to participate and they can withdraw from the research process when they like. Veracity of responses were checked by "iterative questioning" (Shenton, 2004) during interviews.

Initial interviews (n=17) and the first two focus groups were conducted with the help of two local facilitators but the latter part of the research interactions were anchored by me as I could speak the local dialect. Despite the immense help from the local facilitators, lay responses of the residents were seen to be somewhat influenced by facilitators' age, and their own understanding of the topic of research. Occasionally, facilitation process didn't stop with the question and barged into negotiating respondents' views. This incidence was particularly noted in case of a woman participant in the rural cluster.

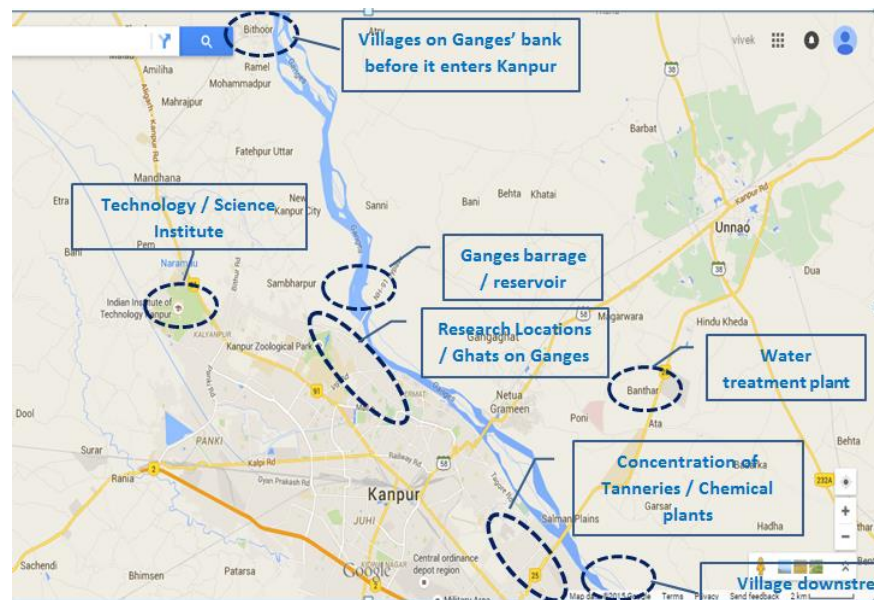


Figure 9: Research Areas in Kanpur

During the process of conducting the interviews and focus groups, I was acutely aware of the response barriers in terms of respondents' keenness to provide 'desired responses' in view of the power dynamic, my own biases as a researcher and the nature of knowledge creation embedded in the process (Delyser et al. 2010). While I had the risk of being considered as an 'outsider' leading to biased responses, my knowledge of local language and styled behaviour to look 'from within' made the respondents confident to speak their mind. In view of Ganges River being a politically charged topic in India, I was careful in initiating and navigating the discussion as objectively as possible. As a result, two respondents even indicated that they feel better-placed to share their views freely in responding to a research for educational purposes as compared to the same sponsored by a government agency or media.

The research domain consists of three urban zones and two rural zones. Urban zones include technical locations e.g. Points of Pollution e.g. Pockets of Tanneries, Sewers (Jajmau Nala) and Ganges' Ghats; Water treatment plant and Indian Institute of Technology; and Jal Nigam (Water Corporation) and Municipality. Rural zones are the points before Ganges enters Kanpur and after it departs.

5. ANALYSIS OF RESULTS & FINDINGS

5.1 Perception of changes in Ganges water and its correlation with occupational dependence on Ganges

Almost all the respondents perceive significant or some changes in the characteristics of Ganges' water in last years except 6% of the sample audience. All the urban residents, irrespective of their gender or occupation, think that the river water has definitely changed for 'worse'. People who don't confirm to this trend (13% of rural population and 6% of total population) live in the villages (figures 10 & 11) and their occupations are mostly independent of regular interaction with the Ganges. A correlation has been noted between people's perception in change of water quality and availability, and their direct occupational dependence on the river as illustrated in figure 11. White & Hunter (2005) noted the strong linkage between water pollution, water quality and availability and livelihood impact. As the water characteristics change for worse, they threaten the very professional and personal interests they were supposed to sustain creating water insecurity and livelihood susceptibility (Rijsberman, 2006). It explains the framing of people's perception influenced by the exposure to direct pollution, perceived impact on their livelihood and the 'noise' of pollution discourse.

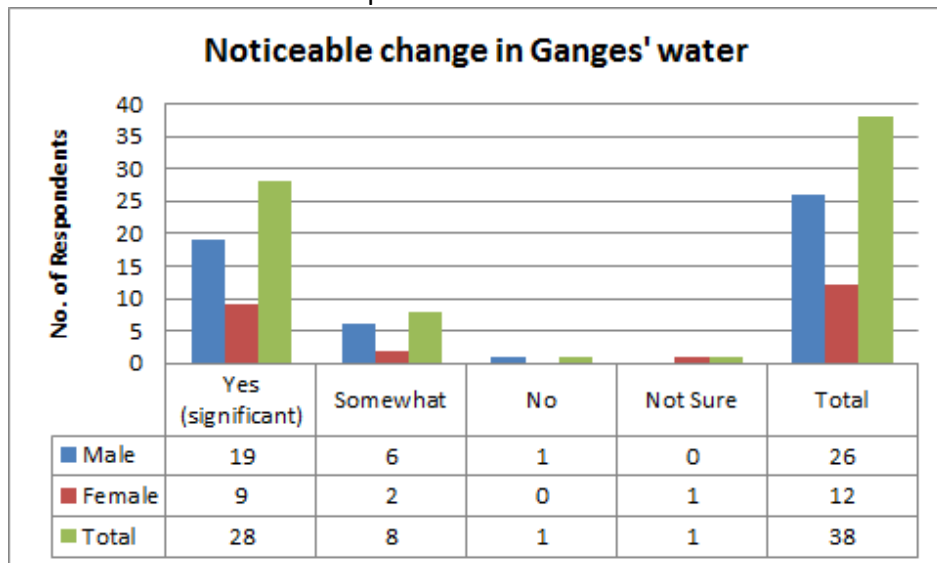


Figure 10: People's perception on the change in Ganges' water (by gender)

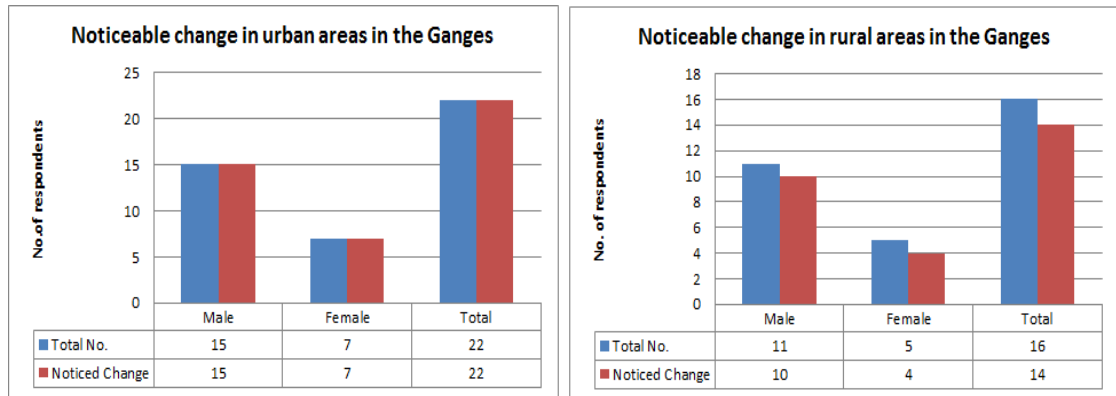


Figure 11: People’s perception on the change in Ganges’ water (by cluster)

5.2 Perception of Impact on livelihood because of water-related changes

On the question of water’s impact on livelihood, 92% respondents viewed it to be significantly or somewhat negative with 8% having a contrarian or no view. While there is a near-consensus on Ganges water having an impact on the livelihood, opinions differ on the manifestation of impacts on occupation and gender lines. Respondents who are fully dependent on Ganges for their livelihood, 11% of total sample and all interviewees are male, observe the changes to adversely impact their customers' behaviour e.g. boatmen have seen a dip in the demand of boat ride for religious purposes. While they agree that changing belief system could be one of the factors, they believe that water pollution is the main driver. They believe that their livelihood suffers more by lowered income than the adverse impact of water on their own health. One of the boatmen quoted,

“Ganges has been our holy goddess and the source of income to run our livelihood for generations. Less and bad water have impacted our livelihood as we don’t get as many customers as before. Losing income is a bigger problem than the health impact of the water”

An urban working woman, from the washermen community (9% of the sample), commented that the livelihood impacts manifest in the form of lower income, health hazards of staying in the river water for extended time and drinking water. Farming community, which is 29% of the sample and includes three sub-sections - farmers growing flowers, seasonal fruits & vegetables and regular crops, had different views about river water’s impact on their livelihood. While flower growers witnessed occasional and marginal dip in their income (10% of the sample), fruit and vegetable growers (14% of the sample) witnessed significant impact because of lack of water availability in the river and poor water quality leading to consumption changes (Fruit farmers in downstream areas of Jajmau bridge in Kanpur particularly mentioned water pollution).

5.2.1 How livelihoods are impacted in view of water change – Occupational View

All occupationally independent males and females (18% of sample size) in urban space have reported significant change in the river water despite their livelihoods not being under threat. Their interpretation of change includes water's physical attributes, its relationship with ecological balance, community behaviour and development, livelihoods, policy framework and climate change. This sub-group includes scientists, policy makers and academicians. Their version of 'livelihood' predominantly touches upon the governance, eco-system and wellness aspect with income from Ganges being just one of the components. It is also illustrated in the comment from the General Manager of Kanpur water board:

"Ganges has been a source of belief and living for lot of people for generations. We are witnessing huge transformations at climate, socio-political and other levels. These changes are having definite impact on Ganga river which, in turn, is influencing livelihood of certain communities. We are trying to cope up with the changes"

On the contrary, occupationally independent people in the rural cluster (6% of the sample) either have no opinion or seen no change in river water's impact on their livelihood. Arguably, it goes back to the point made in section 5.1 that the difference between the views of occupationally independent urban and rural respondents is because of exposure to direct pollution, perceived impact on their livelihood and the 'noise' of pollution discourse. Potentially there is also a play of education and awareness. All occupationally independent urban people are graduate or post graduate (figure 7) as against only one rural respondent. Rest 76% population is occupationally dependent (fully or partly) on the river water and prioritizes loss of income as the primary threat. It includes 26% women who perceive livelihood impact both in terms of loss of income and health hazards of pollution leading to learning disabilities of their children. One of them commented:

"We grow vegetables on the banks of Ganges during summer/winter and do odd jobs during monsoon. Polluted water is killing our income and well-being. My son caught life-threatening diarrhoea when he was eight and missed the school for many months. He doesn't want to go to school now".

5.2.2 How livelihoods are impacted in view of water change – Cluster View

100% urban respondents, irrespective of their occupational dependence on Ganges River, indicated the livelihood impact because of the change in river water as against 88% in the rural cluster. Urban respondents' views on livelihood impact included the occupational displacement, capacities and networks, and natural disasters e.g. flood. This view is in line with the World Bank's (2010) report where it noted a strong correlation between urbanisation and increased vulnerability to natural hazards. Low income groups in the urban sector, who typically live in low lying areas and unplanned terrains, are seen to be particularly vulnerable to floods

and water-related epidemic. Comments from another boatman in the urban cluster highlights the mood

“In the time of my forefathers, we had to struggle to accommodate people who wanted to avail our services but for a few years, people don’t prefer to do the boating. Ganga Ji (Respectful indication to Ganges) has become more volatile in bringing floods and drought. Also, she is badly polluted. When people get in the boat, they see a bunch of open sewers, dead-bodies and the sludge from tanneries. Why would people get in the boat? My community has started leaving our locality opting for other occupations. I am deeply worried for my livelihood”

An adjacent view was taken by an academician who specializes in the physical and social aspects of Ganges’ river:

“Impact of the changes in Ganges on people’s livelihood is long-term. Community networks have loosened, identities negotiated, skills replaced and capacities detached to local realities. While pace of change is daunting, it also shows lack of vision at policy level and weak intent to implement at institution level’

Rural sector notes similar livelihood impacts with a specific difference. People who sell their farm products in the cities at short intervals e.g. fruits and vegetables have higher sensitivity of water problems in relation to their livelihood than those who grow conventional crops e.g. cereals.

5.2.3 How livelihoods are impacted in view of water change – Gender view

In the urban sample, while all occupationally independent male and female respondents reported the river water change to be significant, 100% partly independent females reported the change to be significant against 66% of partly independent males who found the change significant. This difference highlights several aspects including the fact that the income through the Ganges-based occupation was significant and key part of their role to support the household. Also, women seem to define livelihood more broadly than their men counterparts. Comments from one of the partly independent females, who is a washerwoman, is quite topical

“I am encountering a twin challenge of sliding demand and the polluted water. I am in this business for more than 10 years and I have seen a continuously sliding demand. While I enjoy my work, river’s water has turned very bad which, during summer, stinks and causes itchiness. I particularly feel bad when my kids accompany me to the river. Water is not good for our health at all”

On my asking as to why she doesn't plan to move over to another occupation, her response was

"This job gives me independence and I am a businesswoman. In other jobs, I become a servant". Also this gives me a social platform to interact with my friends as we come to work in a group"

This feedback highlights women's perception of the change not only in the sense of physical properties of water. Kids' health and well-being, community networking and independence are other important considerations. These views were also validated in the focus group session with washerwomen. Paudel et al. (2006) noted an inverse relationship between water pollution and the loss of social capital.

5.2.4 Water has changed for worse but it is good for us - Contrarian view

From cluster standpoint, two urban respondents suggested higher likelihood that the polluted river water could be good news as it forced them to rethink and migrate to another set of skills to sustain their living. Ironically both urban respondents who saw it as a positive development migrated over to an occupation which destroyed their previous occupation (from fishermen to unskilled factory workers in tanneries). 22% of boatmen and fishermen have joined occupations which are not integrated in the ecological system. On my inquiring the motive of moving to tanneries from their previous occupations which were ecologically embedded, respondents indicated the dire need to sustain the dwindling income. In people's view, change in consumer dynamic, governance laxity and inadequate regulation have caused conventional occupations slowly disappear e.g. fishing (SANDRP, 2014). Liu et al. (2011), in UNESCO report, emphasise on including appropriate representation of the poor and under-advantaged in the water policy. It also reinforces a point stated earlier that a large section of people in manual & low-paying jobs consider the income and livelihood synonymous.

All two respondents who viewed the worsening problem of river water positive are a subset of larger group (27% of the sample across urban and rural pockets) who are primary breadwinners for their household and switched occupation. The switchers were fully-dependent on Ganges river earlier and now they have moved over to parallel income streams. In the case of women, that was less than 10% (only 1 respondent indicated the change in the occupation-mix). While the sample size is not large enough to generalise, lack of occupational flexibility in women's case sits well with their entrenched roles of supporting the family and remaining in the supporting role during the occupational transition of the main breadwinner (reference). One of the women respondents stated on this point:

"I have to support small kids and the elderly in my house. Learning new skills is not difficult but practicing it within the family constraints is difficult. Also, I don't get support and security from my environment to do it."

5.3 Briefing on people's perception on the Ganges' eco-system changes

On the question of changes in Ganges' eco-system, many points were put forth including emergence of pockets of tanneries mostly on the Kanpur side of the river (DNAIndia, 2015) along with the hutments of the tannery workers and largely unplanned habitation by immigrants. In parallel, an exodus is being observed by the original residents, e.g. fishermen, boatmen etc. who have lived alongside Ganges for generations, to acquire new skills and an alternative source of livelihood. The change in the composition of communities has impacted its internal dynamic of dependence and support, and influenced its interactions with the environment and policies. Replacement of local 'haat' (markets) and 'Mela' (fairs) on the riverside, which used to be a regular feature of the way people transacted and supported the livelihoods of the communities, have been replaced by factories and large shops. While this change is more pervasive than just Kanpur and its causes are many more than just the climate change or policy failure, it illustrates the livelihood impacts nonetheless.

5.4 Perceived causes of water related challenges

All the respondents attributed Sewer and Industrial pollution to be the most responsible factor for water quality degradation and related livelihood problems with 78% polling it to be the top-ranked factor. On perceptual scale, two other causes which emerged as significant are inadequate policy implementation and climate change. Pollution and the lack of policy implementation are highest ranked factors causing water problems as illustrated in figure 12 below. As the pollution and policy are inter-linked and inversely related i.e. more effective the policy implementation, lesser the pollution (Kohn, 1991), people's perception of these two as the top ranked factors is in line with other researches.

Beg and Ali (2008), in their toxicity analysis of the Ganges in and around Kanpur, highlighted that industrial pollution was generally high with chromium level in Jajmau area - up to 30-fold higher compared to another place Bithoor which is 20 miles upstream. The Financial Times reported the same (Chromium) to be up to 100 times higher than the regulatory limit (Financial Times, 2015). FT also noted that most of the sewage water discharge in the Ganges was not treated.

| Factors responsible | Number of Respondents | | | | |
|---|-----------------------|-----------------------------------|--------------------------|--------|------|
| | Top ranked factor | 2 nd top ranked factor | Is it a relevant factor? | Number | % |
| Climate change | 5 | 8 | 13 | 26 | 68% |
| Inadequate policies in place | 1 | 3 | 8 | 12 | 32% |
| Inadequate implementation of the policies | 9 | 13 | 11 | 33 | 87% |
| Cultural practices | 1 | 1 | 7 | 9 | 24% |
| Sewer / Industrial pollution | 22 | 12 | 4 | 38 | 100% |
| Any other (Please specify) | | | 2 | 2 | 5% |
| Total | 38 | 37* | 43** | | |

Figure 12: People’s perception of factors causing the changes in Ganges’ water

**Note: No. of responses would not add up to the population size (n= 38) respondents because one person didn’t suggest a 2nd ranked factors. Response for the relevant factors exceed the population size as it captures all the factors which are not top ranked.*

While the last paragraph inquires about people’s perception on the causes of the change in the Ganges’ water, this paragraph validates their position by tabulating their perception of impact of Ganges’ changes on their livelihood. 75% People ranked pollution as the single biggest influencing factor leading to livelihood impact. If an aggregated view is taken, two out of top three factors perceived to impact the livelihood, were related to climate change or policy as detailed in the figure below.

| | Top ranked factor | | 2 nd top ranked factor | | Total | Is this factor relevant at all? (Including 1st/2nd ranked factors) | |
|---|-------------------|------|-----------------------------------|------|-------|--|------|
| | Total | % | Total | % | % | Total (Multi-factor) | % |
| Frequent flooding leading to damaging property, endangering lives and stressing the livelihoods | 4 | 11% | 8 | 22% | 33% | 21 | 58% |
| Pollution leading to loss of livelihood | 27 | 75% | 9 | 25% | 100% | 36 | 100% |
| Change in people’s behaviour leading to loss of livelihoods | 3 | 8% | 10 | 28% | 36% | 24 | 67% |
| Loss of seasonal water flow due to upstream over-extraction for irrigation | 2 | 6% | 7 | 19% | 25% | 17 | 47% |
| Any other e.g. pesticides etc. | 0 | 0% | 2 | 6% | 6% | 8 | 22% |
| | 36* | 100% | 36 | 100% | | 106** | |

Figure 13: People’s perception of factors causing the livelihood impact

Note*/**: No. of responses would not add up to the population size (n= 38) respondents because two people didn’t perceive any impact. Multi-factor column

exceeds the sample size as respondents have included more than one factor in their inputs.

5.5 Perception framing actors

This research also took people’s responses on how they built their impressions about the factors such as climate change, pollution, policy etc. There seems to be a correlation between the proximity of lived experiences e.g. pollution and its impact on their livelihoods and how ‘real’ people viewed the factors as responsible to have caused water problems. 87% of respondents, who interacted more intensely with the river water for their livelihood, formed their perception based on their direct and ‘involved’ experience which is reflected in the table below by ‘direct evidence of pollution’, ‘unpredictable weather’ etc. Their opinion about policies is largely based on the communications they receive through media and/or in the political discourses. The perception of inadequate implementation of the policies comes from its not having visible and positive livelihood impact. The study didn’t find any significant difference in the feedback on cluster or gender lines.

| | Indicators | | | |
|---|-------------------------------|--------------------------------|---------------------|-------------------------|
| | Unaided Recall | | Recall on Prompting | |
| Climate change | Unpredictable weather | Media news | Melting snow | Government says so |
| Inadequate policies in place | Media news | Political discourse | NGO report | Technical understanding |
| Inadequate implementation of the policies | Failure of government schemes | No positive livelihood impacts | Media news | Political Discourse |
| Cultural practices | Religious ceremonies | Low attendance in fairs | Media news | Electric cremation |
| Sewer/Industrial pollution | Direct evidence of pollution | Impacted livelihoods | NGO report | Media report |

Figure 14: Perception-framing actors

During the discussion 24% (8 out of 33 respondents) people whose livelihood directly depends upon Ganges River and 80% (4 out of 5 respondents) of others also highlighted that the sewer & industrial pollution is related to the failure of policy implementation. The impact of climate change is not seen to be as intrusive and direct as that of lack of policy implementation or the existence of policy itself.

5.6 Reference to other studies in Ganges basin around Kanpur area

Similar researches have been conducted in other large cities based in Indo-Ganges basin namely Bhagalpur, Allahabad and Varanasi. All these places broadly share the socio-cultural setting and climatic context with Kanpur. Bilgrami and Kumar (1998) noted severe impact of water pollution on people’s health in Bhagalpur which is a mid-sized city on the bank of Ganges. Similarly an extensive water quality research was conducted by Hamner et al. (2006) in Varanasi. They noted that the “logistic regression analysis indicates that personal use of the Ganges River including

washing laundry and kitchen utensils, brushing teeth, and bathing in the river have strong associations with disease outcome. Activity in the river can be expected to expose users directly to bacteria and infectious agents present due to the regular and widespread discharge of untreated sewage into the river". These and other similar studies were focused on health & hygiene aspect. Similar to the findings in Kanpur, these studies noted many relevant parameters e.g. temperature, pH value, total dissolved solids (TDS), turbidity, dissolved oxygen (DO), biological oxygen demand (BOD) and faecal coliform count (FCC) as per standard procedures for the examination of Wastewater. Water quality testing was performed on statistical data for a 12 year period in Ganges river. Results from the statistical analysis indicated that average BOD and FCC levels hugely exceeded minimum acceptable quality levels, putting people's health to risk and causing livelihood susceptibility. There is a characteristic difference between these places and Kanpur though. Kanpur has grown as a large industrial city unlike Varanasi, Bhagalpur or Allahabad which means that the Ganges' and dependent livelihoods are in more complex dynamic in Kanpur. Secretary of Pollution Board of State Government of Uttar Pradesh (Banerjee, 2014) has admitted the fact that Ganges is the most polluted in Kanpur city within the state.

"A test conducted under National Water Quality Monitoring system across 21 areas of Ganga river revealed that the river water is most polluted in Kanpur area while the least in Muzaffarnagar city of UP," said, JS Yadav, UPPB, Secretary".

5.7 Limitations of the Study

Sample size and the time on hand to conduct the fieldwork were limited which can present generalisation bias and over-emphasis on the outlying data-points in the outcomes. In view of the research scope considering the roles of climate change and policy in livelihood impact through water-related challenges, presence of several variables might impact the sample selection despite the efforts taken to minimize it. Also, despite putting the best guards of objectivity and neutrality, there is always a chance of researcher bias in terms of conducting the research and doing the analysis.

6. DISCUSSION

6.1 Characterisation of perception of water leading to compromised livelihood and dis-empowerment of women

A large section of sampled people witnessed a definitive change in the Ganges River and perceived its correlation with lowered income, impacting their livelihood. Other aspects of livelihood e.g. community and networks as social capital were reported to be significantly impacted too in the Ganges basin (Carney, 1998; Haan, 2000; Leach et al., 1999; SANDRP, 2014). Consequences of water related challenges are manifested by a significant portion of people transitioning to multiple occupation-based income model in 'informal sector' (Hart, 1973) to sustain. Rahman et al. (2007) have noted that the open-access resources are 'integral' to the security of under-advantaged communities and livelihoods in Ganges basin. Beck and Ghosh (2000) argued that a significant part of income of Indian poor communities' could be earned from 'common property resources' with up to three-fourth 'resource harvesting activities' undertaken by the women. It demonstrates that women play a significant role in income generation alongside men apart from their culturally entrenched roles of doing household chores in some ecologically-embedded communities. Any degradation of wetlands or river ecosystem could affect livelihoods in general and women's interests in particular (Sugden et al., 2014).

6.2 From rural-urban transition to intra-urban migration for livelihood sustenance

Economic and livelihood benefits of rural-urban transition, leading to urbanisation phenomenon, is widely recognised (Glaeser, 2011; Krugman, 2011) and despite the challenges it poses, it is an essential ingredient to the sustained economic growth (World Bank, 2009). Rural-urban transition was also explained by modernisation theory from social evolution perspective (Bernstein, 1971). Historically rural-urban transition pertained largely with the 'productivity' on account of industrial urbanisation (Krugman, 2011) which, in post-industrial scenario, moved onto less tangible benefits such as 'agglomeration' of informal networks and knowledge sharing (Storper and Venables, 2004). Diversified transition evolved out of this simplistic notion of rural-urban transition (Start and Johnson, 2004) and impacted those livelihoods which were stuck in a 'pervasive and enduring' manner between traditional agriculturist and commercialized model (Bryceson, 1996; Ellis, 2000). Majority of the samples included in this study belong to such livelihoods that are making diversified transition from pre-industrial to industrial-model of livelihood e.g. urban washermen and boatmen becoming tannery plant and chemical industry workers. While it may sustain their livelihood economically, it might have near-irreversible impact on community structures and informal networks. Also, a large section of the interviewed people in the rural areas was straddling between rural

and urban domains which show their increasing dependence upon urban markets (Bryceson, 1996).

6.3 Play of water as an environmental commodity for some and social right for others

Before the industrial era started causing temporal and spatial occupational mobility, conventional occupations were embedded in the environment and inherited from one generation to another (Grusky, 2001; Laband and Lentz, 1983). In this backdrop, communities whose livelihoods were dependent upon the river system transferred their access rights to the next generations. Any specific distinction between the 'basic water right' meant for drinking & household purposes and the 'Water-use right', typically for occupational purposes, was not made (Bird et al., 2009). This context sits well with those who have been embedded in Ganges' eco-system for generations in Kanpur. Their livelihood, skills, networks and identity gravitated around their inherited entitlement to access the Ganges. Global forums have emphasised the protection of traditional water-bodies from pollution and unlawful encroachment to provide continued access to indigenous people, safeguard livelihoods and protect cultural practices (WHO, 2003). Given that the Ganges basin is passing through a phase of huge pressure because of growing population, unregulated resource utilization and low productivity levels (Sharma et al., 2010), conventional livelihoods are facing displacement and extinction. Exploitationists who access the water for industrial returns have not been appropriately regulated and charged to compensate for the natural resource replenishment and human rehabilitation (FT, 2015). This dualism, whether water is a commodity or social right, is also demonstrated by a conflicting stand in the 'framework for action' developed by Water's World Water Council (WWC) and Global Water Partnership (GWP). The framework entails two opposing recommendations in terms of how water should be viewed. While one recommendation emphasises on the upkeep of delivery of water services with private sector participation under cost-recovery principle, the other one highlighted the role of water as the right and primarily a state responsibility (Morgan, 2004). Also, WWC/GWP framework doesn't provide much clarity about the rights of people who have occupations dependent upon commonly shared water, and governance methodology to the state authorities.

6.4 Legitimate access to water entitlements compromised - A policy and governance failure by the institutions

'Water right' is stipulated by the global policy to ensure the "right to take and use water subject to the terms and conditions of the grant" (Burchi and D'Andrea 2003). Water access entitlements have been formalised by General Comment No. 15 of United Nations Economic and Social Council as legislative right on 'absolute

right to water' and guidance from MDG on 'access to water' (WWF, 2007). General Comment No. 15 also highlighted the scope of freedoms and entitlements:

"The freedoms include the right to maintain access to existing water supplies necessary for the right to water, and the right to be free from interference, such as the right to be free from arbitrary disconnections or contamination of water supplies. By contrast, the entitlements include the right to a system of water supply and management that provides equality of opportunity for people to enjoy the right to water (para. 10)"

In Indian context, this framework has not worked as effectively in Ganges basin as expected to protect people's water entitlements. While India has a set of environmental regulatory frameworks dating back to 1970s, it lacks cohesive surface water regulation leading to water access and entitlement problems for the poor (Greenstone and Hanna, 2012). India's water policy is driven by National River Conservation Plan (NRCP) under the ministry of Environment, Forest and Climate Change. While NRCP has been constituted on the lines of environmental institutions in the west, it didn't have legislatively accorded jurisdiction on other bodies like Central Pollution Control Board and State Pollution Control Board (CPCB / SPCB) to enforce the implementation of the programs (Sharma and Roychowdhury, 1996). Absence of clarity on the mechanics of funding, political empowerment and constitutional mandate to override state and local bodies ended up in failed implementation of Ganga Action Plan in 1990s and financial irregularities by the state & local units (Ministry of Environment and Forests, 2006). Also, local government authorities e.g. water corporation, pollution treatment centres function under the limitations of 'structure of interests' (Banks et al., 2011) with little incentive to 'deliver' entitlements to the urban poor. UNDP (2006, 2007) commented that the "Corruption remains one of the least addressed challenges in relation to water governance and water service delivery" and water governance can only be improved by equitable gender and stakeholder representation.

It is ironic to note that tanneries and chemical factories in Kanpur, which are symbolic of industrial growth and social progress, have caused the water resource crisis and livelihood impacts. It also highlights the need to adopt a balance between the economic liberalism, political compulsions and socio-ecological requirements. Until that happens, poor's interests would remain adversely affected by continuing water contamination caused by "sewage disposal, industrial effluents, chemicals from farm runoffs" etc. (Ramachandran, 2006).

6.5 Short-term economic perspective of the livelihood is most dominant feature for the poor

Subsistence livelihood demands immediate fulfilment which breeds short-termism. Most often, daily income is all that the poor earn to keep their livelihoods continuing. Conventional community networks and inherited skills were their

cushion to sustain but changes in socio-economic dynamic and inadequate governance have left them severely exposed. In the changing scenario where the income is under threat and intangible social capital is dwindling, the poor are increasingly focusing on protecting their immediate earnings to keep the lights on, irrespective of spatial or gender differences. Secondary studies suggest (Ersado, 2006; Lingam, 2005) and this research corroborates that the poor demonstrate an ability and tendency to identify parallel income avenues to support their livelihoods. While men are noted to prioritize the immediate earning aspect of livelihood more, women tend to attribute importance to other aspects as well e.g. health and children's well-being. This line of gender-oriented prioritization seems to be in sync with their respective roles in the social structure in South Asian context where male members are typically expected to 'earn' the income and female members support the family.

Immediate earning requirements and multiple sources of income of the poor are nothing new (Hart, 1973; Ersado, 2006; Lingam, 2005). I would argue that it has been the case well before the Ganges was polluted as badly or even the rapid socio-economic changes started. So what is changed then? In my view, a set of fundamental changes are taking place including the shift in identity and political expediency. Members of 'Machuara' (a local term for the community which survives on catching/selling fish) community are joining tanneries as an unskilled worker and boatmen are migrating their occupations to construction industry. This research, similar to secondary researches e.g. Nasreen et al. (2013), indicates that people are seeing members of their community migrating to another location for alternate occupations. This two-way loss of social capital may reduce the sustainability of livelihoods in the face of another crisis. Also, the change in livelihoods and exposure of transition risks seem to lead a section of people towards political expediency. I believe that it is about their quest for institutional representation and carving out an evolved identity.

Concluding Remarks

The study finds that people relate their livelihood impacts with 'pollution' part of the water more as they believe something could be done about it. This is why failure to implement the policy to treat water, inadequate policies and politics of governance have been ranked higher than the climate change. This is also about the 'exposure frequency' and 'noise intensity'. Pollution related visuals and discourses which people receive first-hand become part of their perception frame more than the climate related factors which they can't see as clearly. Finally, it is somewhat cultural to attribute natural hazards to 'kismet ki baat' (matter of luck) as one of the elders put about the floods and droughts. Big impact natural hazards are far and few, and are perceived to be too big to manage as opposed to institutionalised daily-impacting incidence of water pollution and politics over its governance. People perceive their combined role to severely impact their livelihood

and identity at personal level, and adversely affect the community equilibrium at collective level. Some cautious optimism was shown by a few respondents who view it to be a mid-term travail if the governance systems are set right.

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