Governance of Inter-Sectoral Water Re-allocation within the Context of Urbanization in Hyderabad. Using the Institutions of Sustainability (IoS) framework

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1. Introduction

The 'Global Water Crisis' with increasing water demands in the agriculture, industry, and household sectors due to growing populations, increasing urbanization, and economic growth is an emerging concern (Meinzen-Dick and Ringler, 2006). Taking into account the long-term growth in income, industrial expansion, and irrigation development, Rosegrant et al. (2002) projects the global water withdrawals to increase by 35% by the year 2020. This underlines a major challenge in simultaneously meeting food requirements and water demands (Meinzen-Dick and Ringler, 2006).

Cities, home to half the world's population and expected to further increase to 60% by 2030 (Hilderink 2009) emerges to be of critical importance in issues pertaining to climate change. According to UN estimates, cities cover only 2% of the earth's surface, yet consume 75% of all resources and produce 75% of all waste. By the year 2025, global population is expected to increase to 7.9 billion, more than 80 percent of whom will live in developing countries and 58 percent in rapidly growing urban areas. (Meinzen-Dick and Ringler, 2006)

Often described as leapfrog development (Gordon and Richardson 1997), urbanization is a universal phenomenon (Srinnivasulu 2008) and is being recognized as one of the major facets of understanding development issues (Hilderink et al., 2009). This rapid urbanization and industrialization has major implications primarily on land use patterns, energy and water consumption with increasing pressure on the environment (Madhavi Lata et al., 2007; Hilderink 2009). However, characteristics of this urbanization processes vary among regions with differing driving forces and consequences. Understanding these factors of influence on urbanization dynamics facilitate to better assess future trends of water, energy and land use to counter unsustainable developments (Hilderink 2009), which will as well have implications on rural livelihoods, environment and food security.

With rapid urbanization, the increase in demand for water resources will be higher for urban and industrial uses than for agriculture (Rosegrant and Ringler, 1999). While the demand for irrigation continues to increase in many regions, demand for municipal and industrial uses due to increased economic activity is also increasing, but many times faster (Meinzen-Dick and Ringler, 2006).

To quantitatively state it, water consumption for irrigation is expected to increase worldwide from 1,436 cubic kilometers in 1995 to 1,492 cubic kilometers by 2025. At the same time, non-irrigation demands will grow much faster, from 363 cubic kilometers to 588 cubic kilometers during the same time frame (Rosegrant et al., 2002). The changes in demand for water will occur at a faster pace in the group of developing countries, (Meinzen-Dick and Ringler, 2006; Rosegrant and Ringler, 1999) which creates a situation of competition. Under such circumstances, cities will generally have to re-appropriate water already used, allocated or "owned" by other users, generally agriculturists (Molle and Berkoff, 2006). The competition for limited water resources between agriculture and industrial water uses is

rapidly increasing requiring the transfer of water out of agriculture (Rosegrant and Ringler, 1999).

However, while there may be obvious economic gains in transferring water from agricultural sectors, decisions cannot be based on simple economic criteria only. Importance of agriculture and its role in food security and rural livelihoods (Meinzen-Dick and Appasamy, 2002) cannot be undermined. Irrigation remains one of the most critical farming inputs which serves as an essential poverty reduction tool, a crucial contributor to affordable food prices, and through its significant multiplier effects, improves many other livelihood outcomes, such as health and nutrition (Lipton et al., 2003; Rosegrant et al., 2002).

The key challenge will be to seek ways and means to accomplish the reallocation of water to the urban cities from agriculture in a rational and equitable manner that minimizes costs and avoids the potentially large negative impacts on both the rural economies from which the water is drawn and on the future growth of food supply and demand (Rosegrant and Ringler, 1999).

2. Problem Statement and Study Area

The case of Hyderabad, capital of the State of Andhra Pradesh (AP) in South-India, is exemplar of the challenge represented by sustaining a rapid urban growth in a water-scarce environment. The city has an estimated population of 7 million (City Mayors Statistics, 2009). With a current growth rate of 27% per decade, Hyderabad's population is expected to reach an estimated 10.5 million by 2015. About 40% of the State's gross cropped area is irrigated, and irrigation's contribution to State agricultural production is about 60% (Strategy Paper on Irrigation Development, Government of Andhra Pradesh).

To cater Hyderabad, over the last three decades, water has been brought to the city from the Musi River initially and further on from the Manjira and Krishna Rivers. However with rampant urbanization, the city began withdrawals from the Singur reservoir, located on a tributary of the Godavari River to meet its rapidly expanding water needs in 1991. Existing administrative rules govern the allocation of water where the urban demand of Hyderabad has been given undue priority over much longer established agricultural demand (Celio, 2007). And with continuing urbanization and increasing water resources variability, the pressure to reallocate water from agricultural to urban uses through outright capture, appropriation of irrigation infrastructure, modified infrastructure operations, and high-level institutional manipulation will further increase (Celio et al., 2010). Existing property rights on water resources in the state have been found to be biased against the poor disregarding equity concerns. Even the newly drawn institutional arrangements promoting collective action strategies in canal water management have not addressed the equity issue (Reddy and Shiferaw, 2008). Hodgson (2007) further argues the inability of participatory governance structures to operate effectively, as long as water users remain mere spectators without clearly defined legal rights over water that they can assert against other users and sectors.

3. Water Conflict: Cities vs. Agriculture- A Literature Review

Limited water resources coupled with escalating water demands has put great stress on water which is increasing recognized as a crisis (Cai, 2007). This is further substantiated by Merret (2003) where he states that in the field of water resources management, a widely held *belief* exists that allocation stress is to be found in many parts of the world. The apparent strength of this argument as given by Molle and Berkoff (2006) is predicated on four interconnected assertions, that agriculture gets the *"*lion's share*"* of all diverted water resources; that agricultural use incurs large wastage with only 30-40 % irrigation efficiency; that the value of water in nonagricultural sectors is much higher than in agriculture; and that water demand in the cities are seldom sufficient, depending on climate, resource availability or economic development.

This water stress has intensified water use conflicts between upstream and downstream areas and also between agriculture and the municipal and industrial sectors in China (Cai, 2007). And with irrigation by far the largest water user and often regarded as a low-value use of water, there has been a tendency to reallocate water from agriculture to meet industrial and domestic needs (Zhou et al., 2009). This apparent misallocation is often attributed to the failure of the government to allocate water rationally. (Molle and Berkoff, 2006)

Globally, economic studies have evaluated surface water transfers, in general, as well as potential effects on agriculture (e.g. Taylor and Young, 1995; Keplinger et al., 1998; McCarl et al., 1999; Knapp et al., 2003). Numerous studies on water transfers from agriculture to urban uses have been examined under different water transfer mechanisms such as water markets or quasi-water markets (Michelsen and Young, 1993; Levine et al., 2007), where one of the major concerns with water transfers has been the equity effect on regions supplying the water. Further, according to Molle and Berkoff, (2006) in a situation of competition, cities will generally have to re-appropriate water already used, allocated or "owned" by other users, generally agriculturalists. Such transfers are bound to breed political tension and stress irrespective of the mechanism used, whether it's by unilateral bureaucratic decision, coercion, compensation or a market transaction.

Rosegrant (1997) points out that reallocation can not only lead to decline in agricultural productivity and irrigated area, and change cropping patterns, but also negatively affect business activities, local government fiscal capacity, and the quality of public services in areas from which water is being transferred. This negative effect is because of the decline in irrigated area or production and associated reductions in agriculturally linked economic activities. Permanent transfers of water rights may hinder future economic development in the area of origin and induce out-migration. Misallocation, also clearly as a consequence of poor water management results in economic inefficiency. (Dinar 1998)

Poor countries relying on irrigation will be particularly hit by declines in food production resulting from growing water transfers out of agriculture (Meinzen-Dick and Ringler 2006). In addition, in arid and semi-arid areas, alternatives to irrigated agriculture are rare, and water reallocation can lead to rural-urban migration and abandonment of plots (Fereres and Ceña, 1997; Raskin et al., 1995; Wolter, 1997). However, transfers of water to uses of higher economic value are occurring and will undoubtedly continue (Molle and Berkoff, 2006). Although economic factors certainly play a major role in shaping water transfers, it would be

naïve to ignore the broader political economy where powerful groups are most likely to obtain water at the expense of less powerful users (Meinzen-Dick and Ringler, 2006).

This phenomenon of conflict and reallocating water between agriculture and other uses in cities in water-scarce environments is becoming a major issue (Celio and Giordano, 2007). Though new institutions are most needed for dealing with it, what form these institutions should have and when and how they should be put in place is still a debated question. New forms of governance, institutions, and policies need to be crafted through processes that seek synergies and involve multiple stakeholders (van de Berg and van Veenhuizen, 2005). Further, water transfer obviously leads to a transfer in property rights (Bruns and Meinzen-Dick, 2000).

Rosegrant and Ringler (1999) also see the need for comprehensive reforms to mitigate the potentially adverse impacts of water transfers for local communities and to sustain crop yield and output growth. The competition for limited water resources exists between different stakeholders and at different levels, amongst many others, most prominently between agricultural and urban and industrial users and uses, and environmental uses. Transferring water out of agriculture will likely impact a wide range of stakeholders, particularly more so, if appropriate institutions to manage water transfers are not in place.

On water policy reforms to save water and manage reallocation, supply augmentation of water through new water development has been common to address water shortages. However, in maturing water economies which is primarily characterized by increasing scarcity values for water (Randall 1981), and transfers of water, the importance of demand management increases (Meinzen-Dick and Ringler, 2006). The literature on demand management (Gleick, 2003) to water management also often suggests that judicious use of the available water will be enough to ease the pressure over water resources.

Meinzen-Dick and Ringler (2006) further state that demand management is to generate both physical savings of water and economic savings which can be supported through a variety of policy measures, including economic incentives to conserve water use, e.g. pricing reform and reduced subsidies, but also complementary regulations on water use rights, and policies targeting poor and vulnerable groups, leak detection, retrofitting, recycling, and other technical improvements as well as quota and license systems. However in addition, it is also vital to look into regulation and economic incentives to reduce the negative ecological, economic, and social impacts of municipal and industrial water use as well.

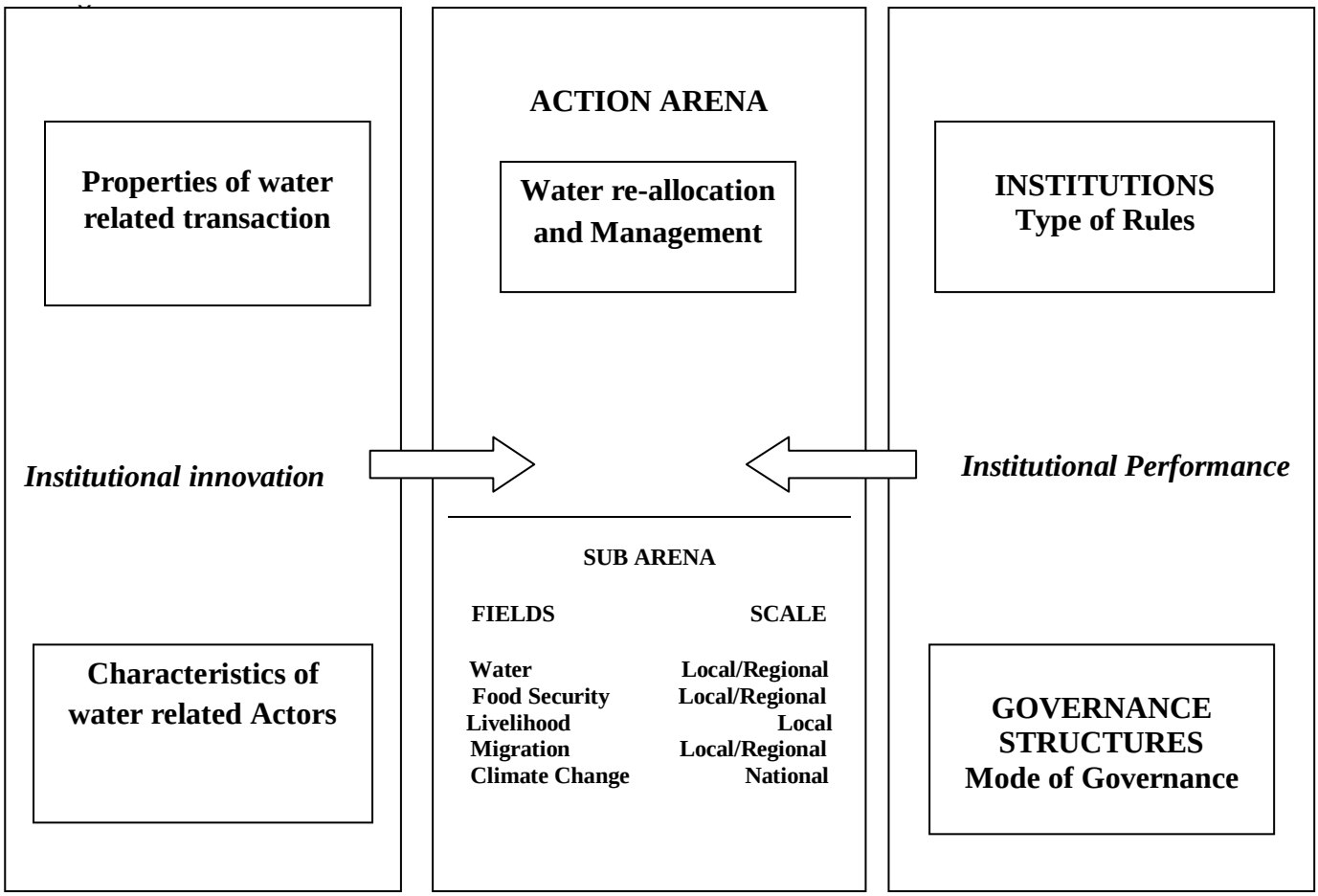
The defined nature of water policy reform and the policy instruments needs to be country or region specific, relevant in their context such as the scale of economic development and urbanization and institutional capability, the relative water scarcity, the level of agricultural productivity, prevailing rights to natural resources, relative water shortages, and other basin-specific characteristics (Rosegrant and Ringler, 1999). While they further recognize no single water policy reform can be applied universally, additional research will be required to design specific policies to any given country, region, and basin. However, some key elements of a demand management strategy can be identified. Thus the process of reallocation can be better managed through the reform of existing administrative water management organizations, through the use of incentive systems such as volumetric water prices and markets in tradable water rights, and through the development of innovative mixed systems of water allocation.

Therefore the paper seeks to look into the institutional and policy opportunities and constraints towards developing key water reallocation and adaptation strategies within the context of urbanization in Hyderabad. The paper essentially underscores the need to understand and improve the management of inter-sectoral water reallocation among users and uses. Applying the Institutions of Sustainability (IoS) framework, the research paper probed into the Institutional arrangement in order to identify what form these institutions should have and when and how they should be put in place. This will allow new forms of governance, institutions, and policies that are crafted through processes that seek synergies and involve multiple stakeholders.

4. Analytical Framework

An analytical framework for institutional and policy analysis is needed to analyse water re-allocation and management issues. The Institutions of Sustainability (IoS) framework (Hagedorn, 2008; Hagedorn et al., 2002) is used as the analytical framework for this research and is adapted to the specific context of water reallocation and management practices and policies.

Institutions of Sustainability (IoS)



SOURCE: ADAPTED FROM HAGEDORN (2008)

Four key exogenous factors are identified by the IoS framework that influence every action situation by shaping the situational context and, largely, determine its outcome:

(1) the *properties of the transactions* that are induced or prevented in the action situation
(2) the *characteristics of the actors* involved in the action situation,
(3) the *institutions* (i.e., sets of rules)
(4) the *governance structures* in place to make the rules effective.

Theses four exogenous factors are interconnected and also influence each other. The transactions related to water management and re-allocation determines which institutions emerge. The institutions influence the type of governance structures that are chosen so that rules become rules-in-use. Actors influence transactions, institutions and governance structures but are themselves subject to institutions and governance structures at the same time.

Operationalization of the framework in order to answer the research questions relating to water re-allocation and management.

With reference to the analytical framework it describes the areas that are relevant for the empirical analysis in more detail. These areas concern

(a) policies and their link to institutions, governance structures and technical measures,
(b) the action situations in sub-arenas,
(c) examples for water -related transactions and
(d) water- related actors.

Relationship between Policies, Institutions, Governance Structures and Technical Measures

The action arena 'water reallocation and management' comprises all practices and policies that apply to a case study area directly or indirectly, i.e. that causes water re-allocation by means of increase of water demand by urbanization the threats to agriculture originating from urban water demands. In order to operationalize the framework it is necessary to be more specific as to what the two terms mean and how they are linked. With reference to the IoS framework we conceive that policies affect institutions and instruments, and both are implemented via governance structures. The governance structures are organizational solutions to make rules effective. Governance structures include hierarchies, markets, hybrid forms, planning processes, knowledge and information systems and networks, monitoring infrastructures, procedures for conflict resolution and distribution of costs, and incentives to promote innovation and learning. Governance structures may be public or private forms of organization. Action situation i.e. water reallocation is the focal 'unit of analysis'

One part of the analysis is concerned with water reallocation, urbanization and agriculture, while the other part focuses on the actors and policies (institutional and policy analysis). Each analysis is divided into steps indicating the clusters of research activities. The focus of analysis is on the properties of water-related transactions. As a result of this analysis, a common understanding is provided on how water reallocation (a water-related transaction) is interrelated with urbanization and agriculture. In this analysis, water reallocation and management refers to all those water related activities that help to prevent or reverse water reallocation management and adaptation.

Properties of water-related transaction

1. How water use/ demand is interrelated with urbanization
2. Water re-allocation status between Hyderabad and Agriculture
3. Related practices (Urbanization- increased industrial activity) that causes reallocation
4. Actors involved/affected in water re-allocation a) Farmers b) Water Boards c) City Development Authority d) Irrigation Department.
5. Measures for just re-allocation

Institutions and Policy Analysis

1. Identify water related actors and their characteristics
2. Position of the actors and the administrative level they act at and what role they play in policy design and implementation
3. Actors' perceptions and values which determine their objectives and their resulting behavior and action
4. Identify policy measures relevant to water re-allocation (lessons from Maharashtra)
5. Identify other policy measures linked to water re-allocation
6. Identify rules and laws
7. Identify governance structure that enforce the compliance of actors with the rules set out in the policies
8. Policies and their implementation lead to outcomes, and further subjected to the assessment of the impact of the policies

5. Summary and Conclusion:

The Institutions of Sustainability (IoS) framework was employed to facilitate an understanding of the ongoing complexity of water conflict across array of multi-sectoral, and multidimensional issues, actors and stakeholders by integrating the properties of transactions, characteristics of actors, institutions and governance structures and subsequently displays their relevance in action arenas, which being 'Water Reallocation and Management'.

The paper essentially described how this analytical framework can be operationalized in order to allow and develop a systematic and feasible methodology to undertake a rational institutional analysis. The Institutions of Sustainability (IoS) framework was chosen because it provides a holistic and systematic frame for analyzing and understanding the diverse issues and relationships and captures the complexity of determinants affecting water management and reallocation. The IoS framework also uses a metatheoretic language, i.e. a multilevel taxonomy of the underlying components of the situations human actors face (Ostrom, 2005; Hagedorn, 2008) which enabled a systematic frame for analysing and understanding the diverse issues and relationships involved in the ongoing conflict in governance of water between the urban needs of Hyderabad and the agriculture demand. The IoS framework also allowed the integration of the diverse research approaches deriving from farm economics, political science and institutional economics, which essentially forms an integral set-up of the overall problem of water conflict and governance in the present context of Hyderabad.

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