



PROCEEDINGS OF THE RESILIENT CITIES 2012 CONGRESS

Session title: D2 Local governance leading on mainstreaming adaptation

Presentation title:

The hydro-social contract in urban water management in the USA and India

Abstract:

This paper addresses the challenges of ensuring equity in rapidly urbanizing areas in a manner that leads to positive Integrated Water Resources Management (IWRM) reforms in both the formal and informal sectors for meeting human needs. The development of governance structures, the hydro-social contract, climate change, and water security through diverse technological and social capital are discussed in the context of (peri)urban cities and their waters in the U.S and India. Livelihood opportunities of the various (peri)urban communities as well as social inequities are addressed, as well as the need to recognize and account for social equity issues by researchers, policy-makers, and civil society at large. Building resilience using a water-sensitive approach is becoming fundamental, and variations in achieving water security from changes in institutionalized policies in the U.S. to adaptive capacity of vulnerable communities in less institutionalized India are compared in relation to the effort to revitalize distressed urban water environments.

Keywords:

Climate Change, Equity, Governance, Hydro-social Contract, Water Security

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
ICLEI does not accept any kind of liability for the current accuracy, correctness, completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



Introduction

Urbanization has been one of the most pronounced trends of the 20th century. From both developed and developing countries, a growing body of water professionals are focused on transitioning to more sustainable urban water management as they respond to the challenges associated with environmental degradation, rapidly growing urban populations, and impacts from climate change. In addition, rapid urbanization in many nations – in particular the growth of small urban centers – goes hand-in-hand with the growth of what are called '(peri)urban' areas that combine 'urban' and 'rural' characteristics and present new challenges to urban growth management (Tacoli, 2006). The mixture of urban and agricultural land use has been recognized as being characteristic of the vernacular urban fringe of Asian megacities. This landscape has been called the 'Desakota (McGee, 1991)', the rural-urban fringe or the (peri)urban interface (Allen, 2003; Narain and Nischal, 2007).

It is also widely acknowledged that (peri)urban areas serve as receptacles for urban waste and as a source of resources like land and water that are needed to sustain urban expansion. (Peri)urban settlements tend to be at the receiving end of urban development and bear the brunt of the development of urban residential and industrial areas. Urbanization affects the access of (peri)urban residents to water in several ways (Narain, 2009a). Farmers' access to water may be adversely affected as groundwater succumbs to other competing uses, such as demands from industry, recreation and conservation. (Peri)urban people's access to water sources diminishes as the lands on which they are located are acquired for urban and residential expansion. Factories relocated from the city core to peripheries may pollute local water sources. Furthermore, inhabitants of (peri)urban settlements in lesser developed countries tend often to be outside the ambit of organized sources of water supply, since many of them lack a formal tenurial status.

The concept of Integrated Water Resources Management (IWRM) encompasses all aspects of water resources development, management, and use, and it is ever more important a concept to be applied in (peri)urban water management. The World Summit on Sustainable Development in 2002 called for all countries to develop IWRM and water

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
ICLEI does not accept any kind of liability for the current accuracy, correctness, completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



ciency plans. A multiple-uses approach underpins the planning and development of strategies for the provision of water services and rehabilitation of infrastructure that include: (1) assessment of water needs in collaboration with end users, (2) examination of the water sources available—from rainwater to wastewater to piped systems, and (3) match water supplies to needs based on the quantity, quality and reliability required for the various purposes.

In applying the IWRM approach in integrated city planning, inclusive of (peri)urban areas and communities, it requires interaction between multiple sectors such as water, transport, health, education and finance. Deciding where to begin encounters several challenges, including creating a driver for change, recognizing the changing values of water services and socio-economic dynamics, collaborating across institutional divides, finding technological solutions to particular projects, justifying costs and benefits of alternative water supplies, and building community capacity and awareness and resilience in the system.

This paper will focus on the challenges of ensuring equity transforming cities towards sustainability in the U.S. via innovative policy practices and examine water access from a (peri)urban perspective in India, focusing on Gurgaon, located in the North West Indian state of Haryana. Building resilience using a water-sensitive approach is becoming fundamental, and variations in achieving water security from changes in institutionalized policies in the U.S. to adaptive capacity of vulnerable communities in less institutionalized cities in India are compared in relation to the efforts to revitalize distressed urban and (peri)urban water environments.

Water Access and Equity Issues in the U.S. Context

In urban environments, small impacts add up. Many communities in the United States, ranging in size, population and geographic location, are looking for ways to assure that the quality of rivers, streams, lakes and estuaries is protected from the impacts of development and urbanization. In the past, the main causes of water degradation were point sources that could be targeted directly through facility discharge permitting processes, but sources of contamination, include nonpoint sources, are now prevalent throughout entire watersheds and across jurisdictions and are far more complex to

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
ICLEI does not accept any kind of liability for the current accuracy, correctness, completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



ess. Additionally, federal agencies such as the Environment Protection Agency (EPA) are addressing environmental justice (EJ) or disproportionate distribution of pollution problems where disadvantaged communities have had inferior access to adequate drinking, surface and sewer water resources. Social, economic, and cultural factors play a role with respect to differential exposure to pollutants/contaminants; these factors include but are not limited to income, employment status, access to insurance, health care, limited English proficiency, and the existence of social capital, and are important in determining vulnerability and the ability to prevent, withstand, or recover from negative environmental impacts. EPA defines EJ as the fair treatment and meaningful involvement of all people with respect to the development, implementation and enforcement of environmental laws, policies, or regulation. The U.S. urban waters work supports EJ in a positive cycle that begins with connection to water and builds community engagement, leading to water quality improvement and community revitalization to transform forgotten or neglected urban waterways in the U.S. cities. This effort brings together state, tribal, federal, and local partners in efforts to foster understanding, public access, and enhanced stewardship of urban water commons.

The Hydro-Social Contract

Fundamentally, the development framework of urban water policy and management strategies that are sensitive to various social, economic and cultural factors, such as the implicit agreements between communities, governments and businesses on how water should be managed, is often characterized as the *hydro-social contract* (Lundqvist et al., 2001). This term is used to describe the *pervading values* and often *implicit* agreements between the three entities and is shaped by the dominant cultural perspective and historically embedded urban water values, expressed through institutional arrangements and regulatory frameworks, and physically represented through water systems infrastructure. City transition states as shown in Figure 1 presents a typology of past and present hydro-social contracts in the Western societies as well as proposes a future hydro-social contract underpinned by sustainability principles (Brown et al., 2008).

<Figure 1. Evolving Urban Water Hydro-Social Contract>

Conference organisers: ICLEI – Local Governments for Sustainability

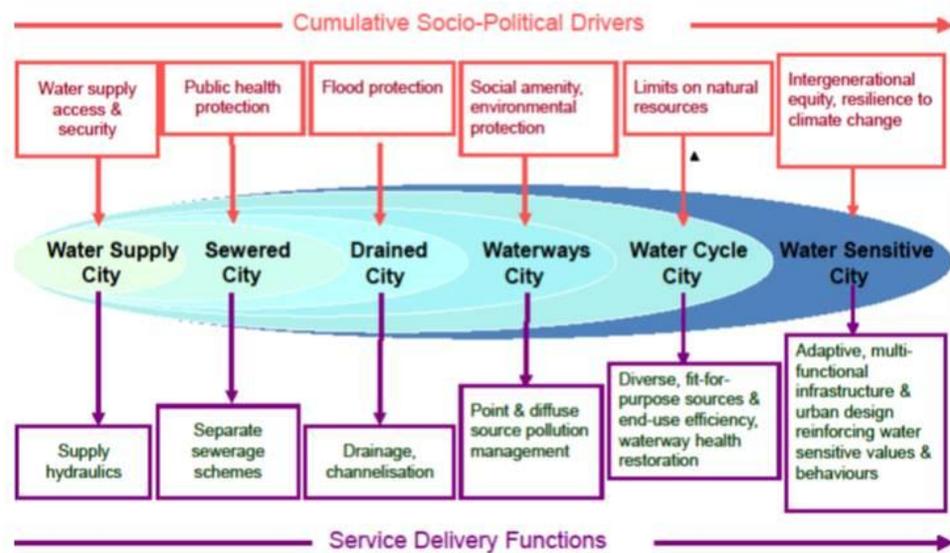
In cooperation with the City of Bonn and the World Mayors Council on Climate Change

ICLEI does not accept any kind of liability for the current accuracy, correctness, completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



Evolving Urban Water Hydro-Social Contract



Brown *et al* (2008), and Wong and Brown (2008)

[Figure 1. Evolving Urban Water Hydro-Social Contract]

For most Western societies, the first transition state was the *water supply city*, where the service delivery function was to supply water, and the social-political driver was to provide access to safe drinking water. This level of hydro-social contract evolved further to a *sewered city* that aimed to protect the public health by separating sewer lines from supply. The next evolved transition state was a *drained city* where efficient stormwater conveyance offered flood protection and facilitated urban expansion; followed by the *waterways city* that aimed to control point and non-point sources of pollution, reflecting a

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change

ICLEI does not accept any kind of liability for the current accuracy, correctness, completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



ety that recognizes the value of environmental protection and pollution prevention. At the *waterways city* transition state, the hydro-social contract began to integrate visual and recreational features for communities, and regulatory functions emerged to reduce pollutant input and environmental discharges.

As a city progresses through the varying transition states, it accommodates additional and, sometimes, competing objectives which can produce nonlinear progressions. When a city recognizes the current “limits” of water resources as well as the limits to waterways’ capacity to assimilate pollution, it is impelled towards reuse and end-use efficiency of water resources as well as identification of alternative water sources through decentralized and diffuse technologies. Additionally needed are the norms and government responses required to co-manage the water cycle between businesses and communities with diverse stakeholder involvement and the learning necessary to deliver flexible solutions. The move to the next transition state – a *water cycle city* – presents many challenges, but ultimately progresses towards sustainability. In the U.S., promoting sustainable practices, guided by EPA, involves working with a broad group of stakeholders to help bring about more sustainable practices on three levels: 1). sustainable water infrastructure, e.g., sustaining the collection and distribution systems, treatment plants and other infrastructure that collects, treats and delivers water-related services; 2). sustainable water sector systems, e.g., sustaining all aspects of the utilities and systems that provide water-related services; and 3). sustainable communities, i.e., promoting the role of water services in furthering the broader goals of the community.

Transforming cities to more sustainable urban water cities will require major socio-technical overhaul from conventional to transdisciplinary (“systems thinking”) approaches to ensure that water is given due prominence in the integration of urban planning with disciplines of engineering and environmental sciences associated with the provision of efficient energy and water services – including the protection of human health and aquatic environments. This *water sensitive city* approach – the final transition state – envisages sustainable water futures, and a hydro-social contract that is socially equitable and adaptive, integrating normative values of environmental repair and protection. Water-sensitive solutions can be achieved by adopting new features in urban planning via total water cycle and diversified water planning, integrated planning that embeds water efficiency, and multiple community benefit policies with greater community involvement

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
 ICLEI does not accept any kind of liability for the current accuracy, correctness,
 completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



ring socio-spatial equity in participation in urban water governance. Positive institutional and sector reforms, and improved water quality through more efficient and sensitive water uses and values have resulted from policies recognizing the importance of inter-agency/multi-stakeholder cooperation and coordination, enforcement, and management, from traditional single objective spending to investing in runoff reduction and storm water management strategies with multiple benefits. In the U.S., green infrastructure approaches to reduce imperviousness and preserve natural resources are designed in tandem within a context of several policies and programs to protect water resources and simultaneously add value to communities. Green infrastructure can be a cost-effective alternative or supplement to hard infrastructure development and refers to an array of technologies, approaches, and practices that protect and use natural systems (or systems engineered to mimic natural processes) to manage rain water as a resource. Under green infrastructure, rainwater can be conserved in dry-weather condition and, in wet-weather conditions, green infrastructure can help solve combined sewer overflows, enhance environmental quality, and achieve other economic and community benefits.

Box 1 <goes here>

The approaches in developing adaptive governance systems in supporting societal development and technical resiliency will be discussed in the following sections – juxtaposing the U.S. and Indian contexts from a formal to a less institutionalized society.

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
*ICLEI does not accept any kind of liability for the current accuracy, correctness,
completeness or quality of the information made available in this paper.*

<http://www.iclei.org/resilient-cities/>



Levers of Change towards a Water Sensitive City

The U.S. experience suggests that levers of change in the hands of governmental institutions can create an enabling framework that engages local communities and development industry in planning and decision making. First of all, a city needs a vision that is shared across the water and planning sectors. Government agencies and Civil Society Organizations could be champions to promote a liveable, sustainable cities program/message: for example, that sustainable cities will recognize that all water is good water, it has many values and “fit-for-purpose” uses. Or that “Cities are interconnected communities and each is a living metabolism that supplies nutrients and energy.”

Secondly, water authorities can work together *inter alia* with citizen/stakeholder groups and other sectoral groups towards an integrated program that weaves together multiple goals and engages with various local agencies. In the U.S. the Urban Waters Federal Partnership, led by EPA, includes 10 national agencies (e.g., Housing and Urban Development, Department of Transportation, Department of Interior, etc.) to restore and protect urban water bodies by engaging with communities in activities that foster increased connection, understanding and ownership of their waters and surrounding land.

Third, governments can align incentives with development planning, regulate and price stormwater management, recognize voluntary leadership as well as leverage large transportation projects for green infrastructure. For example, funding and federal assistance to community-led efforts has resulted in 20% State Revolving Fund Green Set Aside program and other economic incentives such as tax incentives in conservation programs.

Sound science is additionally important for quantifying costs and benefits and for accountability and verification of targets and goals. Tools such as demonstration/pilot projects, runoff models, properly scaled integrated GIS maps are needed for local settings.

Lastly, development of training, models, certification program, maintenance operations, and conferences for practitioners (i.e., engineers, planners, landscape architects, landscapers, builders, developers, etc.) are needed to instigate change. Education and Outreach to build capacity of the community, industry and government are needed to get buy-in from key stakeholders for them to make informed choices that test, prove, demonstrate, and deliver integrated water management.

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
 ICLEI does not accept any kind of liability for the current accuracy, correctness, completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



Water Access and Equity Issues in the Indian Context *(Peri)urban locations bearing the urban shadow*

In India, Gurgaon has grown over recent years as a major outsourcing, residential and recreational hub. This growth has been made possible by acquiring land and water resources from the periphery. (Peri)urban residents lose both land and water rights in order to provide water to the growing city (Narain, 2010). As cities grow and urban populations multiply, urban authorities typically respond by creating additional water supply infrastructure. The supply of water to cities involves the development and construction of water treatment plants that are usually built on land acquired from peripheral villages. When (peri)urban residents lose this land, they also lose access to water sources located on those lands – such as tubewells, that are an important source of water not only for irrigation but also for drinking and other domestic purposes. Similarly, when water needs to be transported from distant sources to meet the requirements of the city, it is through canals and channels that pass through the peripheral villages and for which lands are acquired from the peripheral areas. Once the lands go, the (peri)urban residents lose access to sources of water that may be located on those lands for their use. For example in Budheda, a cattle dependent village in (peri)urban Gurgaon, farmers lost 17 acres of land to the State to build canals to transfer water to a water treatment plant to provide water to the city. When the lands were acquired, farmers also lost access to their tubewells, which left them dependent on the wastewater flowing from the city as a source of irrigation water.

(Peri)urban residents often live under a regime of water insecurity in India. Many farmers in (peri)urban villages had installed tubewells along the Gurgaon Water Supply (GWS) channel to benefit from the rise in the water table level when the GWS was dug in the 1980s to bring water to the Basai Water Treatment Plant to supply water to the city. These tubewells subsequently had to be removed when work started on a new channel, running parallel to the GWS channel to augment the water supply to the city.

Adverse effects on local conditions

The construction of water treatment plants to supply water to the city in (peri)urban locations can have adverse impacts on local conditions. When the Basai water treatment

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
ICLEI does not accept any kind of liability for the current accuracy, correctness,
completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



It was constructed to supply water to Gurgaon city, it also had negative impacts on the residents of Basai (Narain and Nischal, 2007) even though it supplied domestic drinking water and irrigation water to some farmers. The location of the water treatment plant led to a rise in the local water level via water diversions and channelization, posing risks to buildings in the region. Broken pipes and leaks from the water treatment plant also have led to an increase in the mosquito population causing several vector borne diseases.

Water tenure: public or common property water resources

Furthermore, the acquisition of lands for urban expansion or industrial needs can reduce access to public or common property water sources located on those lands. Sultanpur village in (peri)urban Gurgaon is among the Panchayat land that was proposed to be acquired for the development of a Reliance SEZ (Special Economic Zone), where a water supply tank was installed, managed, and operated by the PHED (Public Health and Engineering Department) (Narain, 2007). Although this tank was the source of drinking water supply to much of the SEZ, the acquisition of this tract of land for development caused the loss of access to water for the (peri)urban villagers. Additionally, land was acquired for the construction of a highway as part of this project which also affected routes to access points of water sources for the (peri)urban villagers. Since the local groundwater is saline, the residents of Sultanpur obtain water from a hand-pump at a distance of about 1.5 km by crossing a railway track, posing a safety hazard. With the construction of the highway, they had to divert their route to the point of water collection and walk a longer distance.

Appropriation of rural water by urban elite

Urbanization process in India often brings the urban elite into the peripheries where cheap land can be acquired, and the urban elite can afford costly water extraction technologies, sometimes depriving the locals of access to this resource. For instance, in another village Sadhraana in (peri)urban Gurgaon, the local residents have been left chasing the water table as large farm-houses constructed by the urban elite have pre-empted the groundwater using submersible pump-sets that can dig much deeper than the pumps of local residents (Narain, 2010). This has placed water resources out of reach for small and marginal farmers. When the groundwater underlying their farm-houses is saline, the

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
 ICLEI does not accept any kind of liability for the current accuracy, correctness,
 completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



thy farm-house owners have bought small parcels of land overlying the fresh groundwater and transported groundwater through underground pipes to their farm-houses over distances of 2-3 kms. This falling of the water table has rendered the domestic hand-pumps used by the locals useless and has meant an increase in the distance walked by women to collect water for their household needs, affecting their quality of life adversely, and severely restricting their choice of sources for water collection.

Rural-urban water conflicts

Growing competition between rural and urban water needs presents risks for conflict. In March 2008, farmers living near Gurgaon breached the Gurgaon canal, the major supplier of drinking water to the city, forcing the residents of Gurgaon city to buy water from private sources (tankers) at prices as high as Rs.500-700 per 5,000 litres. About 400 water tankers had to be pressed into service to supply water to the people of Gurgaon, meeting just 30 percent of the total demand for water in the city. The water crisis in Gurgaon is seen as an outcome of the short-sightedness of the government in issuing licenses for commercial malls and residential development without cognizance of the water resources needed by the local communities, which has rendered them more vulnerable.

Discussion: Levers of Change

Equity Policies for Sustainable Urban Watersheds

Uncoordinated, uninformed, and duplicative agencies make Integrated Water Resources Management (IWRM) challenging as a means of responding to population growth, increased urbanization and non-point sources of pollution. Building strong communication and effective partnerships with the widest range of stakeholders, including national, state/provincial, and local/community partners, has never been more urgent to protect water and its multiple uses. Urban patterns of development often make waterways inaccessible to adjacent neighborhoods as well as (peri)urban surroundings, which limits the ability of the community to be the driver for local solutions. Local communities tend to place greater value on their resources when they have greater control over them. On this basis, water will be valued and utilized best when its users are informed and able to exercise appropriate levels of local choice.

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
ICLEI does not accept any kind of liability for the current accuracy, correctness, completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



n in highly industrialized cities in the U.S., urban residents have little true access to their waters. Creeks and streams are often turned into culverts to make way for roads and hide polluted waters, and valuable waterfront property often belongs mainly to industry. For example, the Mystic River, a Boston waterway, was once a popular swimming place of natural beauty with abundant fishing that was memorialized in the poem "Over the River and Through the Woods." Now the Mystic faces significant problems from years of industrial use, pollution and neglect, although recent efforts have partially restored a watershed that had suffered from bacteria, nutrient over-enrichment, and heavy metal pollution. With 21 distinct communities in the watershed, pooled restoration efforts included increased water-quality monitoring, stepped-up enforcement that put an end to the dumping of more than 10,000 gallons of sewage a day into the river, and expanded local community partnerships with state and federal agencies jointly addressing the long-neglected river and its tributaries.

Nationally, the U.S. environmental justice policy, which embodies issues of social equity, also promotes new scientific research in pursuit of a more holistic understanding of environmental health by integrating perspectives from community residents and leaders, community-based non-governmental organizations (NGOs), and community health and environmental quality advocates in the development of national scientific research agendas, as well as in data collection, conduct of risk and exposure assessments, and risk management decisions. This integrated transdisciplinary approach seeks to understand the complex interactions between social, natural, and built environmental systems inclusive of urban waters, conditions and policies that impact human health and well-being. Through sound science, equity or environmental justice can be explicitly addressed by facilitating understanding of how complex interactions result in unequal environmental health conditions or disproportionate impacts among (diverse) disadvantaged population groups, communities, neighborhoods and individuals.

Additionally, using innovative policies in the promotion and implementation of community support and empowerment programs can provide community benefits at all levels, from basic educational and leadership development to comprehensive approaches to achieving healthy, sustainable, and green communities. In the U.S., some of these efforts include financial assistance or grants under programs such as the Urban Waters Initiative, the

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
ICLEI does not accept any kind of liability for the current accuracy, correctness, completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



ronmental Justice Program, Community Action for a Renewed Environment (CARE), Brownfields Area-Wide Planning, and Indian Tribal grants. They also include other place-based programs such as those focused on Local Climate and Energy, Childhood Asthma, Sustainable Communities and Smart Growth, Urban Waters, Superfund, and the Brownfields programs, which are carried out in collaboration with other national agencies, states, local governments, and other stakeholders. Through the place-based community programs, the “community” is the organizing principal in developing community-based partners, including non-profits, businesses, schools and governments, that help create and implement consensus-based local solutions. Communities must have a key voice in choosing their own future and the pathways that they take to reach their goals. Citizens and developers will be able to pursue their individual choices, while ensuring sustainable outcomes, by bearing more fully the environmental and social cost of those choices (<http://www.sustainablecommunities.gov/>).

In India, the deprivation of (peri)urban residents’ access to water could be seen as the outcome of a situation in which rights to water are tied to rights in land. Thus, as lands are acquired for urban expansion – and this has been the usual mechanism for the expansion of cities – the owners of those lands de facto lose access to sources of water. The current debate in the Indian media on the subject has centered around financial compensation to land-owners for land acquisition, but in the absence of a property rights structure for water, the diminishing access of (peri)urban residents to water has received little attention (Narain, 2009a).

A recent World Bank study (World Bank, 2009) notes that trying to restrict rural-urban migration can be counterproductive because limiting density and diversity stifles innovation and productivity; rural-urban transformations are best facilitated when policy makers recognise the economic interdependence among settlements. The debate should instead be about the efficiency and inclusiveness of the processes that transform a rural economy into an urban one.

While a separation of rights in water from rights to land seems imperative in India, it remains difficult to operationalize (Narain, 2009a). Besides, in a setting where contiguous tracts of land are acquired for such activities as the development of special economic zones, a separation of rights would have little significance unless (peri)urban residents are

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
ICLEI does not accept any kind of liability for the current accuracy, correctness, completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



compensated for the water to which they lose access. Needless to say, assigning a value of compensation for the access to water (groundwater beneath private agricultural lands or village ponds that are located on lands that are acquired for other purposes) is a tricky and complicated task.

There can be no denying the fact that improving (peri)urban water access will require much mobilization at the grass-roots level in India. Improving synergies between local governments, NGOs, local civil society and the private sector can play an important role in supporting the positive aspects of rural-urban interactions while reducing their negative impacts (Tacoli, 2002). The balance of evidence on the (peri)urban interface worldwide points to the potential of local level approaches. In (peri)urban areas that are in transition from rural to urban and have inadequate institutional cover in less institutionalized societies, and are difficult to bring directly within the purview of rural and urban jurisdictions, civil society organisations are understood to have enormous potential to improve local environmental conditions, and to resolve political conflicts in governance and to scale up environmental management activities (Dahiya, 2003). There are several cases of local level action in addressing the (peri)urban challenges in the region that offer important lessons for scaling up and replication. Where such approaches exist, it is essential to support them and allow them to be replicated in their surrounding areas.

In general, policymakers and planners need to take equity considerations into account in order to fulfill the hydro-social contract. For example, they need to appreciate the 'rural' and 'urban' connection, not only in terms of flows of goods and services that support rural and urban livelihoods, but also flows of natural resources such as water. The dichotomy between 'rural' and 'urban' water supply as used in conventional planning and reporting of progress can be avoided, and the flows of water between rural and urban areas need to be better understood, documented, and treated as a total catchment. This should be used as a basis for planning the development of water looking at its various uses across rural and urban spaces and then developing mechanisms to balance and evaluate trade-offs between competing uses. The roll out of various innovative partnership initiatives in implementing IWRM and ensuring equity in the U.S. all are implemented in conjunction with a strong community engagement program to promote active participation in the use and management of urban waterways. Sustainable cities will recognize that all water is good water based on the concept of 'fit-for-purpose' use where policies define property

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
ICLEI does not accept any kind of liability for the current accuracy, correctness, completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



ts for traditional and non-traditional sources of water and remove barriers to the use of alternative water supplies, ensure that urban planning integrates the objectives of multiple sectors and stakeholders/communities, incorporate information from all components of the water cycle and share information across organizational boundaries.

As reflected by the experience discussed above in the U.S., movement through the transition phases has left exposed as a primary under-addressed concern the issue of equity in water resource management and service delivery. The experience in India to-date, which occurs in a less institutionalized setting, likewise points to equity as a primary animating concern. The lesson from this comparative discussion is then two-fold. For countries who are developing their water institutional frameworks, it is imperative to recognize the equity challenge upfront and to construct institutional approaches that help ensure equity. For developed countries, the imperative is to recognize achieving equity as an often unfinished piece of business and to redouble efforts to this end. For development to be truly sustainable, it must be development that is sustainable for all and operates in service of environmental health and quality for all.

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
*ICLEI does not accept any kind of liability for the current accuracy, correctness,
completeness or quality of the information made available in this paper.*

<http://www.iclei.org/resilient-cities/>



References

- Allen, A. 2003. 'Environmental planning and management of the periurban interface'. *Environment & Urbanization*, 15(1): 135-147.
- Brown, R., Keath, N., and Wong, T. 2008. Transitioning to water sensitive cities: historical, current and future transition states. 11th International Conference on Urban Drainage, Edinburgh, Scotland, UK.
- Lundqvist, J., Turton, A., and Narain, S. 2001. Social, institutional and regulatory issues. In C. Maksimovic and J.A. Tejada-Guilbert (Eds.), *Frontiers in Urban Water Management: Deadlock or Hope*, Cornwall, IWA Publishing: 344-398.
- McGee, T.G. 1991. 'The emergence of 'Desakota' regions in Asia: expanding a hypothesis' in N Ginsburg, B Koppel and T G McGee eds. *The extended metropolis: settlement transition in Asia*, University of Hawaii Press. HonoLulu, pp. 3-25.
- Narain, V. 2007. A tale of two villages: transition and conflict in periurban Gurgaon. MDI working Paper Series No.002. Gurgaon: Management Development Institute.
- Narain, V and Nischal, S. 2007. 'The periurban interface in Shahpur Khurd and Karnera., India', *Environment and Urbanization*, 19(1): 261-273.
- Narain, V. 2009 b. 'Growing city, shrinking hinterland: Land Acquisition, transition and conflict in periruban Gurgaon, India,' *Environment and Urbanization*, 27 (2), 501-512.
- Narain, V. 2009a. Gone land, gone water: crossing fluid boundaries in periurban Gurgaon and Faridabad, India. *South Asian Water Studies*. 1(2): 143-158
- Narain, V. 2010. 'Flowing across the frontiers. The land and water nexus in the periurban interface'. MDI Working Paper Series N0.007. 40 pp. Gurgaon: Management Development Institute.
- Tacoli, C. 2006. 'Editor's introduction' in C. Tacoli ed. *The earthscan reader in rural-urban linkages*, London: Earthscan. International Institute for Environment and Development.

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
ICLEI does not accept any kind of liability for the current accuracy, correctness, completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



The author(s):

Please fill in the following categories. For more than 2 authors, please copy the boxes.

<p>Dr. Sasha Koo-Oshima Senior International Water Advisor Office of Water U.S. Environmental Protection Agency Email: koo-oshiba.sasha@epa.gov www.epa.gov</p>	<p>Dr. Vishal Narain Associate Professor School of Public Policy and Governance Management Development Institute Email: vishalnarain@mdi.ac.in www.mdi.ac.in</p>
---	--

*Please note that the **email** provided above will be published unless specified otherwise. In addition, if you change your affiliation after you submitted your manuscript please notify resilient.cities@iclei.org.*

Bio:

Sasha Koo-Oshima is currently the Senior International Water Advisor in the Office of Water, U.S. Environmental Protection Agency, and has a rich background of 25 years of national and international experience, most of which has focused on integrated water resources management. As an advisor to the Minister for Water, she leads the agency’s international water engagement. A former graduate of Yale University School of Medicine and Goucher College/Johns Hopkins University, she was previously at the UN Food and Agriculture Organization (FAO) Division of Land and Water, where she served as FAO’s water resource expert and lead on water quality and the environment. She implemented and supervised a substantial set of country and river basin projects and has published extensively on international water issues. She has served on various international technical advisory panels for the GEF and, on wetlands for the Ramsar Convention, in support of research and policy-making for planning and management.

Conference organisers: ICLEI – Local Governments for Sustainability

In cooperation with the City of Bonn and the World Mayors Council on Climate Change
ICLEI does not accept any kind of liability for the current accuracy, correctness, completeness or quality of the information made available in this paper.

<http://www.iclei.org/resilient-cities/>



Attachments:

Figure 1. Evolving Urban Water Hydro-Social Contract

Box 1. Levers of Change towards a Water Sensitive City