Policy Brief

Wastewater use and peri-urban water security conflicts and cooperation

The peri-urban interface refers to specific context where rural and urban features co-exist, in physical, environmental, social, economic and institutional terms. Typical characteristics of the peri-urban interface include rapid land use change, a growing population, degrading rural opportunities, and a lack of urban facilities. The interface involves complex rural-urban interactions, including flows of people, goods, income, capital, natural resources and wastes, and the claiming of peri-urban resources, compromising livelihood security of peri-urban communities. Climate change further aggravates these conditions.

This policy brief is based on field research in Kathmandu Valley in Nepal under the CoCoON–CCMCC project on peri-urban water security. This project investigates how urbanization and climate change shape peri-urban water insecurity and the possibilities for conflict and cooperation around water in four cities of South Asia: Khulna (Bangladesh), Gurgaon and Hyderabad (India) and Kathmandu (Nepal). Kathmandu Valley is among the fastest-growing urban agglomerations in South Asia, with population increasing from 1.6 million in 2001 to over 2.5 million in 2011, thus also radically changing land and water uses in peri-urban areas. Temperature in the valley showed a mean warming rate of 0.033°C/year and rainfall shows a slightly decreasing trend of -5.9 mm/year between 1971-2011 (UN-Habitat, 2015).

Urbanization influencing rural – urban water flow

The research in Kathmandu Valley focused on the Hanumante River Basin, a sub-basin of the Bagmati River Basin. Hanumante River used to be almost dry between March to May (Chaitra and Baisakh). However, it came to be a kind of perennial river, but with untreated wastewater drained directly from households and industries that started in the 1980s. Pollution of Hanumante River started with the failure of the sewerage plants for Bhaktapur Municipality, built with the technical support from the German Technical Cooperation (GTZ) Agency¹ in 1977 and 1983. Later, untreated effluents from land development and housing, as well as the many garments, dye, and wool industries in Bhaktapur Municipality started discharging into the River. Currently, the river acts as an open drainage system. Yet for many farmers along the Hanumante River, it is the only source of irrigation. In Dadhikot, Hanumante River has been the main source of irrigation with declining access to the traditional kulo (canal) fed by Ghatte Khola, a tributary of Hanumante River.

Context: Changing land and water uses and increasing wastewater irrigation

¹ Bhaktapur Development Project (BDP) in between 1974 to 1986 promoted urbanization and industrial development in Bhaktapur town. Among others, the project constructed a sewerage line in the alignment of Rajkulo (Royal canal) that previously served potable water for the town.
Traditionally, farmers in Dadhikot, along Hanumante River irrigated through Ghatte Kulo (canal) originated from Ghatte Khol (stream). They cultivate paddy in monsoon for self-consumption. Cultivating green leafy vegetables, especially for urban supply, is the main source of the livelihood. Over the years, water flow in Ghatte Khol feeding the kulo has decreased. Irrigation from Ghatte Kulo can only succeed during the monsoon and for around a month in the post-monsoon period. The rest of the year, farmers use wastewater from the Hanumante River, using electric, diesel/petrol pumps and pipe networks. Many farmers only use water from Hanumante for irrigation, as canal water does not reach their fields or traditional drainage systems have vanished due to canal encroachment by buildings.

During the driest months (March to May), the river has high concentrations of chemicals and domestic wastes. Farmers try to avoid using this contaminated water but total avoidance is not possible due to lack of alternative water sources. Some farmers have constructed dug wells. These wells are, however, insufficient for irrigation and are used for washing farm products only before taking them to the market.

The population of Dadhikot increased annually over 6% between 2001 and 2011. The growing number of houses in irrigated fields either use water from the Ghatte Khol, kulo or dug wells constructed in their lands. Farmers argue that these actions resulted in a reduction of water flow in the khol, and ultimately in the kulo. Additionally, renting land for brick making and for commercial farming by immigrants, both using the same water source, have increased in Dadhikot. While impacts of reducing flow in the kulo pervade all farming communities, the consequences are most severely experienced by downstream farmers coping with increasing investments for wastewater in exchange for lost freshwater. Climate change, which farmers perceived in forms of delayed and declining rainfall, is further aggravating the situation. As a result, wastewater irrigation is a common, although formally unrecognized, practice.

Cooperation for irrigation

Every year a group of farmers collectively cleans and maintains the kulo and constructs a temporary dam in Ghatte Khol for using freshwater. They are ancestral farmers, either landowners or farmers that have rented the sold land from the new landowners. They collect cash from the farmers who do not participate in cleaning the canal, yet irrigate from it. They usually irrigate on first come first turn basis, but are flexible as per needs. The number of farmers participating in this kulo irrigation is decreasing (with the decreasing availability of the canal water), compelling them to use the only alternative water source: Hanumante River. Over the years, water lifting pumps and pipe networks have become crucial needs for the farmers. Farmers, who lack this equipment, borrow it from fellow farmers (Sathibhai) paying on an hourly basis, a form of paid
cooperation between farmers. Furthermore, farmers whose lands are located near the Hanumante River, allow others to temporarily lay pipes and share pumps for irrigating distant fields. Such sharing of pipes and pumps has been possible through a cooperation ensuring that the turns do not overlap on the same day/time. This is particularly important during the summer, as farmers need to irrigate in the morning or late evening to avoid the damage and economic loss from untreated wastewater. Irrigation from Hanumante, although a costly alternative, has played an important role in continuing the livelihoods of these peri-urban farmers and preventing conflicts over the limited quantity of freshwater that is available.

**Dynamics of land and water use and the conflicts**

Many of the fields earlier irrigated by Ghatte Kulo are converted to built-up areas or residential plots by private land developers. In these processes drainage pipes have been laid along the canal. Clogging of these drainage pipes and disposal of household wastes into the canal are the major causes of conflicts between farmers and in-migrants. Leakage of water from the canal into the sewer system, laid by in-migrants, is another factor leading to conflicts.

Additionally, not all farmers contribute to maintaining the canal. Yet they seek chances to irrigate from the canal. These are mostly the upstream farmers with a location advantage. Most of these farmers rent lands from the local inhabitants and use canal water based on the irrigation rights of the landowners. This diversion reduces the share of already scarce canal water to the downstream farmers, who have continued maintaining the canal. Stealing of water is a major cause of arguments between the upstream and downstream farmers. Further, there is competition for irrigation turns of scarce canal water among the downstream farmers. In addition, farmers need to compete with increasing in-migrants as they lift water from the Ghatte Khola or from private dug wells constructed close to the existing canal alignment. Some farmers irrigate during nights to avoid conflict. However, this practice has largely decreased, as the stream flow has noticeably decreased. In such contexts, the only option for these farmers is to irrigate the wastewater from Hanumante River.

**Cooperation and community resilience**

Although arguments are common in peri-urban contexts with heterogeneous land and water uses and users, most of them do not erupt into conflicts, but are rather managed through local norms. Cooperation and community resilience are sustained through informal groups engaged in maintaining the canal, either through labor and/or cash contributions. Cooperation among the farmers has helped them in dealing with the changing land and water uses to some extent, but divisions have also emerged between them with declining availability of canal water and participation in canal management. Although some new farmers have emerged in the downstream area, many ancestral farmers are losing their right to irrigation water and hence their livelihood. Wastewater has emerged as an important source for irrigation, which for many is possible by organizing the technical means from fellow-farmers. However, it also causes damage to crops, lands and health (which is not the primary focus of this policy brief). Critical analyses of the dynamics of changing land and water uses, their impacts on historical and existing practices of water (and land) access and rights and related conflicts and cooperation in the policy and planning processes can be helpful in improving the resilience of peri-urban communities in the context of increasing urbanization and changing climate.

**Policy context**
Current policies aiming to address the changing land and water uses (National Urban Policy 2007 and draft strategy 2015, National Land Use Policy 2012/2015, Irrigation Policy 2013) lack critical attention to the complex socio-environmental dynamics in the peri-urban interfaces and the interrelated conflicts and cooperation emerging around coping mechanisms such as wastewater irrigation. As long as the core policies dealing with land and water issues remain disconnected from the realities of peri-urbanization, policy aims of conserving agricultural lands, community-based adaptation and improving community resilience may remain rhetoric rather than translating into realities, despite formulation and revisions of policy documents.

Ways forward

Rapidly expanding cities impact peri-urban water quality and quantity, as is shown by evidence from Kathmandu Valley. The current development initiatives are likely to increase impacts on peri-urban land and water resources, as urban-peri-urban-rural boundaries continue shifting with (peri-)urbanization. Urban planning initiatives should critically consider these inter-related issues in co-ordination with related formal and informal groups using and governing peri-urban resources. Based on our study, some interventions that seem paramount in the context of rapid peri-urbanization and changing climate include:

- As water scarcity grows, investment in wastewater treatment and irrigation systems will become more viable. Further, installation of wastewater treatment plants and solid waste management is important for reducing the contamination of water sources. In conventional wastewater systems, design and management are basically top-down; they focus on improving water quality but lack considerations of existing users and uses. The reverse water chain approach (decentralized approach), where end users (farmers in peri-urban interfaces) can express their preferences for use could be a good option. It can be helpful for peri-urban farmers to arrange alternative irrigation sources, as competition for traditional water sources increases under the dual stresses from rapid urbanization and changing climate. In such context, the government should establish clear regulatory frameworks, and monitor based on standard water quality guidelines for planning wastewater irrigation.
- Mechanisms for collecting fees or tax from different polluters (i.e. ‘polluter pays’ principle) and end-users for (of) wastewater use, in user-centric wastewater management, could help to arrange needed investments for wastewater treatment practices. Mechanisms such as block tariff (tariff based on volume of wastewater produced, i.e. tariff for households, institutions, industries etc for sustainability of wastewater management) need to be developed.
- Sound institutions for conserving agricultural land and better monitoring of changing land and water uses can help to conserve traditional (existing) infrastructures, thus maintaining and protecting an environment conducive for farming.
- Organizing awareness programmes on the significance of peri-urban agriculture and their association to health and food security can help to sensitize wider groups. Such programmes at community-level could promote interaction between farming and non-farming social groups to stimulate a better understanding of mutual needs. These can foster better coordination in local development initiatives and prevent negative implications of increasing conflicts in the context of changing peri-urban land and water uses.

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Acknowledgement

We would like to thank the Netherlands Organization for Scientific Research (NWO) for supporting this study. We would also like to thanks Lenneke Knoop (MetaMeta) and Dr. Dik Roth (WUR) for valuable comments and feedback in preparing this policy brief.