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## Degraded Peri-urban Biophysical Environments in South Asia

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Urbanization leads to the deterioration of peri-urban biophysical environments. Urban sprawl encroaches and degrades peri-urban ecosystems, and alters the natural equilibrium. This in turn, depletes the resource base of peri-urban areas. Urban development policies, plans, and programs treat the peri-urban as an opportunity for urban expansion, and rarely factor issues of environmental sustainability. Thus, peri-urban areas are often selected as suitable places for discharge of urban

wastewater and disposal of solid wastes. As a consequence, and because of the haphazard construction of urban infrastructure, the drainage systems of peri-urban areas are severely compromised. This research brief is based on comparative field research in four South Asian peri-urban areas with different biophysical settings. We underscore the adverse consequences of urbanization and climate change and offer policy recommendations.

## degraded peri-urban environments: key issues

In South Asia, urbanization and climate change are two critical stressors that adversely impact the biophysical environment of peri-urban areas. Degradation of peri-urban environments has not received adequate attention in South Asia. Development plans and policies generally focus on either rural or urban areas. Across the region, encroachment of natural water bodies (such as ponds, lakes, canals and rivers) and the disappearance of traditional water systems (such as stone spouts, wells, and local water tanks) is evident. Depletion of water bodies affects wetland ecosystems and reduces retention capacities that prevent rainfall flooding. As a consequence, peri-urban drainage and flood management systems are impaired. Our comparative field research was conducted in peri-urban areas in four cities - Khulna (Bangladesh), Kathmandu (Nepal), Gurgaon and Hyderabad (north-west and south India).

Our findings indicate that rapid urbanization and climate change have short and long-term implications for biophysical and socio-economic environments. Urban wastewater discharge and solid waste disposal is polluting surface water bodies in peri-urban areas. Wastewater reuse for agriculture, a common practice in peri-urban areas, often ignores potential health hazards and other adverse impacts of polluted water. Groundwater is often contaminated with salinity, iron, fluoride, and hardness. Our research also points to the declining groundwater reserves due to over-exploitation for domestic, industrial, commercial, and agricultural purposes. Groundwater recharge rates are reduced because of low rainfall and interventions in the recharge process such as sand mining. In the coming years, urbanization and climate change impacts are likely to alter the urban and peri-urban micro-climates, and worsen urban heat island effects.

## key research findings

Khulna is one of the most vulnerable coastal areas of Bangladesh prone to climate change and urbanization. Unplanned urbanization and wastewater discharge has caused severe environmental degradation in the peri-urban areas of Khulna. Land use and land-cover changes, water pollution, rainfall and consequent flooding has posed serious threats to the biophysical environment. Salinity intrusion is also an important concern. Improper management of solid waste and wastewater has increased pollution load in rivers and natural canals. These have degraded surface water bodies and groundwater aquifers. Over-extraction of groundwater resources has declined water levels and increased salinity

intrusion in deep aquifers. Changes in the climate such as escalation in temperature and humidity, and shifts in the monsoon rainfall, are likely to increase human stress and vulnerability, and reduce agricultural production.

Indiscriminate dumping of solid waste and discharge of urban wastewater in the Mayur River has degraded the water quality of the river, shared by residents of urban and peri-urban areas. Moreover, a gate at the river outfall, controlling the natural tidal flow degrades the water quality and ecosystem functions.



Khulna, Bangladesh

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In Kathmandu, degradation of traditional water infrastructures due to the combined effects of urbanization and climate change has adversely affected peri-urban areas. Like other South Asian countries, in Nepal, the urban mode of life is expanding into peri-urban areas. Consequences include river pollution from the increasing disposal of solid and liquid wastes, encroachment of water bodies, and upstream water extraction. Sand mining from small hillocks creates severe environmental degradation, and leads to the depletion of groundwater, road damage, and soil infertility. Construction of brick industries in peri-urban areas has polluted the surrounding environment and caused adverse health effects. In addition, the fertile top soil is increasingly depleted.



Kathmandu, Nepal

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In Jhaukhel, terrace sand mining in hillocks, is changing the landscape and affecting groundwater and environment.



Hyderabad, India

In Hyderabad, the pollution of urban lakes and groundwater depletion account for the two major sources of water insecurity in peri-urban locations. Unplanned urbanization and improper waste management has led to large-scale pollution and encroachment of existing lakes in Hyderabad. Besides, the groundwater has declined due to over-extraction by city-based water tanker operations. The extraction rates are much higher than the recharge rates, causing aquifer depletion. In addition, the consequences of reduced rainfall due to climate change are obvious in dry lake beds and in lowering groundwater levels. Rapid deforestation for urban constructions has adversely affected the peri-urban ecosystem balance by increasing soil erosion and peak surface runoff. These have led to an offset in the peri-urban microclimate, increasing sedimentation on lake beds, and damaging natural drainage routes. Our research also indicates a substantial reduction in the retention capacity of the water bodies.

Drainage channels flowing into the Raviryala Lake have been obstructed due to urban infrastructure development. Consequently, the lake no longer receives natural water flows. Traditional water control structures in Hyderabad's peri-urban areas have become obsolete.

In Gurgaon, the prevailing land development activities for urban expansion, significantly alter the land cover and land use pattern of peri-urban areas. Newer water demands from residential areas, golf courses, farm-houses and reduced recharge because of increased built-up areas are severely limiting water access and availability for the peri-urban poor communities. Local hydrological conditions affect water availability in *johads* (village ponds), which have traditionally been important sources of water for domestic and livestock needs, fed by the groundwater sources. In practice, while Government water treatment plants, draw surface water, city-based private tankers, residential tube wells and farm houses over-extract the groundwater resources to meet their demands. Significant lowering of groundwater levels and reduced water availability in the *johads* is worsened by low rainfall, as evident in climatic data trends and people's narratives of a changing climate. In many locations, peri-urban farmers use wastewater for agriculture, ignoring long-term health hazards. Reduced rainfall coupled with urban transformations has significantly affected water security and crop production. As a consequence, peri-urban communities are becoming more vulnerable.



Gurgaon, India

Groundwater level decline in Sultanpur caused by reduced rainfall and groundwater recharge has resulted in lower water level in the traditional storage ponds.

## summary

- ▶ Peri-urban water bodies are being depleted and polluted by unplanned urban development and waste discharge.
- ▶ Intervention in groundwater recharge areas and over-exploitation of groundwater for urban water supply has adversely impacted water availability in peri-urban areas.
- ▶ Deforestation as a consequence of urban development offsets the ecosystem balance and affects peri-urban micro-climatic patterns.
- ▶ Changes in trends and patterns of climatic variables such as temperature, rainfall, and humidity are likely to increase water stress and vulnerability in peri-urban areas.
- ▶ Waste water irrigation practiced by peri-urban farmers often creates water pollution and increases potential health hazards.

## way forward

- ▶ Urban development plans must factor peri-urban areas as critical sites upon which urban areas depend.
- ▶ Urban planners should consider peri-urban communities as stakeholders in project implementation, monitoring and evaluation.
- ▶ Sectoral development strategies need to factor climate smart development approaches.
- ▶ Sound institutional frameworks and partnerships between planners and communities are required to sustain peri-urban growth and development.
- ▶ Urban planners must engage with environmentalists, water policy specialists, and peri-urban communities while undertaking any developmental activities in this fragile zone.

This Policy Brief can be downloaded from [www.saciwaters.org/periurban/researchbrief.html](http://www.saciwaters.org/periurban/researchbrief.html)

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