Preservation of low-lying flood zones for agricultural production (Antananarivo, Madagascar).
Photo: M. Dubbeling

POLICY BRIEF
Urban agriculture as a climate change strategy

Key policy messages

- Climate change impacts on cities are increasing. Cities must embrace the triple challenges of reducing the vulnerability of their population to climate change; of mitigating their GHG emissions and of providing sufficient and nutritious food for their residents.
- There is growing recognition of urban and peri-urban agriculture and forestry as an important strategy for climate-change adaptation and disaster-risk reduction, while also bringing mitigation and important developmental benefits.
- Investments in agriculture and green infrastructure have proven to be more cost-effective than other conventional approaches for climate change adaptation.
- Several cities already promote urban agriculture in floodplains, develop rooftop gardens in dense urban settlements, include urban forestry in new housing schemes and preserve peri-urban greenbelts for local food production.
- In order to build more sustainable and resilient cities, local and national governments need to better link food systems to urban planning agendas and integrate urban agriculture in their climate change strategies.
- Policy participation of all actors in the food chain, from producers to consumers, needs to be enhanced to ensure more relevant, accountable equitable and sustainable strategies.

Towards better integration of urban agriculture in climate change strategies

Urbanisation and climate change are closely linked. CO2 and other greenhouse gasses (GHG) are mainly emitted in urban areas.

Cities, and their sheer number of inhabitants, are at the same time also directly and indirectly affected by climate change. Key issues include rising temperatures, increasing rainfall, flooding and urban food insecurity. Rapid urban growth will only increase the number of highly vulnerable urban communities.

Cities have an important role to play in climate change mitigation and adaptation, while at the same time they need to ensure adequate access to basic urban services such as water, food and energy to their growing populations.

Negative climate change impacts on food production and productive arable lands will impact cities with heavy reliance on food imports. The urban poor will be most affected by disruptions in food supply and increasing food prices.

Different forms of urban and peri-urban agriculture and forestry are being adopted by cities such as Bobo-Dioulasso (Burkina Faso), Rosario (Argentina), Kesbewa (Sri Lanka), Kathmandu (Nepal), Dumangas (Philippines) and New York (USA) to respond to these challenges.

This brief will provide concrete examples and related policy support measures to serve as a source of inspiration.

RUAF Foundation
Resource centres on urban agriculture & food security

Greening cities to reduce urban temperature

Many cities are already experiencing the effects of high urban temperatures due to the increase in built-up surfaces and reduced vegetation. Urban gardens, agricultural lands, street trees, parks, forests and green roofs contribute to decreasing direct solar radiation by providing shade, and can help lower temperatures through evaporative cooling.

Land surface temperatures in Bobo-Dioulasso (Burkina Faso) increased approximately 6% a year in the period 1991-2013, due to increased urbanisation.

The city now promotes agroforestry activities in open urban lots (greenways), while also protecting their peri-urban forests to help reduce urban temperatures. The greenways are planted with different fruit bearing tree species. Space is also provided for urban gardening and recreation. Involved households have increased consumption of fresh vegetables and reduced their food expenditures.

New policy texts have been adopted in Bobo Dioulasso to create a municipal committee in charge of future management of the greenways and that will formally include agroforestry and gardening as an urban land use.

A study implemented in the city of Rosario (Argentina) in 2013-2014 also showed that in areas with street trees and urban (garden) parks temperatures were 8-10 °C lower on average throughout the year. Rosario is now not only promoting urban forestry, but also the inclusion of urban agriculture gardens in new housing settlements. It is expected that next to social benefits, such urban greening will also help reduce energy demand for cooling.

Rooftop gardens to improve micro-climates, increase food production and waste recycling

In dense urban centres and settlements where space is limited, cities can promote rooftop gardens to increase thermal comfort in apartments located under the rooftop. Agricultural rooftops furthermore provide for household food production and possible income for sales.

A scenario developed for Vancouver (Canada) illustrates that if half of Vancouver's usable rooftop space were used for urban agriculture, it could generate around 4% of the food requirements of 10,000 people. When combining this with hydroponic greenhouses, this figure could be increased to 60%.

Kathmandu Metropolitan City-KMC (Nepal) has been promoting rooftop gardens in the city since 2012. Farming households become less dependent on buying food on the market, which see prices increase as results of civil unrest or climate change impacting on rural production. By promoting household waste recycling, urban waste volumes that otherwise would end up in the landfill are reduced.

In 2013-14, KMC has trained over 500 households in rooftop farming, built demonstration rooftop gardens, and allocated USD 30,000 for their rooftop garden programme in 2014-2015. It has also formulated a rooftop garden policy and is supporting its integration in urban building codes. In 2014, KMC signed an agreement with the Ministry of Federal Affairs and Local Development to ensure that by the end of 2016 at least 20% of all households in the city produce vegetables from their rooftop.

Promoting agricultural rooftop gardens in Kathmandu Metropolitan City (Nepal). Photo: ENPHO/KMC

"With the shrinking farmland resources, increasing urbanisation and spiraling inflation, it has become inevitable to adopt new types of measures by utilising whatever space we can find." -Rabin Man Shrestha, Environment Division Chief of KMC (2013).

Productive use of flood zones to mitigate flood risks

Increases in built-up surfaces associated with urbanisation also reduce water infiltration and increase storm water runoff during rainstorms. With increasingly intense rainfall, flooding is common in cities that lack adequate drainage systems. Urban and peri-urban agriculture can reduce the impacts of higher rainfall by keeping low lying zones free from construction so that floods have less impact, runoff is reduced, and excess water is stored and infiltrated.

A vulnerability assessment implemented in 2012 in Kesbewa (Western Province, Sri Lanka) warns that floods, sea-level rise and rising temperatures will increasingly impact on the agricultural, urban and housing sectors. Food production in the province is not sufficient, and importing food from other areas of the country is threatened by negative climate impacts. At the same time, cultivable land, often located in low-lying areas, is being abandoned or converted for residential and commercial uses. Flood-related disasters –and their related social and economic damages- have increasingly occurred over the past years.

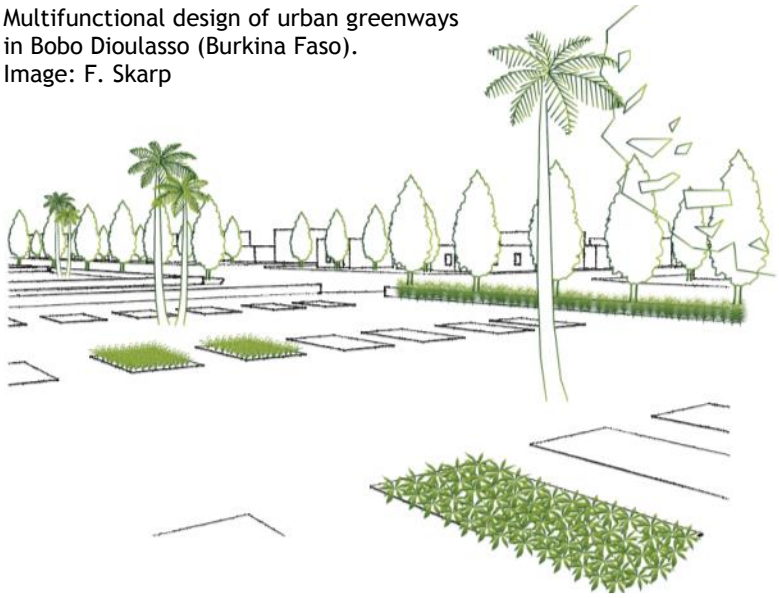
Kesbewa urban council and the province decided to promote new forms of agriculture in former urban rice fields to help reduce flood risks and promote local food production. Likewise, the city of Freetown (Sierra Leone) has zoned all its wetlands and low-lying valleys for urban agriculture.

Similarly, the city of Rosario promotes the preservation and protection of green and productive areas on stream banks to reduce flood risks. Such productive use of flood zones reduces the need for expanding costly drainage infrastructure.

Since 2011, the New York City Department of Environmental Protection (USA) has already provided funding to various urban agriculture projects through its Green Infrastructure Grant Program. The Department committed to investing USD 192 million in green infrastructure by 2015. This includes investing in “blue and agricultural roofs” that hold rainwater and release it to the sewage system slowly; promoting extra-large street tree planters and “green streets”, and turning vacant paved lots and asphalt into gardens. In developing its strategy, the city evaluated the costs and benefits of grey and green infrastructure and found that investing in a green scenario that includes some grey infrastructure was significantly more cost-effective than a conventional approach. The green scenario would save the city and property owners who pay water and sewer fees, USD 1.5 billion in costs over a 20-year period. Beyond initial saving, there are also maintenance fees, which would be considerably higher for grey infrastructure over the years.

“If research plausibly demonstrates attribution between urban and peri-urban agriculture (UPA), climate change mitigation and reduced climate vulnerability, then this would raise the profile of UPA as a mitigation and adaptation instrument and increase political and financial support as well as demand for UPA. Data can then be effectively used to develop climate change action plans, considering UPA next to other interventions, as well as to integrate UPA in urban planning as an appropriate use for physical vulnerable sites and viable response to climate change effects such as excess storm water.”
- S.T. Kodikara, Former Secretary, Ministry of Agriculture and Environment, Western Province, Sri Lanka (2013)

Recurrent flooding in Rosario (Argentina) results in large economic and social damages. Photo: E. Zimmermann



Multifunctional design of urban greenways in Bobo Dioulasso (Burkina Faso). Image: F. Skarp

Protection of (peri)urban agricultural zones for enhanced local food production

In order to reduce its GHG emissions and energy use related to food imports and to enhance city resilience by diversifying its food sources, the city of Rosario decided to protect and expand its peri-urban green belt for horticultural production.

As in many other expanding cities, the traditional agricultural peri-urban area in Rosario is under threat by urbanisation and conversion of agricultural land to soybean production for export. In the past, horticulture production from the greenbelt used to supply most of the fruits and vegetables to the city.

An urban food systems scenario study (2014) illustrated that 95% of the city's CO_2 emissions related to food transports and cooling could be reduced by producing the six main vegetables consumed by the population in the urban and peri-urban area. The total production area needed of 6150 ha. would be available, if protected by land use plans.

A similar scenario study done in Almere (The Netherlands) found that 20% of total food demand (in terms of potatoes, vegetables, fruits, milk and eggs) -projected for a future population of 350,000 inhabitants could be produced locally in a radius of 20 km around the city.

Increased local food production led to reduction in food transports to Almere. When at the same time more renewable energy sources are used for production and conventional production is replaced by organic production, total energy savings would add up to the equivalent of the energy use of 11,000 Dutch households. Savings in GHG emissions would equal the emission of 2,000 Dutch households.

The Rosario municipality has already included new areas for peri-urban agriculture in their city development plan.

The city and the province also provide technical and financial support to peri-urban farmers converting to ecological production. Farmers receive regular technical training and support visits. They also received a low-interest credit.

In addition, mew marketing channels for ecological produce had to be sought to ensure producers sufficient income and future perspectives. The city and the province therefore signed an agreement with the Hotel and Restaurant Association to guarantee marketing support and buyer agreements. This will not only allow for an increase in producer income, it also increases the populations' access to healthy foods.

"We see the importance of preserving and expanding areas for local food production. The municipality has included a new land use category in our urban development plan being 'land used for primary production'. We have currently doubled the peri-urban agricultural protection zone from 400-800 ha"- Mónica Fein, Mayor, Rosario (August 2014)

Preservation of the peri-urban greenbelt for horticulture production in Rosario (Argentina), and Maputo (Mozambique). Photos: R. Terrile and R. Kahane

Selecting and innovating urban agriculture models with highest climate change and development impacts

Cities have to choose the specific types of urban and peri-urban agriculture and forestry that best fit their local socio-economic, climatic, agronomic and spatial conditions. Production systems and management techniques also have to be looked at.

Reducing use of chemical fertilisers and replacing them by organic waste has beneficial effects on both emission reductions as well as city waste management.

Production of seasonal crops and promoting local consumption also helps reduce food related GHG emissions. Cities can do so by use of local food labels or promoting farmers markets and local food hubs. They can also promote preferential local food procurement for the public sector (hospitals, schools, offices).

Consumer education and food waste reduction are other important strategies.

Production systems and technologies that use more renewable energy for irrigation, mechanisation, processing and transport of food need to be promoted. For example, solar powered cold storage facilities will allow for longer storage periods and less product loss in periods with higher temperature

Small and medium scale enterprises for local food production, processing and marketing will require support.

Further innovation is needed to make urban agriculture itself more resilient to climate change. Response strategies could include adjustment of production systems, cropping patterns, selection of adapted crop varieties and improved water management.

Being a flood and drought prone area, Dumangas city (Philippines) for example organises Climate Field Schools that seek to combine indigenous knowledge with scientific methods. It helps local communities to strengthen their food security and livelihoods by teaching farmers to read weather forecasts, interpret satellite photos and set up their own weather stations. This timely information helps farmers decide what and when to plant.

In Trinidad (Bolivia), 100 hectares of raised cultivation fields in peri-urban areas, prone to both flooding and illegal occupation for settlements, have been established. These new structures resemble an ancient agricultural technique common in the region, and have a ring ditch-and-wall to protect it from inundation, wildfires and to retain water in the canals to cope with drought.

The crops grown are both traditional and introduced in the area, in response to market demand and food habits, with a long-term aim to increase the consumption of fresh vegetables. Ducks, hens and fish are farmed alongside and in the canals.

Thanks to these innovations, agriculture becomes viable again in marginal and disaster prone areas; reducing vulnerability, improving food security and generating new jobs. They also contribute to reducing damages to infrastructure which lessens reconstruction and rehabilitation expenses for the government.

Rehabilitated flood-prone areas in Trinidad (Bolivia). Photo: R. Quiroga

Policy uptake

With increasing urbanisation, climate change and growing urban demand for food, cities need to address the triple challenge of climate change mitigation, adaptation, and improving urban food security. The case studies mentioned here show that urban and peri-urban agriculture and forestry may be suitable strategies to address this triple challenge.

Municipal and provincial governments can play a proactive and coordinating role by:

1. integrating urban agriculture and food security into climate change adaptation strategies;
2. maintaining and managing agriculture as part of the urban and peri-urban green infrastructure;
3. identifying open urban spaces prone to floods and landslides, and protecting or developing these as permanent agricultural and multifunctional areas;
4. integrating urban agriculture and forestry into comprehensive city water(shed) management plans, development plans, building codes, and housing programmes;
5. recognising urban agriculture as an accepted, permitted and encouraged land use, and
6. developing a municipal urban agriculture and food security policy and programme.

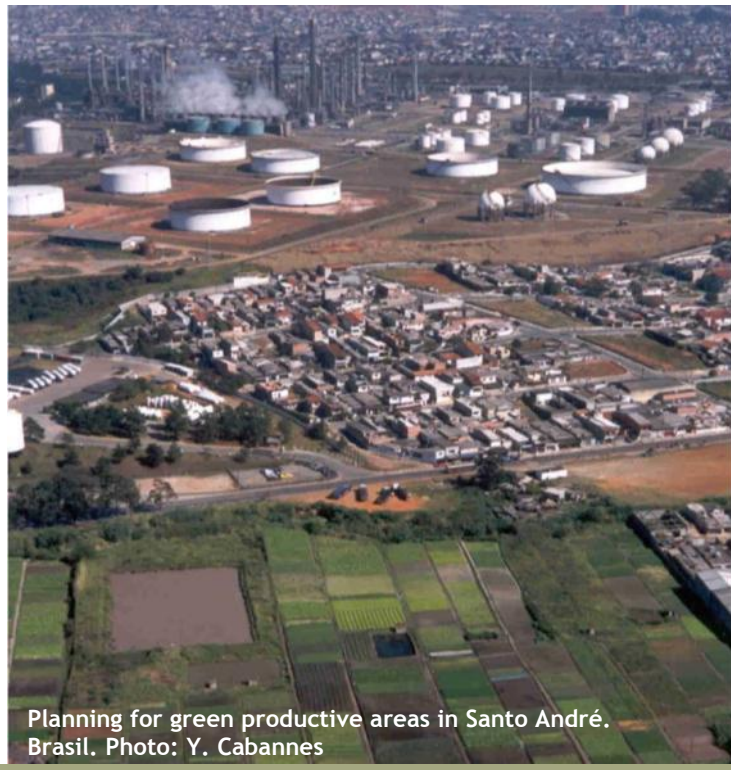
The above will also need new urban design concepts with cities promoting green mosaic planning, instead of urban in-fill, to protect valuable ecosystems and biodiversity hotspots, preserve natural corridors and designate low-lying areas and flood plains for agriculture.

The involvement of the subnational (provincial) governments is key to addressing agriculture and land-use planning at larger scale (outside municipal boundaries), facilitating access to financing and developing provincial policies that must accompany city-level strategies.

Building more resilient cities also requires multi-level governance at local level.

A key condition for success is that participation allows all relevant stakeholders (small-scale producers, consumers, food processing and retail, financing agencies and government bodies) to jointly develop an agenda of required improvements and innovations. Initiatives rooted in multi-stakeholder participation will be more effective in reaching their objectives, more transparent/accountable in the use of resources and can ensure longer-term sustainability beyond temporary government administrations.

"Agriculture must be considered a key land-use feature for sustainable city-regions. Integration of food systems in city-region planning requires support from a full suite of urban management and governance measures. Special attention needs to be paid to health standards, storage and processing, land zoning, land tenure systems, use of vacant land, and access to water. In terms of urban governance, it is important for vulnerable groups, particularly women, youth, and migrant workers, to have a voice in a transparent decision-making process." - Raf Tuts, Coordinator, Urban Planning and Design Branch, UN-Habitat (2013)



Planning for green productive areas in Santo André. Brasil. Photo: Y. Cabannes

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Elaboration: Marielle Dubbeling, RUAF Foundation m.dubbeling@ruaf.org
Design: Femke Hoekstra, RUAF Foundation

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