



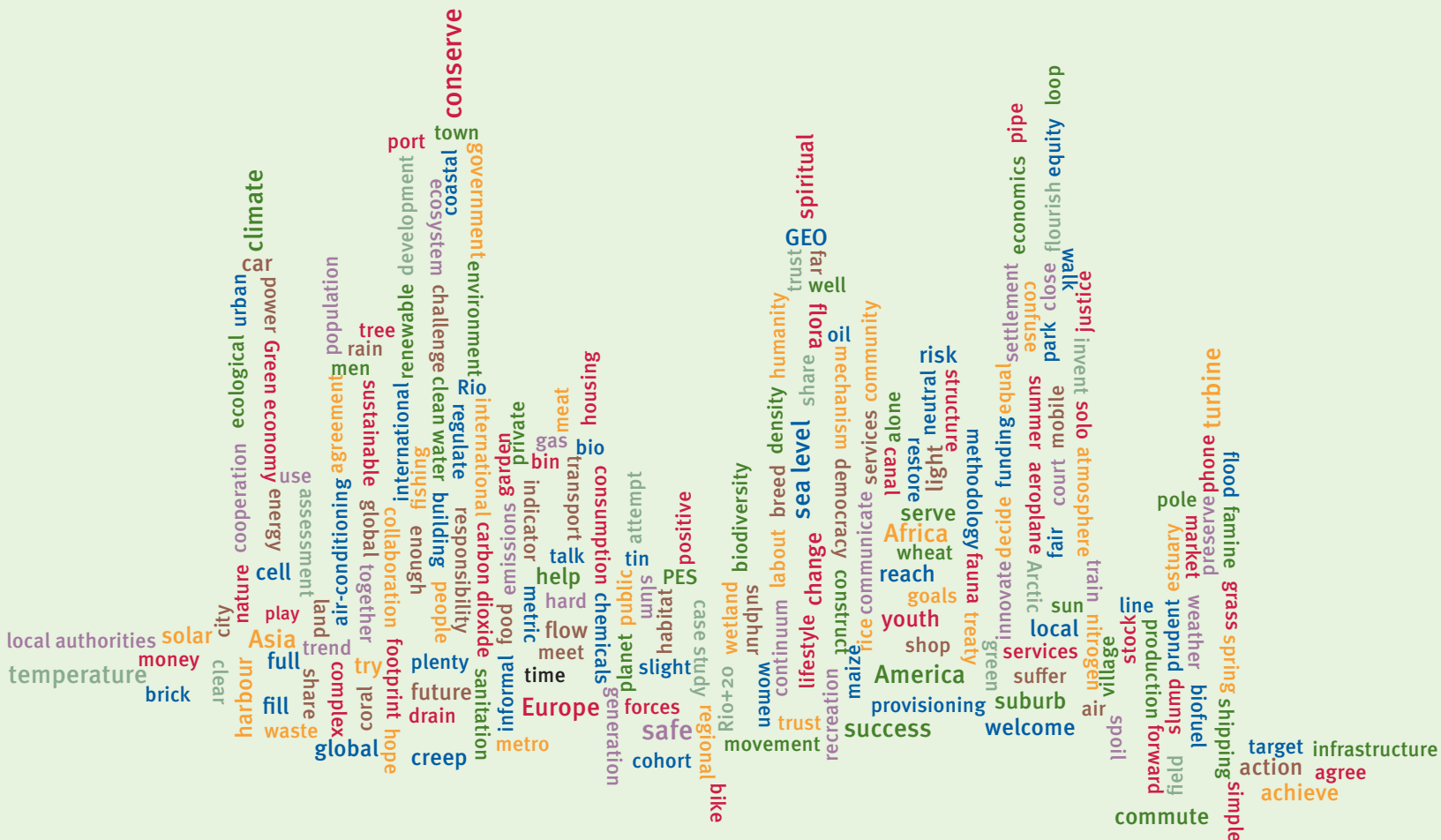
ICLEI
Local
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GEO 5

Global Environment Outlook



for local government
solving global problems locally

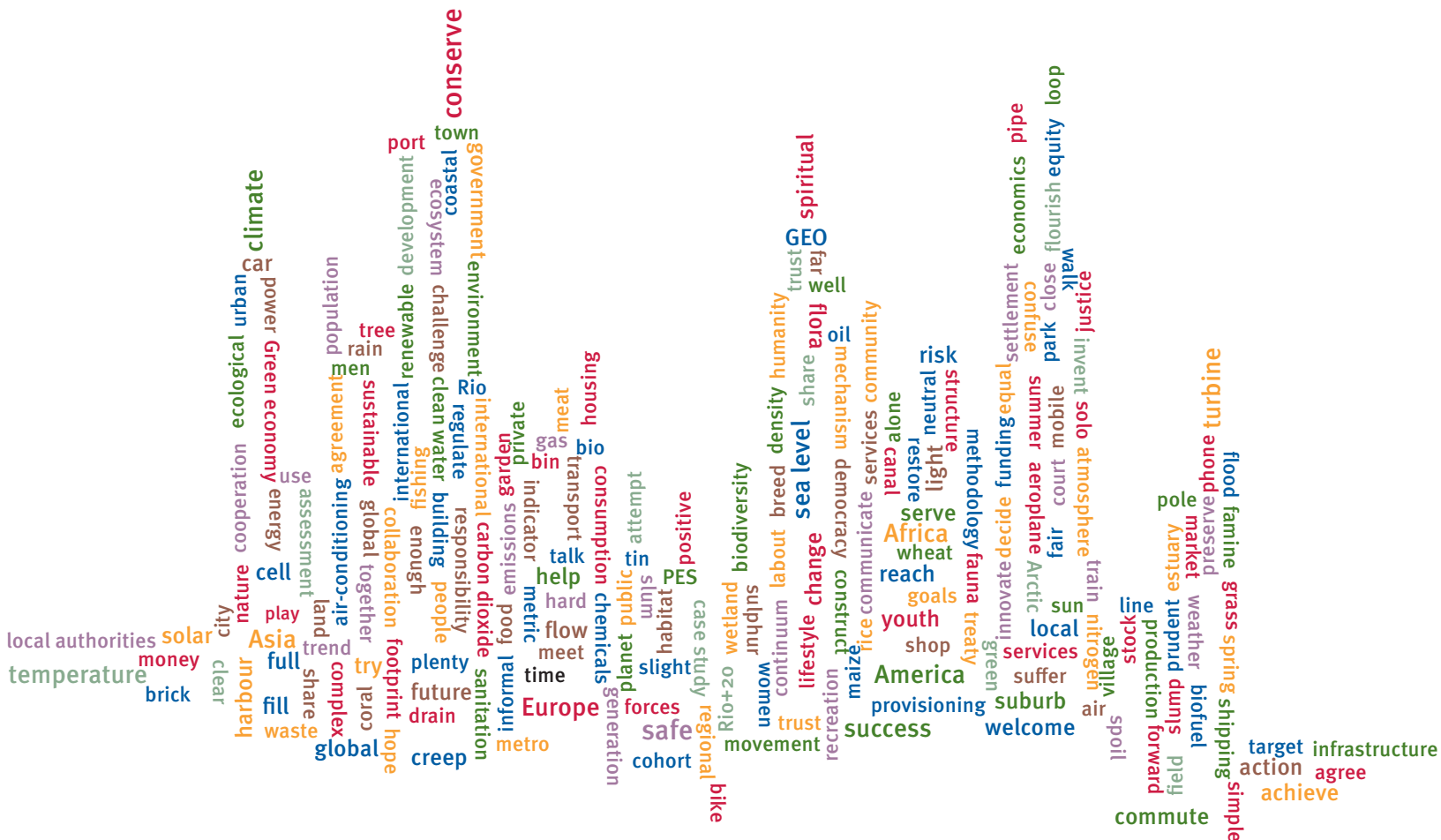




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The logo for the Global Environment Outlook (GEO) 5. It features the word "GEO" in a large, outlined, serif font. To its right is a large, bold, red number "5". Below "GEO" and to the left of the "5" is the text "Global Environment Outlook" in a smaller, dark grey, sans-serif font. To the right of the "5" are three stylized globes of the Earth, showing different continents and oceans, arranged in a cluster.

for local government
solving global problems locally



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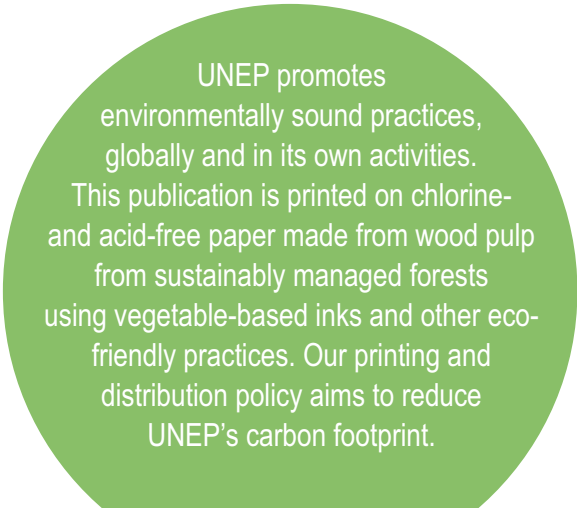
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FOREWORD

The planet and its people are accelerating towards a sobering and largely unsustainable future; a conclusion reached by the fifth *Global Environment Outlook (GEO-5)* — an international assessment coordinated by UNEP. A sharp and decisive turn towards a Green Economy has to occur.

Of 90 key goals set by the international community over the past decades and assessed in *GEO-5*, only in four of them can significant progress be shown, for example the phase-out of lead in petrol. No progress has been made towards achieving 24 of the goals, including adequately addressing dwindling fish stocks and the intensification of droughts.

If global and regional environmental trends continue, they will have significant adverse implications for human well-being. Local governments already experience many environmental strains at the local level, along with pressures from local communities and businesses. In the absence of strong international action, their responses represent beacons of hope — and many of their efforts are decades old. For example, climate change was a focal point for local action even before the introduction of international climate mechanisms.

This *GEO-5* companion report for local authorities, prepared by ICLEI — Local Governments for Sustainability in collaboration with UNEP, highlights that the world is rich in local policies, initiatives and projects. These are rapidly evolving and becoming ever more sophisticated and integrated. Local initiatives offer possible pathways for tackling environmental challenges and reaching international targets.

This joint ICLEI and UNEP report underlines that many of these initiatives have been envisioned and enacted by local authorities in the world's cities and towns, where today over half the global population resides. Their actions represent a body of accomplishments that can illuminate the path to “the future we want”.

The findings and case studies also offer signposts towards a set of possible sustainable development goals post-2015. The action of local authorities for a sustainable 21st century

already unites developed and developing countries in terms of sharing and evolving experiences through global networks such as ICLEI. Take the city of Windhoek in Namibia, for example, where policies and strategies are under way to better manage water supplies to meet the needs of a growing population, or Cape Town, where biodiversity assets are protected by innovative mapping and planning.

A public-private partnership in Pangkalpinang, Indonesia, has transformed an old tin-mining area into a botanical garden with important new ecological services including water supplies to local communities.

Tokyo — the world's largest metropolitan area — has developed a Cap and Trade system in addition to a Green Buildings programme to reduce carbon emissions by a quarter by 2020 compared to 2000 levels. Among many actions, the German city of Bonn promotes the purchase of sustainable goods and services, thereby acting as a catalyst for the greening of supply chains far beyond the city limits.

Bogota in Colombia has pioneered creative and integrated land-use planning and is internationally known for its bus rapid transit system. It has also placed the city within the regional ecosystem of surrounding landscapes and settlements.

If a fresh and innovative future is to be charted, then we need all hands on deck, including governments, multilateral institutions, companies and citizens. Without sustainable cities, only a partial transition can be possible.

Local authorities, including regional and provincial governments, are already demonstrating that paradigm shifts and radical changes are both possible and beneficial. World leaders can build upon these examples and achievements at the Rio+20 Summit to replicate them and scale them up towards more ambitious action and targets. The opportunity for world leaders at Rio+20 is to accelerate action and turn sustainable development from patchy implementation into a reality for 7 billion people, rising to more than 9 billion by 2050.



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Secretary General
ICLEI — Local Governments for Sustainability



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INTRODUCTION TO GEO-5

Global Environment Outlook (GEO) is UNEP's consultative, participatory assessment process reporting on the state, trends and outlook of the global environment, and drawing on the expertise of close to 300 scientific and policy experts. The process has two other important functions: to provide policy options to inform environmental decision making, thus facilitating the interaction between science and policy, and to build capacity for conducting integrated environmental assessments amongst a wide variety of regional and national organizations and individuals around the world.

GEO uses the DPSIR framework – drivers, pressures, states, impacts, responses – for assessing the state and trends of the environment and seeks to answer the following questions:

- What is happening to the environment and why (*pressure and state*)?
- What are the consequences of a changed environment (*impact*)?
- What can be done at regional and national levels and how can internationally agreed goals and targets be achieved (*response*)?

GEO-5, the latest in the GEO series, released in June 2012, provides an assessment of the state and trends of the global environment in relation to internationally agreed goals; evaluates the gaps and barriers in their implementation; and provides policy options that have the potential to speed-up realization of these goals.



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PURPOSE OF GEO-5 for Local Authorities

The *GEO-5 for Local Authorities* report has been developed by ICLEI – Local Governments for Sustainability in collaboration with UNEP, and draws on the findings of *GEO-5*. The report shows that pressures on the global environment affect the local level. Conversely, local decisions and responses can not only improve local conditions, but also significantly contribute to improving the state of the global

environment. By placing global and regional environmental challenges in the context of local policy making, the report aims to make the findings of *GEO-5* more relevant for local governance. The report highlights the role that local authorities can play in meeting internationally agreed goals and targets and in addressing local, regional and global environmental challenges.

THE GLOBAL PERSPECTIVE

The challenges

Unprecedented changes are affecting human well-being

GEO-5 shows that currently observed alterations in the Earth System are unprecedented. While efforts to slow the rate and extent of change – including measures to enhance resource efficiency and mitigate the effects of climate change – have been moderately successful, they have not managed to halt or reverse adverse environmental shifts. With human pressures on the Earth System accelerating, humanity has either exceeded or is approaching several global, regional and local environmental thresholds. Once these have been passed, abrupt and possibly irreversible changes in the life-support functions of the planet are likely to occur, with significant adverse implications for human well-being. For instance:

- The escalating frequency and severity of climate events, such as floods and droughts, affects both natural assets and human security.
- Accelerating temperature change and sea level rise are affecting the social cohesion of many communities including indigenous and local ones, with sea level rise posing a threat to natural assets and food security in some places.
- Substantial biodiversity loss and the on-going extinction of species, including the collapse of a number of fisheries and the loss of species used for medicinal purposes, are affecting the provision of ecosystem services.
- Multiple and interacting factors, such as droughts combined with socio-economic pressures, are affecting human security.

Internationally agreed goals have only partly been met

A large number of internationally agreed goals are in place to address environmental challenges. Despite this, *GEO-5* says that the international community has made uneven progress in achieving these goals and improving the state of the environment. Indeed the trends of environmental deterioration identified in *GEO-5* demonstrate that much still needs to be done with respect to internationally agreed goals.

The current policy focus

GEO-5 observes that policy is largely focused on addressing the pressures or symptoms of change rather than the underlying drivers or root causes. Population growth and economic development are seen as the drivers of global environmental change, with particular facets exerting pressure: energy, transport, urbanization and globalization.

Understanding the growth of these drivers and the connections between them will go a long way to addressing their collective

impact on the Earth System and in finding possible solutions, thereby preserving the environmental benefits on which all human societies and economies depend.

Options for action

Scaling up promising policies – regional and local examples

GEO-5's regional analysis identifies promising policy responses and instruments, based on best practice, that have been adopted successfully in one or more regions and that have the potential to speed up achievement of internationally agreed goals. These were found to be successful, in part, due to their enabling environment or local context. Table 1 on the following pages provides examples from *GEO-5*, which ICLEI then builds on, highlighting related case studies of innovative local government action.



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Table 1 Policy responses and instruments successfully adopted in one or more regions		
GEO-5 area of focus	Policy responses/instruments identified in GEO-5	Featured local government policy examples
Environmental governance	• Multi-level/multi-stakeholder participation. • Increased introduction of the principle of subsidiarity. • Governance at local levels. • Policy synergy and removal of conflict. • Strategic environmental assessment. • Accounting systems that value natural capital and ecosystem services. • Improved access to information, public participation and environmental justice. • Capacity strengthening of all actors. • Improved goal setting and monitoring systems.	• Rizhao, China: implementation of an eco-city building plan substantially reduces emissions.
Climate change	• Removing perverse/environmentally harmful subsidies, especially on fossil fuels. • Carbon taxes. • Forestry incentives for carbon sequestration. • Emission trading schemes. • Climate insurance. • Capacity building and finance. • Climate change preparedness and adaptation such as climate proofing infrastructure.	• EThekweni (Durban), South Africa: integrating adaptation planning into a general planning and development framework, cemented by institutional programming. • Sofala Province, Mozambique: a pilot project in the voluntary carbon market. • Tokyo, Japan: Green Building and Cap and Trade programmes to reduce carbon emissions and enhance energy efficiency in buildings. • Veracruz State, Mexico: the Veracruz Programme on Climate Change and the State Law on Mitigation and Adaptation to Climate Change Effects promote action to address climate change and protect vulnerable groups. • New York City, United States: the Assessment and Action Plan is one output of the Climate Change Task Force to address the impact of climate change on water. • Masdar, United Arab Emirates: carbon-neutral city development plan.

Table 1 Policy responses and instruments successfully adopted in one or more regions (*contd.*)

GEO-5 area of focus	Policy responses/instruments identified in GEO-5	Featured local government policy examples
Energy	• Increased international cooperation in the transfer and application of energy-saving technologies. • Promotion of energy efficiency. • Increased use of renewable energy. • Feed-in tariffs. • Restriction on fossil-fuel subsidies. • Low-emission zones within cities. • Research and development, especially on batteries and other forms of energy storage.	• San Jose, California, United States: a green building policy to reduce energy and water consumption in new residential, commercial and industrial construction projects. • Stockholm, Sweden: a low-emission zone.
Air quality	• Air quality guidelines such as those of the World Health Organization. • National air quality standards.	• European Union directives for air quality, vehicles, stationary sources and national emissions. • Stockholm, Sweden: a low-emission zone. • Bogota, Colombia: urban planning and transport. • Curitiba, Brazil: urban planning and transport.
Land	• Integrated watershed (catchment) management. • Smart growth in cities. • Protecting prime agricultural land and open space. • No-till, integrated pest management and/or organic agriculture. • Improved forest management. • Payment for ecosystem services (PES) and Reducing Emissions from Deforestation and Forest Degradation (REDD+). • Agroforestry and silvo-pastoral practices.	• Pangkalpinang, Indonesia: a public-private partnership with the Bangka Botanical Garden that reclaims land spoilt by mining. • Curitiba, Brazil: through its integrated urban planning and transport policy, Curitiba has prevented urban sprawl and enabled more sustainable urban development. • Portland, United States: infill, retrofits and brownfield development prevent urban sprawl and land degradation.

Table 1 Policy responses and instruments successfully adopted in one or more regions (contd.)		
GEO-5 area of focus	Policy responses/instruments identified in GEO-5	Featured local government policy examples
Freshwater	• Integrated water resources management. • Conservation and sustainable use of wetlands. • Promotion of water-use efficiency. • Water metering and volume-based tariffs implemented at a national or sub-national level. • Recognizing safe drinking water and sanitation as a basic human right/need. • Effluent charges.	• Windhoek, Namibia: protecting water sources from environmental damage caused by a growing informal settlement adjacent to a dam. • Stirling, Australia: smart use of water in parks to reduce overall water use and associated financial costs. • Iloilo, Philippines: rehabilitating, protecting and developing the Iloilo River. • Lima, Peru: reusing wastewater for irrigation to reduce the use of groundwater. • Abu Dhabi, United Arab Emirates: developing integrated coastal zone management to protect the coastal landscape and its ecosystems. • Tel Aviv, Israel: soil aquifer treatment of wastewater for agricultural irrigation.
Oceans and seas	• Integrated coastal zone management (ridge-to-reef). • Marine protected areas. • Economic instruments such as user fees.	• Abu Dhabi, United Arab Emirates: applying integrated coastal zone management by establishing urban development boundaries, setting aside critical areas and designating non-development zones, protecting coastal landscapes and other sites of value by redirecting development, and preventing habitat fragmentation.
Biodiversity	• Market-based instruments for ecosystem services, including payment for ecosystem services (PES) and Reducing Emissions from Deforestation and Forest Degradation (REDD+). • Increasing the extent of protected areas. • Sustainable management of protected areas. • Transboundary, biodiversity and wildlife corridors. • Community-based participation and management. • Sustainable agricultural practices.	• Cape Town, South Africa: advanced tools to ensure that biodiversity conservation is an integral part of sustainable urban planning and development. • Trang, Thailand: assessing and including biodiversity in planning and plans. • Bonn, Germany: establishing a favourable framework for biodiversity.

Table 1 Policy responses and instruments successfully adopted in one or more regions (*contd.*)

<i>GEO-5</i> area of focus	Policy responses/instruments identified in <i>GEO-5</i>	Featured local government policy examples
Chemicals and waste	• Registration of chemicals. • Extended producer responsibility. • Product redesign (design for the environment). • Life-cycle analysis. • Reduce, reuse and recycle (3Rs) and cleaner production. • National and regional hazardous waste treatment systems. • Control of inappropriate export and import of hazardous chemicals and waste.	• Reykjavik, Iceland: application of environmental criteria as a requirement in the procurement process for cleaning contracts.



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REGIONAL AND LOCAL REALITIES

Improving local conditions with global benefits

The role of local governments

The actions of local governments can cumulatively have positive global impacts, but they remain the level of governance closest to citizens, and must address the many and often competing requirements of local stakeholders. Often, they respond to existing and foreseen environmental challenges, for example community complaints about local air pollution or economic concerns over losses incurred by floods. However, such concerns can also come from the growing environmental awareness of citizens regarding climate change and its negative impacts on individuals, communities and economic activities.

As part of its jurisdictional responsibility and in response to identified needs, a well-functioning local government provides appropriate framework conditions and incentives, moderates,

stimulates ideas, innovates and provides examples to make continuous local improvements and mitigate negative local change. A local government's proximity to local needs, local stakeholders and local realities makes it better equipped than any other government level to determine the local pathway to sustainability.

Local government can drive local policies and processes to address climate change, air pollution, biodiversity loss, land degradation, water dynamics and chemical and waste issues, among others. In consultation and cooperation with stakeholders, there are several approaches that local governments can use to move towards environmental sustainability (Box 1).

Table 2 further illustrates, with examples, how internationally agreed commitments can be met through local action.

Box 1 Local government action for sustainability

- Improving municipal operations by introducing sustainable procurement, energy-efficient public buildings, etc.
- Enabling others by encouraging voluntary action, acting as a role model, providing information, etc.
- Improving public utilities and infrastructure by increasing resource efficiency in utilities and management of infrastructure such as transport, changing the energy matrix, improving waste management, investing in green area preservation, etc.
- Using the legal and jurisdictional mandate to provide a regulatory framework of building codes, planning and land-use planning, development strategies, etc., and ensuring their monitoring and enforcement.
- Setting targets and measurable outcomes backed up by baseline information, data collection, etc.
- Conducting environmental impact assessments and strategic environmental assessments (EIAs and SEAs) of development plans, programmes and policies.
- Public participation/consultation, particularly in spatial planning exercises.
- Data collection and monitoring for informed decision-making.
- Access to environmental information and justice.
- Rewarding innovation and sustainability.
- Amendment of higher-tier governance acts and statutory reforms to enable local innovation.
- Setting appropriate local legislative and institutional frameworks.

Source: Martinot *et al.* 2009; Bulkely and Kern 2006

Table 2 International goals and local action		
Goals and targets assessed in <i>GEO-5</i>	Internationally agreed goals/ agreements/commitments or obligations assessed in <i>GEO-5</i>	Examples of contributions from local government
Atmosphere		
Limit temperature increase to less than 2°C above pre-industrial levels and reduce anthropogenic climate change	United Nations Framework Convention on Climate Change (UNFCCC 1992)	Contributions are illustrated by the multiple actions taken by local governments to mitigate and adapt to climate change. These are expressed in declarations and commitments such as the Mexico City Pact (ICLEI 2012a) and Durban Climate Change Adaptation Charter (ICLEI 2011a); targets (City Climate Catalogue) (ICLEI 2012a); and measurable actions (carbon in the Cities Climate Registry) (ICLEI 2012a). Local governments show progress in the absence of a clear and ambitious international post-2012 climate framework. At UNFCCC COP 16 in Cancun, local and sub-national governments were recognized as governmental stakeholders within the global climate regime, in recognition of the global climate advocacy of local governments over two decades.
Reduce air pollution	Convention on Long-Range Transboundary Air Pollution (CLRTAP) (UNECE 1979); WHO (2006)	
Promote environmentally sound projects	Johannesburg Plan of Implementation (JPOI) Paragraph 9a (WSSD 2002) Advisory Group on Energy and Climate Change (AGECC 2010)	
Land		
Reduce desertification, soil erosion and deforestation	World Food Summit Plan of Action Paragraph 33g (FAO 1996) Agenda 21 Chapter 11.12a (UNCED 1992) United Nations Convention to Combat Desertification (UNCCD 1994)	Local governments play a key role in development planning and urban expansion, thus affecting land-use change. This is evident from examples around the world, where planning, land-use zoning and other administrative functions play a key role in directing urban development. Local governments also influence the use of ecosystem services, which, amongst other functions, provide food and local livelihoods (TEEB 2010); and contribute to MDGs 1, 3, 4, 5 and 7. Examples include the FAO's Food for Cities programme (FAO 2012). By managing ecosystems sustainably, local governments can tackle land degradation while also dealing with the impacts of climate change and addressing biodiversity loss at its source.
Reduce hunger	Millennium Development Goal (MDG) 1 (UN 2000)	

Table 2 International goals and local action (contd.)		
Goals and targets assessed in <i>GEO-5</i>	Internationally agreed goals/ agreements/commitments or obligations assessed in <i>GEO-5</i>	Examples of contributions from local government
Water		
Sustain resources and quality	JPOI Paragraph 26	Local governments are often direct providers of water as well as large water consumers. They develop, regulate, invest in, inform and set framework conditions. Effective local-level planning and management can lower the cost of water and sanitation infrastructure. Local governments have also made commitments known as the Lisbon Principles. The Local Government Water Code is a global call for action to resolve pressing and difficult water management situations by carefully considering the moral and ethical dimensions of decisions on day-to-day water resources management (IWA <i>et al.</i> 2012). Also see the ICLEI guide on JPOI and the MDGs (ICLEI 2004), focusing on water, sanitation and human settlements.
Universal access	MDG 7	
Biodiversity		
Reduce pressure on biodiversity; promote conservation	Convention on Biological Diversity (CBD 1992)	The role of local governments has been recognized by the CBD. At its COP 10 in Nagoya, Japan, Parties adopted the <i>Plan of Action on Sub-national Governments, Cities and other Local Authorities and Biodiversity 2011–2020</i> (CBD 2010). At CBD COP 9 in Bonn, Germany, Decision IX/28 was taken, which first recognized the critical role that cities and local authorities play in the implementation of the CBD objectives. COP 10 advanced on that by providing guidelines that national governments can follow in order to support local authorities towards the mutually beneficial goal of achieving the objectives of the CBD (ICLEI 2012a, 2012b, 2012c, 2012d).

Table 2 International goals and local action (*contd.*)

Goals and targets assessed in <i>GEO-5</i>	Internationally agreed goals/agreements/commitments or obligations assessed in <i>GEO-5</i>	Examples of contributions from local government
Chemicals and wastes		
Reduce chemical pollution to protect human health and the environment	JPOI Paragraph 23	Local governments are often direct providers of waste management systems as well as large producers of waste. Waste management systems are being pursued in ways that mitigate greenhouse gas emissions. Through green procurement criteria and strategies and using their purchasing and investment power, local governments can influence the amount of chemicals used and limit the waste produced at source.
Minimize waste and improve waste disposal and recycling	JPOI Paragraph 23	



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Figure 1 Urban population by city size

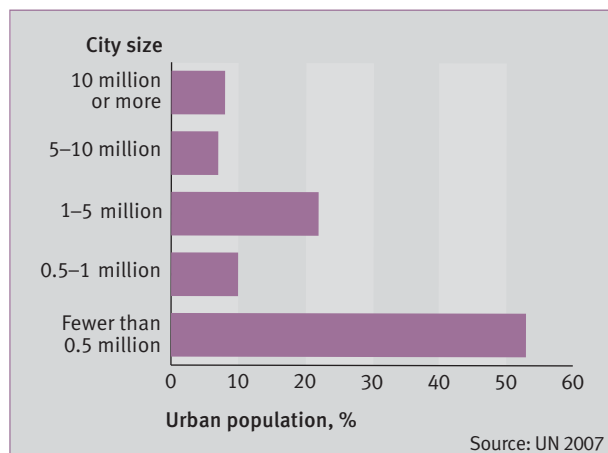


Figure 2 Total urban population by region

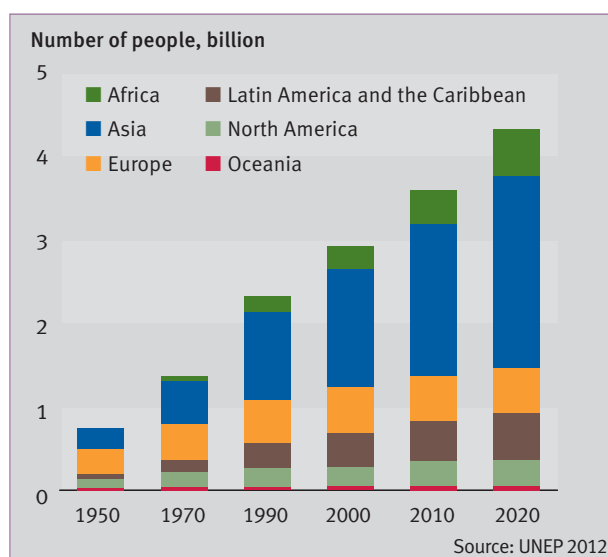
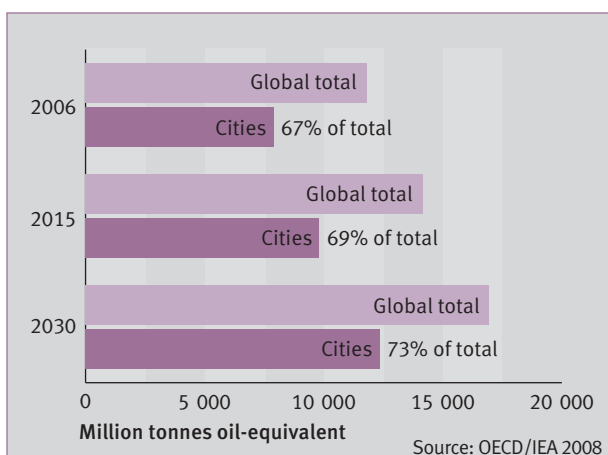


Figure 3 World primary energy demand in cities



THE EXAMPLE OF URBANIZATION

A major driver of change

The previous pages provide numerous examples of best practice at all levels, available to address key environmental challenges and realize internationally agreed goals. This section aims to use one single example of a driver of environmental change – urbanization – to show not only the challenges faced, but examples of excellent initiatives that are being implemented at the local level to address them.

Urbanization, from small towns to mega-cities, is identified in *GEO-5* as a key driver of environmental change. Urban areas of fewer than 500 000 inhabitants house the majority of urban dwellers (Figure 1). While cities cover just 1–2 per cent of the Earth's land surface (Schneider *et al.* 2009) and generate the majority of global GDP (Roxburgh *et al.* 2011), they produce 70–80 per cent of total greenhouse gas emissions (UNEP 2012).

Clearly, urban decision making has a profound impact on the state of the environment and this will increase in importance as a projected 66 per cent of the world population will be living in urban areas by 2020 (Figure 2).

Environmental challenges

The emergence of environmental risks associated with unmanaged urbanization is often an incremental process with particular challenges for local governments. Whatever the urban form and density, a lack of adequate planning exacerbates the environmental problems that rapid urbanization causes. Particular challenges include:

- **Climate change:** risks from sea level rise, flooding and hydro-meteorological disasters as well as impacts on food security, health and the spread of disease; heat island effects; water scarcity and threats to water quality due to a lack of sanitation and waste treatment.
- **Energy security:** urban economies' high dependency on secure energy provision; under-recognized urgency of reducing energy demand through higher efficiency and of decoupling energy production from centralized and high-risk sources (Figure 3).
- **Water and sanitation:** as cities expand, demand increases, groundwater sources dry up, surface water sources recede, and untreated wastewater pollutes scarce freshwater and poses serious health risks.
- **Ecosystems and biodiversity:** expanding cities degrade, fragment and pollute environmental and urban habitats, impoverishing ecosystem services within urban areas and the hinterland on which they depend.
- **Chemicals and waste:** risks to human health and quality of life as a result of ever-increasing waste generation and inadequate disposal.

CASE STUDIES

Local responses

Local environmental governance and urban-based initiatives are extremely important in protecting ecosystems, improving climate-change mitigation and adaptation measures and

ensuring effective water and waste management. Through such activities, local governments can contribute substantially to meeting national and global environmental challenges, as shown by the case studies on the following pages.



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AFRICA

Windhoek, Namibia: Protecting water supply from the Goreangab Dam

In the late 1990s, faced with increasing environmental degradation resulting from a burgeoning informal settlement adjacent to the Goreangab Dam, Windhoek City Council used a Local Agenda 21 planning process to develop an environmental management plan aimed at reducing pollution, protecting a valuable water supply and preventing further environmental damage. The plan included a commitment to improve the physical infrastructure and to establish a wide-ranging environmental public awareness campaign.

Through the Incentive Grants Project (IGP), the council took a leading role, building on the previous work of the Goreangab Action Committee (GAC). Plans were based on an environmental impact assessment (EIA) which was shared with local communities, particularly in Greenwell Matango. The EIA resulted in:

- establishing surface aquaponics on the lake-shore and reed beds at a nearby water reclamation plant – both the reeds and the aquaponics crops are harvested and used by the community to generate income;
- upgrading public lavatories in the informal settlement;
- installing household lavatories and connecting them to the water and sewer systems.

These actions were the beginning of a process that aimed to protect the city's water supply – in conjunction with three other dams, the Goreangab Dam supplies 70 per cent of this. Combined public involvement and a commitment to infrastructure improvements have protected a valuable water source.

Source: ICLEI 2000

EThekwini, South Africa: Climate adaptation

EThekwini municipality, also known as Durban, is a pioneering African example of how adaptation planning can be integrated into the general planning and development framework. Risk and disaster management frameworks have been developed and are being implemented as part of the phased Municipal Climate Protection Programme (MCP) initiated in 2004. This provides the institutional basis for the city to build resilience, reduce risks for

vulnerable groups, and prepare for the negative impacts of climate change on the municipality.

There are three key components to MCP: municipal adaptation to ensure the integration of key activities into relevant line functions; community-based adaptation focused on building capacity; and a series of interventions focused on urban management challenges such as the



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AFRICA

EThekweni, South Africa: Climate adaptation (contd.)

urban heat-island effect and sea level rise. The MCPP has been developed over time through the following phases:

- Phase 1 Impact Assessment: The *Climatic Future for Durban Report* (2006) assessed the local impacts of climate change and proposed possible adaptation and mitigation responses.
- Phase 2 Adaptation Planning: A *Headline Climate Change Adaptation Strategy* (HCCAS) (2006) highlighted some key interventions for successful adaptation. This has been, and continues to be, extended through various adaptation initiatives including reforestation projects, sea level rise modelling, community adaptation plans and the development and implementation of municipal adaptation plans for the water, health and disaster management sectors.
- Phase 3 Developing the Tool Box: Development of an integrated assessment tool to enable evaluation and comparison of strategic plans and policies in the context of climate change.
- Phase 4 Mainstreaming: Initiatives have included the integration of climate change considerations into city planning and development by the creation of a Climate Protection Branch within the Environmental Planning and Climate Protection Department (EPCPD) and the establishment of an Energy Office in 2009. Other interventions have included hosting a carbon neutral 2010 FIFA World Cup and the COP 17-CMP 7 Climate Conference in Durban.

Source: ICLEI 2012e

Sofala Province, Mozambique: A pilot project in the voluntary carbon market

A voluntary carbon credit project, established in 2003 in Sofala Province, has helped reduce poverty in a region that is still suffering from the impacts of civil war. By late 2009, the project included 1 510 farmers who rely on subsistence farming, wood gathering and hunting. Between 2003 and 2009, carbon credits totalling US\$1.3 million were sold, corresponding to 156 000 tonnes of carbon dioxide (CO₂) at an average price of US\$9.0 per tonne. The farmers, the initiating company and its local non-profit subsidiary that undertook project monitoring and evaluation each received a third of the income. The main difficulties revolved around measuring and evaluating carbon sequestration, including

the establishment of a baseline and assessing increases in stocks, as existing satellite data were insufficient. Other challenges related to community management and governance. Earnings were reduced by the relatively high costs of carbon sequestration, at US\$3.4 per tonne of CO₂, and by an inability to sell all the credits. Nonetheless, the project increased rural employment from 8.6 per cent to 32 per cent, while 73 per cent of households raised commercial crops compared with 23 per cent previously. There was also a measurable increase in literacy and the development of a business ethos and skills.

Source: UNEP 2012

Cape Town, South Africa: Maintaining urban biodiversity

The City of Cape Town has shown how biodiversity conservation can become an integral part of sustainable urban planning and development. Cape Town's urban expansion has put international biodiversity hotspots at serious risk, and local government efforts have centred on protecting the landscape and biodiversity by establishing a network of ecological corridors (BioNet).

Using GIS technology, BioNet is a transformative initiative that prioritizes and links terrestrial areas, water-courses and wetlands through corridors and urban open space. Using an holistic approach to sustainable urban

development, BioNet provides a tool and approach to protect the endangered endemic vegetation habitats in a large and growing city.

The City of Cape Town has revised its conservation planning analysis to ensure that this adequately caters for the potential impacts of climate change. It is also in the process of developing a methodology for mapping ecosystem services that will result in products to inform future investment in the city's ecological infrastructure.

Source: ICLEI 2012f

ASIA AND THE PACIFIC

Pangkalpinang, Indonesia: A public-private partnership reclaims spoilt land

The Bangka Botanical Garden (BBG) in Indonesia's Pangkalpinang municipality is an innovative example of corporate social responsibility that illustrates the potential of public-private partnerships. The partnership transformed an ecologically important area, formerly used for tin mining, into a botanical garden. As well as providing recreational opportunities to the community, the garden supplies clean water to the municipality and has become a significant wildlife habitat. Furthermore, its creation has led to the development of the Bangka Goes Green movement.

The owner of BBG was awarded the national Kalpataru Award, given to outstanding individuals who improve the environment. Strong visionary leadership was provided by Djohan Riduan Hasan, owner of PT Donna Kembara Jaya, a local firm that initiated the idea. With support from the local government, the land reclamation plan grew into a botanical garden rich in species diversity. With its implementation came a greater sense of responsibility and interest in preserving the local environment.

Source: ICLEI 2011b

Rizhao, China: An eco-city plan

Since the Rizhao municipal government began implementing its Eco-City Building Plan in 2003, the local environment and extended urban area have significantly improved. At the same time, the city has benefited economically and the quality of life of its residents has been enhanced.

Between 2006 and 2010, sulphur dioxide (SO₂) and chemical-oxygen-demand emissions fell by almost 24 and 19 per cent respectively; the amount of public green area per person increased from 10.5 m² in 2000 to 19 m² in 2010 and, over the same period, clean energy use increased from 70 to 90 per cent. Urban central heating systems fuelled by solar energy heat up to 1 million m², reaching 65 per cent of the city area, and solar lighting

systems are widely used in parks and public squares. Due to using clean forms of energy, the city saves 3.8 billion kilowatt hours of electricity annually, replacing 1.44 million tonnes of standard coal, thus reducing annual emissions of CO₂ by 3.25 million tonnes, SO₂ by 2.2 million tonnes and dust by 20 000 tonnes.

Twenty-five of Rizhao's industrial enterprises have so far attained ISO14001 environmental management system certification, and a further 63 companies are currently undergoing the certification process. Rizhao's efforts have been recognized at both national and international levels, and the municipality hopes that other cities will follow its example.

Source: ICLEI 2012g

Stirling, Australia: Water-smart parks

This initiative aims to conserve water and has identified priority parks for eco- and hydro-zoning, irrigation system retrofits, soil moisture probes and connection to a centralized irrigation system. Reductions in 2009–2010 resulted in the city consuming only 84 per cent of its yearly

groundwater allocation, saving more than 840 million litres. Overall, in 2009–2010 the council reduced its total water use by a quarter of the 2008–2009 total.

Source: ICLEI 2010

Iloilo, Philippines: Iloilo River rehabilitation

Iloilo City has developed a master plan to rehabilitate, protect and develop the Iloilo River by collaborating with multiple stakeholders and integrating a set of policies and strategies. The Iloilo River Development Master Plan Project demonstrates how increased public participation,

joint action and the integration of policies and strategies can result in a shared vision and agenda for restoring the ecological balance of the Iloilo River, while developing its economic potential.

Source: ICLEI 2011c

ASIA AND THE PACIFIC

Tokyo, Japan: Reducing greenhouse gas emission through energy-efficient building

Tokyo's Green Building and Cap-and-Trade programmes are progressive initiatives to reduce the carbon footprint of existing and new commercial buildings through energy-efficient building technologies. As Tokyo is the largest metropolitan area in the world, its example sets a

powerful precedent for urban market instruments for climate mitigation. The programmes are fundamental to the municipality's goal of reducing CO₂ emissions by 25 per cent below 2000 levels by 2020.

Source: ICLEI 2012h

Trang, Thailand: Supporting biodiversity conservation

Trang has integrated biodiversity conservation into urban development planning, highlighting the need for information on biodiversity and stakeholder involvement. The municipality initiated a conservation project at Nam Jed Klong (*klong* means canal), working with the Klong Nam

Jed Conservation Group, a locally driven organization, to restore and conserve the canal's ecology. The initiative has surveyed and assessed biodiversity to support action plans and policies.

Source: ICLEI 2011d



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EUROPE

Bonn, Germany: A city within nature

Located on the river Rhine, Bonn is in a biologically diverse region characterized by the Rhine and Sieg Valleys, and Kottenfrots and the Waldville Ennert areas which are part of the Siebengebirge range of hills. Although the city has experienced significant development pressures, it has established a favourable framework for biodiversity and still exhibits a high level of species and habitat diversity. Bonn is part of ICLEI's Local Action for Biodiversity initiative and is committed to the ideal of promoting sustainability as a solution through:

- ensuring the avoidance of environmentally harmful materials in municipal construction and maintenance in its contract awards;

- requiring city employees to give adequate consideration to environmental precautions and suitable priority to environmental protection, since the city serves as a model for emulation and wishes to promote, through its own purchasing, the development and production of environmentally friendly product alternatives;
- the city's administration only uses recycled paper, a practice that conserves wood pulp and wood resources and thus helps protect forests both locally and globally.

Source: CBD 2012; ICLEI 2008; Bonn 2008

Stockholm, Sweden: Air quality management policies in a low-emission zone

Stockholm's low-emission zone was launched in 1996 and initially targeted heavy-duty vehicles entering the city centre. Vehicles complying with Euro 1 standards were allowed free access while those more than eight years old had to be retrofitted or issued a permit. Enforcement was carried out by police inspections, leading to an overall compliance rate of around 90 per cent within a few years. Actual air pollution concentrations in 2000 were down by 0.5–2 per cent for nitrogen oxides and by 0.5–9 per cent for particulate matter compared to the theoretical values calculated for a no-policy situation. Then, in 2007, following a successful trial period in 2006, a variable congestion tax was launched for vehicles entering Stockholm's city centre during working hours on weekdays, with vehicles running on electricity and biofuels being exempt.

It was found that:

- the number of trips and the distance travelled in the inner city in 2006 decreased by 100 000 per day and 8.5 per cent respectively;
- the share of clean vehicles in the private fleet increased from 5 per cent in 2006 to 14 per cent in 2008;
- average pollutant concentrations decreased in the inner city by 10 per cent for nitrogen oxides, 15 per cent for carbon monoxide and 15–20 per cent for particulate matter.

Both air-quality management policies were found to be even more effective if supported by additional measures such as green area networks, clean fuels, clean vehicles, extension of public transport and promotion of cycling



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EUROPE

Stockholm, Sweden: Air quality management policies in a low-emission zone (contd.)

and walking. Nonetheless, the congestion tax has been shown to generate a net social benefit of around US\$95 million (€70 million) per year in the form of shorter and more reliable travel times, reduced greenhouse gas

emissions, health and environmental benefits, greater traffic safety, increased use of public transport and higher government revenue.

Source: UNEP 2012

Bologna, Italy: A car-free city

Bologna has experienced significant increases in car use. In response, with the aim of protecting the historical city from pollution, preserving monuments and improving air quality, the local authority introduced a radical limited traffic zone.

In July 1989 the entire historical centre (4.5 km²) of Bologna was converted into a controlled access area. The traffic restriction was enforced from 7:00 a.m. to 8:00 p.m. for all private cars. Only public transport, electric and residents' vehicles are allowed into the zone, with other private car drivers having the option to gain access by buying a one- or four-day ticket. However, to minimize private car use, only three such tickets are available per driver each month. Commercial delivery companies are

charged a flat rate per year, depending on the emission levels of their vehicles.

In conjunction with the limited traffic zone, the municipal authorities have made a strong commitment to making Bologna a bike- and pedestrian-friendly city. Forty-five kilometres of sheltered walkways already exist and, most recently, the city has established 128 km of clearly marked cycle lanes. Although detailed figures are not yet available, the limited traffic zone has resulted in significant reductions of pollution as car use has diminished by 25 per cent, protecting the city's physical and culture heritage while substantially improving urban air quality.

Source: ICLEI 2011e; TRANSLAND 1999

Reykjavik, Iceland: Sustainable procurement

The Green Cleaning programme in Reykjavik is an outstanding example of sustainable eco-procurement. As environmental criteria are a requirement in the procurement process for cleaning contracts, the programme ensures that public cleaning contracts are fulfilled in a way that minimizes negative impacts on both the environment and human health. The results have been impressive: cleaning costs have been halved and the programme has

motivated the market to supply green cleaning products. In two years the market share for eco-labelled cleaning services in Iceland has grown from less than 10 per cent to more than 50 per cent, demonstrating that local governments can increase sustainability while simultaneously reducing public spending.

Source ICLEI 2012i

Tel Aviv, Israel: Treating wastewater for reuse using natural systems

Tel Aviv has been using soil aquifer treatment (SAT) for its wastewater for several decades, and the recovered water is used to irrigate agricultural crops in the south of the country. However, in response to the aging system's drawbacks, a rising population and an increasing need for land for urban settlement around Tel Aviv's periphery, the city has had to find a more appropriate and compact solution for its wastewater treatment. Tel Aviv has piloted a modified version of SAT, which not only is more effective

but also uses less land. The short SAT, combined with nano-filtration, was found to remove microorganisms and micropollutants quickly and efficiently, producing water of almost drinkable quality, and highly suitable for irrigation. This combination of technologies was found to be superior to the conventional SAT technology in terms of land use and time parameters, and is equivalent in terms of water quality.

Source: SWITCH 2011a



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LATIN AMERICA AND THE CARIBBEAN

Curitiba, Brazil: Compact cities – integrating urban planning and transport

Through integrated urban planning and transport policy, Curitiba has prevented urban sprawl and enabled more sustainable urban development. In the 1970s and 1980s, physical, economic and demographic growth was rapid and the city became an important industrial and commercial centre. Urban planning focused on building the city and decentralizing it. From the 1990s until today, the city's main planning focus has been on sustainable development and integration of Curitiba's metropolitan region. A master plan and zoning requirements were prepared by the Instituto de Pesquisa e Planejamento Urbano de Curitiba (IPPUC), which was created in 1965 as an independent agency to supervise and implement urban planning.

The result of the strategy – which put people at its centre and emphasized integrated planning – is that the city has become a showcase of ecological and humane urbanism,

with ongoing improvements over the past 38 years to social, economic and environmental conditions for its residents. An axis of intense economic activity provides structured corridors along which the city introduced a rapid transit bus system. The rapid transport catchment, which covers 90 per cent of the city, accounts for 45 per cent of daily personal journeys, has reduced traffic congestion, encourages high-density development and has improved and maintained air quality. The planning policy additionally includes stringent zoning requirements that consider density, geological constraints, water and wind direction, type of industry, and urban cultural and social factors. One benefit of Curitiba's comprehensive approach to urban planning is that, per person, the city's residents use about 30 per cent less fuel than their counterparts in other Brazilian cities.

Source: Goodman *et al.* 2006; ICLEI 2005

Veracruz State, Mexico: An institutional framework for climate change mitigation and adaptation

The State of Veracruz is the first state in Mexico to implement a climate change mitigation and adaptation programme and has become a beacon for local governments in other developing countries.

Climate change scenarios predict a 100–150 cm increase in sea level by 2100. The Mexican coast of the Gulf of

Mexico could therefore lose 500 000 hectares of pasture, 250 000 hectares of farmland, and 8 000 hectares of existing tropical forest villages. Furthermore, a warming of 2°C and a reduction in rainfall of around 10 per cent are predicted, accompanied by extreme rainfall events and floods in certain areas. These changes will particularly affect agricultural production, but also human health and

LATIN AMERICA AND THE CARIBBEAN

Veracruz State, Mexico: An institutional framework for climate change mitigation and adaptation (*contd.*)

biodiversity. At the same time, a preliminary inventory has indicated that the state emits about 27 million tonnes of CO₂, about 8.9 per cent of Mexico's total annual emissions.

The Veracruz Programme on Climate Change and the subsequent State Law on Mitigation and Adaptation to Climate Change Effects is pivotal in promoting action to address climate change and protect vulnerable groups. Initial first steps date back to 2008, when the Center for Climate Studies in the Department of Civil Protection of the State University was founded. The State of Veracruz established the State Board for Mitigation and Adaptation to Climate Change Effects as the body responsible for interagency coordination. Its advice contributes to existing programmes and assists in developing a statewide strategy for the next six years.

In addition, it:

- promotes the participation of different sectors of society in the state's climate change policy-making process;
- monitors compliance with the State Law on Mitigation and Adaptation;
- encourages and promotes coordinated actions and collaboration;
- encourages the use of renewable energy and clean technologies;
- manages national and international resources;
- at state and municipal level it trains people with the required skills to develop techniques relating to mitigation and adaptation, and promotes self-management of resources.

Source: ICLEI 2012j

Lima, Peru: Wastewater reuse for irrigation in the urban context

Precipitation in Lima is extremely low, making the city highly dependent on its surface- and groundwater. Climate change projections suggest even greater scarcity. The local authority considered the multi-functional use of water sinks

and recycling treated wastewater for irrigation. As a result, more clean water has become available for higher-value uses such as drinking.

Source: SWITCH 2011b

Bogotá, Colombia: Good practice in urban land-use planning

With 79 per cent of its population living in cities, the Latin America and Caribbean region has the highest levels of urbanization in the developing world. However, this has often occurred without appropriate institutional responses, resulting, for example, in the underdevelopment of infrastructure and unplanned land use, leading to a wide range of environmental problems including urban sprawl, pollution and loss of agricultural land. Nonetheless, some cities have developed innovative ways of attenuating the environmental pressures related to the growth of urban areas. Amongst them is Bogotá's Environmental Management Plan 2001–2009 (Plan de Gestión Ambiental del Distrito Capital – PGA).

Formulated in collaboration with the Capital District authorities, citizens and inter-sectoral representatives, the plan, together with a Regional Planning Board (PGA), has encouraged public participation, the introduction of environmental standards and urban management. Mainly focused on integrated land-use management, the PGA

seeks to resolve environmental externalities related to the socio-economic, cultural, political and environmental transformations of the Colombian capital.

This interest in sustainable urban development has encouraged the PGA to consider the city as part of a broader ecosystem in which regional and local considerations are interrelated. The Environmental Management Plan relies on:

- the Capital District Environmental System, which establishes guidelines, standards, activities, resources and institutional competencies;
- the Environmental Information System, which systematizes environmental data;
- FOFIGA, a financial support for PGA programmes and projects which obtains its resources through, amongst others, penalties, fines, redistributive taxes, compensatory rates, water-use rates and transfers.

Source: UNEP 2010

NORTH AMERICA

San Jose, California, United States: Green building standards

In September 2008, San Jose, California, adopted a green building policy to reduce the consumption of energy and water in new residential, commercial and industrial construction projects. The policy is a step forward for San Jose's Green Vision, which sets a goal of ensuring that 4.5 million m² of buildings built or retrofitted in the city will be green within 15 years. Leadership in Energy and Environmental Design (LEED) or Build It Green's GreenPoint standards are used for all new buildings, regardless of type or size. Commercial and industrial buildings that are 2 300 m² or more must meet LEED's

Silver standard. Residential developments of 10 or more units are to meet the basic LEED certification standard or achieve 50 points under the GreenPoint rating system. Housing structures that are 23 metres or more high are required to meet basic LEED standards. Starting in 2012, commercial and industrial buildings of 1 000 m² or more and residential buildings that are 23 metres high or more must meet LEED Silver standards.

Additionally, this local government response has set a number of goals: to reduce per-person energy use by



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NORTH AMERICA**San Jose, California, United States: Green building standards (contd.)**

50 per cent, receive 100 per cent of electrical power from clean, renewable sources, divert 100 per cent of the waste from landfill and convert waste to energy, and recycle

or beneficially reuse 100 per cent of wastewater (about 380 000 m³ per day).

Source: ICLEI USA 2012

New York City, United States: Planning for adaptation in a mega-city with ageing infrastructure

New York City's water system is likely to be confronted by several challenges linked to climate change. These will affect its water supply and both the effectiveness and physical infrastructure of its wastewater system. The New York City Department of Environmental Protection (NYCDEP) is responsible for managing the city's water supply as well as its sewer and wastewater treatment systems. The department's US\$17 billion, 10-year capital plan gives an indication of its size.

In 2004, NYCDEP initiated a Climate Change Task Force, which examined the water and wastewater systems' vulnerabilities to climate change. Released in 2008, NYCDEP's

Assessment and Action Plan is the first major output of its work as part of the Task Force. Potential adaptation measures include continuing to aggressively protect the city's water supply; reducing water demand and increasing redundancy, for example through greater water-use efficiency and maximized use of existing infrastructure to address the projected rise in temperature and seasonal drought as well as the anticipated growth in population; upstream flood control; reduced inflows to sewers and wastewater plants; protection from storm surge and sea level rise; and design improvements for wastewater treatment plants.

Source: SWITCH 2011c

Portland, United States: Urban Growth Boundary

Portland's Urban Growth Boundary has long been studied in urban planning discourse, yet this method of ensuring sustainable urban development has never been a more prescient learning tool for local policy makers around the world. Infill, retrofits of cities, brownfield site develop-

ment and the prevention of urban sprawl are the chief initiatives in preventing unsympathetic development and land degradation, and in reducing pollution.

Source: ICLEI 2012k

Canada: The Quebec and British Columbia carbon taxes

In 2007, Quebec became the first North American state or province to introduce a carbon tax. Energy companies are required to pay US¢0.8 for each litre of petrol distributed in Quebec and US¢0.938 for each litre of diesel fuel. Compared to other jurisdictions this tax rate is very low.

The revenue-neutral carbon tax in British Columbia is much more ambitious. Rate increases were phased in, starting at a modest US\$10 per tonne of CO₂-equivalent in 2008, rising at a rate of US\$5 a year to US\$30 a tonne in 2012. The tax's revenue neutrality is achieved by allowing tax reductions for businesses as well as for poorer sections of society, which also receive payments. The comprehensive tax applies to all emissions from fossil fuels, accounting for approximately 70 per cent of the province's

total emissions. Emissions from fossil fuels exported from British Columbia are exempt. In 2010, the tax began to apply to biodiesel as well. The new tax did not seem to have significant political repercussions – the provincial party that introduced it was re-elected.

Addressing drawbacks typically associated with carbon taxes may have enhanced its acceptability. This includes mitigating or eliminating the potentially regressive nature of carbon taxation, with comprehensive coverage combined with targeted tax reductions, and reducing potentially large adaptation costs for carbon-intensive industries through a gradual phase-in of the tax.

Source: UNEP 2012

WEST ASIA

Abu Dhabi, United Arab Emirates: Integrated coastal zone management

The coastal zone in Abu Dhabi is facing rising demand for socio-economic and cultural activities as a result of increasing urbanization, tourism and zoning for industrial development. With this in mind, the Urban Planning Council developed the Plan Abu Dhabi 2030, an integrated long-term plan that recognizes the importance of terrestrial and marine environments with a strong emphasis on integrated coastal zone management. It recommends specific action, including the establishment of urban development boundaries, setting aside critical areas and designating non-development zones, protecting coastal landscapes and other sites of value by redirecting development, and preventing the fragmentation of habitats.

The Coastal Management Committee, which was established by the Abu Dhabi Executive Council, has been taking steps to reconcile the needs of different users through an integrated master planning approach to coastal zone management. A new Maritime Strategy was set up and Coastal Development Guidelines with spatial zoning for Plan Abu Dhabi 2030 were completed in coordination with the Abu Dhabi Urban Planning Council. This highlights important habitats for protection including hotspots within the Al Gharbia district. Measures include reviewing existing legislation relevant to coastal area management, and the use of environmental impact assessments.

Source: Abu Dhabi Urban Planning Council 2007

Masdar, United Arab Emirates: A carbon neutral city

Masdar, a city which will spread over an area of approximately 6 km², is a new clean-technology development that will place those companies involved in its construction at the heart of global renewable energy and cleantech industries. To be located 16 km outside the centre of Abu Dhabi, Masdar aims to become a zero-carbon city on the basis of a variety of policies. Firstly, passive buildings, smart building management and orientation and energy-efficient performance lie at the heart of its planning and design. Secondly, its energy management will be founded on the most up-to-date and innovative efficiency techniques available in conjunction with stringent building guidelines to minimize energy consumption for heating

and cooling. All electricity generation will be from renewable sources, particularly photovoltaics and solar-tube collectors for domestic hot water. A 10-megawatt photovoltaic plant is currently being developed, the biggest in the Middle East, and will be connected to the Abu Dhabi power grid.

Currently, all energy requirements for Masdar's construction are being met by on-site renewable energy production. Once the city is fully developed, however, 80 per cent of its energy requirements will be generated off-site, but still from renewable sources.

Source: Masdar 2011

Al-Karak, Jordan: Integrated agricultural management

The main objectives of the policy in Al-Karak are to:

- arrest land degradation and optimize the long-term productive capacity of land and water resources;
- improve the income of vulnerable farmers, especially women, through active participation;
- safeguard and upgrade the productive potential of natural resources and enhance returns;
- prevent soil degradation, restore soil fertility and promote efficient use of soil and water;
- strengthen the capacity of local technical and managerial staff; and
- meet the needs of local farmers.

Technical and financial support is provided to:

- build soil and water conservation structures and improve agricultural production;
- encourage tree planting;
- enhance sustainable land and water management practices;
- promote rural microfinance to support on- and off-farm activities;
- build cisterns and dams for water harvesting;
- improve animal husbandry;
- maintain springs and irrigation canals; and
- construct small reservoirs, known as *hafira*, to retain run-off for later use.

WEST ASIA**Al-Karak, Jordan: Integrated agricultural management (contd.)**

Local communities have benefited from the newly vibrant agricultural sector through processing local products and having better access to financial services. Some 5 350 households have benefited from the various soil and water conservation measures, while spring protection and/or rehabilitation programmes alone have benefited about 1 000 households. The improved agricultural extension services are estimated to have reached about 22 300 households, and the provision of loans and support for developing alternative income-generating activities have benefited more than 5 000 women and landless farmers.

These investments in soil and water conservation have reduced, and will continue to reduce, the degradation of the fragile ecosystems in the project area. They will also improve vegetative cover, reduce run-off and soil loss, improve soil fertility, and enhance sustainable use of the natural resource base. The project has raised awareness about the impacts of land degradation and desertification while improving farmer's livelihoods, diversifying income sources, and alleviating both poverty and out-migration.

Source: UNEP 2012



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CONCLUSIONS

Local governments play a crucial role in supporting national governments in implementing multilateral environmental agreements (MEAs) and facilitating the transition of cities' economies to a green urban economy, as well as setting more ambitious sustainable development goals and targets. The contribution of local government to meeting goals and targets is crucial and deserves recognition.

Findings from *GEO-5* reinforce the importance of setting measurable goals and targets to effectively monitor progress and advance the sustainability agenda. Goal-setting arenas at the international level include not only public institutions such as the UN system but also civil society groups and private-sector associations, as well as local authorities. Global goals need to be complemented by synergized regional, national and local goals, as well as concrete national action plans.

Local governments respond to international and national framework conditions. National governments need to agree on ambitious targets and make relevant commitments. In implementation, national and state governments have to be locally responsive. Higher tiers of government need to respond to local needs by amending institutional, procedural or other arrangements, and by providing the kind of legal, technical, or financial support and incentives required on the ground.

Some of the examples in this report illustrate the commitment of local governments within enabling frameworks supported by higher tiers of government. State and national governments can set the conditions for successful and effective replication and up-scaling. However, the examples also show that local governments have expanded their actions and responses to local challenges towards ever more integrated and holistic approaches, often in isolation from national government policies, underlining the increasing awareness and understanding of the multiple interdependencies of the human and Earth System at the local level.

In the absence of goals, targets and national directives, local governments can and have taken action to support the development of such national-level objectives. Local governments play an important role in showing what can be done and providing examples for replication and up-scaling.

Organizational, institutional, legal and political structures and processes that promote planning and implementation are needed to prevent environmental degradation and build urban and community resilience – the infrastructure decisions made today will influence the ability of communities to move

towards sustainability for decades to come. Local governments have to be provided with the necessary conditions and capacities from national or regional governments' enabling frameworks. It is vital that their potential is recognized, supported and facilitated.

GEO-5 highlighted that innovative responses are an opportunity for cooperation – messages that resonate with the examples provided from local governments. Responses at the local, national and international levels interact and generate incremental, structural and transformational change. As there is no universal solution to environmental degradation, a range of tailored responses is required to reflect the diversity of regional needs. In areas of common global concern, however, coordination, participation and cooperation are critical for jointly meeting internationally agreed goals and targets, while also addressing the capacity deficits in a range of countries.

Insights from *GEO-5* for cooperation include the need to:

- engage society at all levels in defining a vision of sustainability;
- identify policies that are unsustainable and redirect or reverse them;
- enhance the role of leverage – a successful transition will require a diverse array of measures that strengthen a sustainability mindset in society through education and awareness raising;
- change the rules and incentives to advance sustainable practices;
- create feedback loops and make adjustments in the physical processes and structures of organizations to keep environmental pressures at acceptable levels;
- implement adaptive management to enable governments and other entities to improve capacity for managing complex transition processes through continuous monitoring, learning and course correction to reduce the costs of not meeting internationally agreed goals;
- invest in a combination of technology, governance and management measures, while developing and promoting sustainable consumption and production patterns.

Humanity's future is critically dependent on the capacity of individuals, local governments, countries and the international community to respond to environmental changes that increase risks and reduce opportunities for the advancement of human well-being. Through a global consensus on the way forward, the potential of local governments can be maximized.



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