



WWF

SUMMARY

A satellite image of the Earth at night, showing the continents of North and South America. The landmasses are covered in a dense network of yellow and white lights, representing urban areas and infrastructure. The oceans are dark blue. The image is taken from a high angle, showing the curvature of the planet.

# URBAN SOLUTIONS for a living planet

# LEARNING TO LIVE IN CITIES FOR A ONE PLANET FUTURE

For the first time in human history most people live in cities. Smart, efficient cities can provide a vibrant and higher quality of life with a smaller ecological footprint. Cities are the epicentre of sustainable development.



PHOTO: LEUNG CHO PAN

## Cities are important

It is now an urban world: cities are home to more than half of the world's population.

Nearly all population growth over the next 30 years will be concentrated in urban areas according to estimates. The UN projects that by 2050, 80% of the world's population will live in cities. Urbanization is happening fastest in Asia and Africa. By 2030, all developing regions will have more people living in cities than rural areas.

In the big picture, urbanisation is new. In 1800, less than 5% of the world's population lived in cities. Today cities are home to over 70% of Europe's and North America's populations. This represents a fundamental change in our relationship with the environment.

## Sustainable development means quality of life

Sustainable development means doing more with less. It means using smarter systems to get more quality of life with less environmental impact.

Sustainable development means less pollution, noise, and congestion – and more parks, cycleways, footpaths, waterways and trees. Sustainable development means having walkable neighbourhoods and conviviality – lively social and cultural life replacing atomized suburbs.

Sustainable development means more local economies, development and employment, and environmental technology transitions.



PHOTO: REBECCA DAVIS

## Cities have abundant opportunities to reduce the total footprint

The average city dweller has a larger ecological footprint than a non-city dweller, largely because they tend to be wealthier and consume more. But within cities there are substantial opportunities for eco-efficiency gains.

Well-run cities can significantly reduce their footprints while keeping constant or raising the quality of life. For example, mass transit and cycling can offer similar commuting times as cars but on a smaller footprint. Using district heating instead of a basement furnace provides the same heating with a smaller carbon footprint.

Cities can be cultural and economic centres with a low per capita footprint. The sustainable development pilot project BedZED in London offers housing and lifestyle amenities comparable to those of other neighbourhoods. But thanks to sustainable design practices, the per capita ecological footprint in BedZED is half that of the typical Londoner. BedZED, and a growing number of developments like it, demonstrate that improved technology and design can provide a similar lifestyle with half the environmental load. Cities can provide an attractive lifestyle with a small footprint.





## Cities can – and must – be the centres of change

Cities have strong abilities to learn and innovate – and competitive pressures to do so. People and resources gravitate to sustainable urban centres of innovation that provide long-term opportunities and a high quality of life.

City planning is complex. Creativity and determined effort, supported by good science, networks and stakeholder participation, are all critical requirements for sustainable urban development.

Municipal governments have enormous leverage: to push transitions to renewable energy, to protect natural resources, and adopt technologies that provide residents with high quality of life on smaller ecological footprints.

## Cities and biodiversity

Cities impact biodiversity directly and indirectly. Biodiversity comes under threat primarily through habitat loss, over-harvesting of wild plants and animals, pollution, climate change, and invasive species.

Cities directly pressure biodiversity when greenfield and brownfield zones are developed. Infrastructure projects – aqueducts, power plants, or roads, for example – can also lead to habitat fragmentation and loss.

Indirect pressure on biodiversity stems from demand for food, energy, and materials. Thereby, population size, technologies used, and levels of consumption are key predictors of a city's impact on biodiversity.

Greenbelts, preserving natural parks and waterways, land trusts, anti-sprawl regulations, and a focus on protecting wild areas are ways cities can safeguard natural areas for enjoyment and ecosystem services today and in the future.



PHOTO: MARTIN HARVEY / WWF-CANON

## Cities are well positioned to be sustainability leaders

As cities grow, they have greater responsibility for protecting the local and global environment. Building standards, transport systems, and waste management have major environmental impacts along with other urban systems.

Much of the growth in urban populations will be taking place not in the world's mega-cities but in small and fast-growing cities. Diffusing good practices to this large group of fast-growing cities is decisive. They are in a strong position to achieve eco-efficiency.

One of the biggest challenges to good environmental stewardship is the entrenched vested interests in outdated technology. Sustainable development sometimes demands a paradigm shift, such as moving from fossil fuel, or from road toward rail. These shifts need good governance and mediation among economic interests, given the potential for employment and green growth. Legacy special interests can compete against the long-term vitality of the city. Good governance means providing leadership for sustainable economic development.



PHOTO: PER SUND





PHOTO: PETER RAHTJE

## Good stewardship rewards itself

Well governed and well designed cities are more sustainable along every dimension. Responsible decisions for humanity and the environment pay for themselves. Consider water sanitation, safe transport or air quality. There are self-reinforcing cycles – positive or negative – connecting ecological sustainability with economic and social sustainability. A healthy environment attracts people to cities and encourages investment at all urban scales from neighbourhood to region. Inclusive urban solutions where competing interests are well mediated will also be more sustainable than urban divides, with their vicious spiral effects of urban social, environmental and economic degradation.

Green development means greater efficiency – getting more goods and services at less environmental cost – and this is another way that sustainable development pays for itself.

## Problems can be complicated. But solutions propagate quickly



PHOTO: ULF GRÜNBAUM / AZOTE

Cities are complex systems with many interlinkages and feedback cycles. Problems arising in this complex system can easily multiply. For example, fleeing urban air pollution to live in suburbs only multiplies the problems – with increased air pollution, social division, energy and climate unsustainability.

But solutions can multiply too. Planning for a high quality urban centre with clean air supports more energy-efficient mass transportation and housing forms. Water treatment that safely recycles energy and nutrients from wastewater is economically, environmentally and socially more sustainable.

## WWF works for sustainable cities

WWF is increasingly giving attention to urban sustainability. It has become clear that working with cities is critical for the aims of sustainable global footprints and conservation of biodiversity. Conservation goals are deeply linked with production and consumption patterns, in turn largely driven by urban societies' demand. WWF recognises that cities have strong opportunities to reduce global footprints – and thereby reduce biodiversity impacts – with sustained or increased quality of life, through better design and participation for sustainable development.

This has inspired WWF's current work to study and catalogue real examples of how cities make sustainable choices in terms of global footprints and nature conservation. The challenge is to switch rapidly to sustainable pathways by learning from real cases.

WWF's study in progress of some 100 learning cases provides the basis for this booklet. It highlights key learnings about cities, human needs and ecosystem functions: air, water, food, nature and green space, energy, housing and buildings, accessibility and mobility, consumption, waste management and sinks, and climate regulation.



# CITIES AND ECOSYSTEMS: LEARNING CASES

Many of cities' basic needs depend on nature: air, water, food, energy, climate regulation, sinks for waste absorption and more. Other city needs like housing, consumption, and mobility have potentially huge impacts on nature, depending on how cities make choices.

To understand how cities can have sustainable footprints and can support biodiversity, we can begin with these key impact categories. How can cities manage their water? What forms of energy can a city choose? What are the consequences of these choices?

The 10 urban needs categories presented here – air, water, food, nature, housing and buildings, accessibility and mobility, energy, consumption, waste management and sinks, and climate regulation – each connect with the others in countless ways. Wise choices for water, for example, have positive effects on the sustainability of energy, air quality, food, etc. Interlinkages are a key theme in the most inspirational case studies presented here.

Everything is connected. Many world-leading systems for sustainable urban life have begun with that insight.





# AIR QUALITY TOUCHES MUCH



Air quality is a top concern for cities for many reasons. Air pollution seriously affects human health and causes economic harm via multiple pathways such as lost productivity. Air quality is also critical for ecosystem functions from forest health to agriculture in and around cities.

Fortunately, governments have powerful leverage over air pollution. Cities can control air quality through regulation and choices over energy and transport systems.

## Rizhao – Clean energy for clean air

Rizhao is leading Chinese cities in switching to solar. Solar water heaters are mandatory. Solar panels are required on all new buildings and all renovated public buildings. As of 2007, 99% of all households in Rizhao's centre, and 30% in its suburbs, were using solar heaters, while 1,000s of homes use solar-powered cookers. Solar cells also power Rizhao's traffic lights and street lamps. Using solar for electricity may have large implications for air quality in China where coal is still extensively used for electricity generation. Rizhao is frequently listed as one of the top ten cities in China for air quality.

## Delhi – Fighting hard for air quality

Delhi used to be one of the world's most air-polluted megacities. But starting in the 1990s the city began an aggressive campaign for air quality including:

- Mandatory conversion of all commercial passenger vehicles (buses, 3-wheelers, taxis) to compressed natural gas (CNG), and requiring catalytic converters
- Requiring low-sulphur fuel
- Closing or relocating over 1,000 of the worst point sources of air pollution

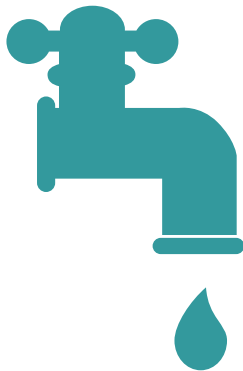
These steps made a large difference, but challenges remain. Poor technology in small CNG engines have thwarted the expected benefits. The rising popularity of diesel passenger cars has also erased some gains. The sheer growth of traffic has also meant that despite strong action, the challenge of clean air in Delhi remains daunting. Yet Delhi is an important example of determined action to improve air quality.

*Air pollution seriously affects human health and ecosystem functions from forest health to agriculture. Governments have powerful leverage over air pollution such as energy and transport choices.*



PHOTO: THOMAS HAUGERSVÆN / WWF NORWAY

# WHOLE-CYCLE APPROACHES



Water holds the biosphere together. So it links many environmental issues: pollution, biodiversity, food, energy, climate regulation and much more. How well we use, manage, waste or pollute water can largely determine the sustainability of our environments.

Water connects many issues in urban systems also. These examples show how a few cities manage their water resources.

## **New York City – Improving water demand management**

Threatened with water shortages New York City sought solutions other than building dams. The city instead used a set of effective methods for reducing water use. Tracking water usage through metering was made mandatory (backed by fines) and achieved near 100% compliance. A leak detection programme was instituted and proved hugely effective, discovering thousands of leaks in the municipal mains. In one year (2003) leak repairs were made that saved 225 million litres of water per day. Finally, a water-saving appliances replacement programme led by the City's Department of Environmental Protection provided incentives to install low-flow toilets and showerheads. The estimated savings are between 190 and 300 million litres of water per day.

## **Stockholm – Closing loops, solving multiple problems**

Stockholm's water treatment strategy aims to turn waste products into useful resources. This could solve an associated range of environmental problems, thereby reducing ecological footprints – and boosting the economic sustainability of water treatment. From sewage is produced biogas, fertilizer and even heat. This reduces greenhouse gas emissions: biogas partly replaces fossil fuels for sewage plant operation, vehicles, heating, electricity production, and fertilizer production. Stockholm's sewage biogas saves 6 million litres of petrol and diesel per year, equivalent to 14,000 tonnes of CO<sub>2</sub>. Its treatment of sludge enables critical recycling of agricultural nutrients such as phosphorus, and reduces the need for landfill. Lower air pollution from energy sources is among additional benefits.

## **Hyderabad – Urban agriculture irrigation with wastewater**

Higher water scarcity due to urban expansion or climate change means that city wastewater is increasingly valued as a consistent, year-round water source for agricultural irrigation. In Hyderabad, India, vegetables, rice, green fodder and dairy products are produced with wastewater irrigation along the Musi River Belt. Its water is classified as wastewater because of hundreds of millions of litres of untreated wastewater polluting it daily. This system does support food security, jobs, nutrient recycling, and biodiverse agriculture. But there are serious problems: wastewater irrigation exposes farmers and consumers to pollutants, including industrial-chemical effluents and pesticides. A key obstacle is the lack of institutional support to address the problems of wastewater irrigation that are often ignored as an uncomfortable reality, connected with weaker social groups.

*Water holds the biosphere together. In Stockholm, water management turns sewage into biogas, fertilizer and even heat, multiply reducing ecological footprints.*



PHOTO: MALENA KARLSSON

# A SALAD OF ECOSYSTEM FUNCTIONS



The basic need for food is deeply interconnected with other human needs and ecosystem services – air, water, waste management, energy, and more. Thus problems in one function tend to multiply into other areas. But solutions also can be multiplied. A growing body of research highlights an extensive range of problems that can be mitigated with practices of urban agriculture and regional food systems.

For example, agriculture near or in cities reduces the need for transport of food. This cuts a city's dependence on fossil fuels including world market prices, and reduces emissions of CO<sub>2</sub> and other air pollutants.

## High local supply of food

Already some 15% of the world's food is supplied by cities. Much higher shares of a city's food needs are provided in some cities' agriculture, e.g. **Havana, Cuba**, forced by oil shortages and malnourishment to rapidly implement urban agriculture, resulting in provision estimated at 40% to near 100% of Havana's vegetable consumption.

Urban agriculture can increase resilience also via high levels of biodiversity, a widely observed outcome possibly due to smaller-scale cultivation by many actors on fragmented patchworks of greenspace. Agricultural resilience and urban food security are also boosted through closed resource cycles: local supply of water, soil and nutrients, i.e. through waste recycling and composting.

## Milwaukee and Growing Power

In Milwaukee, USA, the urban food organisation *Growing Power* uses an approach to food security integrating a range of interconnected benefits. It is a land trust that conserves greenspace and biodiversity, and provides huge volumes of food and soil from compost using only low-cost methods like raised beds, vermiculture, and greenhouse-heating via composting. One closed loop involves aquaculture of Tilapia fish, plants fed by fish wastes, water simultaneously cleaned and circulated. It is also a centre for youth education and employment, and community building. The affordability and accessibility of nutritious food for lower income people in cities are promoted through these symbioses.

## Shanghai – waste fertilises agriculture

On a much larger scale, in Shanghai, waste fertilises urban agriculture. The city has created a green agriculture zone around the city where nutrients from waste are recycled and produce an estimated 50% of the vegetables for Shanghai's 19 million inhabitants. Waste management becomes more sustainable because high percentages of organic material in Shanghai's waste are composted. Shanghai has protected this green ring also to reduce air pollution and protect near-urban greenspace.

*Already some 15% of the world's food is supplied by cities. Much higher shares of a city's food needs are provided in some cities' agriculture, e.g. Havana, Cuba.*



PHOTO: IAKOV FILIMONOV



# ECOSYSTEM SERVICES AND BIODIVERSITY



A wide range of ecosystem services come from the natural spaces surrounding and inside cities. Natural spaces clean the air and water, temper floods, provide water and food, protect biodiversity, increase physical and psychological wellbeing, reduce noise pollution, regulate the local climate, sequester CO<sub>2</sub>, provide drainage, and provide renewable energy. The breadth of ecosystem services provided by nature is often underappreciated.

Competition for space in urban contexts is often intense. Planners must work to preserve natural spaces such as waterways, regional parks, and open space preserves. Nature-friendly land-use planning must feature strong regulation and effective controls. These will be more feasible when they are integrated approaches that account for the multiple uses of land in and near cities.

## Multifunctional habitat networks in Germany

Habitat fragmentation is one of the main negative pressures on biodiversity and healthy ecosystems. Multifunctional habitat networks are focused on reconnecting habitats with high importance areas for nature conservation (e.g. reserves). They are planned for addressing multiple landscape functions simultaneously: air quality, recreation, preventing urban sprawl, climate regulation, agriculture, and forestry. In Germany, multifunctional networks are a major planning theme. The city of Aachen's nature conservation programme "Aachener Revier" is an example of a multifunctional network for a post-industrial landscape – here marked by the aftermaths of mining. The programme combines networked habitats with conservation of ecosystem functions, and is linked to human settlements to encourage recreational use. Another widely recognised programme is the IBA-Emscher Park in the Ruhr Region.

Nature in and near cities takes many forms: parks, green roofs, private gardens, farms, etc. All of these are the focus of a growing body of research that continually updates our understandings of the benefits and problems of each approach. Canberra is another example of planning for large-scale nature around cities. But that vision has had challenges: how to balance thriving healthy wild animal populations with the demands for high-volume road transport. Challenges notwithstanding near-urban habitat networks are certainly a benchmark model for reference and learning.

*Natural spaces clean air and water, temper floods, provide water and food, protect biodiversity, increase physical and psychological wellbeing, reduce noise pollution, regulate climates, sequester CO<sub>2</sub>, provide drainage, and provide renewable energy.*



PHOTO: LINDA MORE

# ENERGY EFFICIENCY FOR SUSTAINABILITY



Improving buildings' energy efficiency is one of the most cost-effective methods for reducing the carbon footprint. Most energy efficiency upgrades pay for themselves through energy savings.

Yet green upgrades to buildings are often not carried out. One reason is that the pay-back period is perceived to be too long. Also, the cost savings from energy efficiency returns to tenants rather than building owners or developers who made the green investments. Berlin is one of a growing number of examples where innovative financing is helping to reward investment. So-called energy efficiency contracts split the savings from energy-efficiency investments between the investor and tenant.

### **Berlin reduced energy costs by 26% with building retrofits**

Berlin has renovated more than 1,300 buildings since 1997 generating 26% savings in energy costs. The renovations have paid for themselves in less than 10 years.

The Alliance for Employment and Environment was formed by city government, trade unions and environmental organisations to renovate more than 300,000 apartments. It included insulation, improved heating and ventilation and the installation of renewable sources of energy. Between 2001 and 2006 this led to investments of more than 10 billion EUR and 140,000 new jobs.

Financing has been one key to the program's success: relieving building owners of investment costs. Renovations are paid for via loans after calculations of expected energy returns. Energy efficiency contracts have become an established model for financing – featured, for example, in the *Clinton Climate Initiative's programme* for urban renovation projects. Berlin's programme has been emulated in more than 20 cities worldwide, including projects in Bulgaria, Chile, Romania and Slovenia.

### **The Merton Rule**

Building efficiency regulation can be modest, practicable and yet impactful. Merton, a borough of London, began in 2003 with a modest rule that all new buildings must have at least a 10% reduction of CO<sub>2</sub> emissions through the use of renewable energies. Compliance is measured with smart meters, and violations carry fines. Developers in Merton have enhanced the renewable energies market by investing in small wind turbines, heat pumps, biomass heating, PV panels, and solar water heaters, among other strategies. Merton's small-steps approach has worked so well that around half of Britain's local authorities now use similar approaches.

*Improving buildings' energy efficiency is one of the most cost-effective methods for reducing the carbon footprint. Beddington Zero Energy Development (BedZED) is an environmentally friendly housing development in Hackbridge, London, England.*



PHOTO: MARCUS LYON / BIOREGIONAL

# FROM A TO B VIA SUSTAINABLE CHOICES



Cities need space – and people need to access the city. But spatial and transport planning are tied together with a range of other vital choices for ecological footprints and nature conservation. How much land will be used, and how much left for nature and agriculture? How much energy will be needed and what energy sources will be used? What kinds of emissions into air, water and soils will result?

### Freiburg – starting with energy sustainability

The interconnectedness of accessibility and mobility with other issues is positively shown by a city that started – earlier than most in the 1970s – with a decision to save energy. Citizens in Freiburg, a German university city of over 200,000 inhabitants, did not want to accept a planned nuclear power station. That first step led to the development of Freiburg as a global first-rank model of sustainable urban life – from leading solar industrialisation, to high quality of life via energy-saving spatial and transport planning. Freiburg sought energy sustainability and identified transport choices and urban sprawl as key factors. Prioritisation of walking, cycling and mass transport (structured on a bus network feeding a clean and quiet light rail system) has gone hand-in-hand with planning for a dense, high quality urban environment controlled by guidelines and master plans. Almost the entire city centre is pedestrianised, one of the strategies that enabled Freiburg to grow mass transport usage by some 50% and bicycle traffic by 100%, but car trips only by 1%, in the 15-year period 1976–1991. In 1999, 50% of all daily trips were walking and cycling. Compact urbanism saves circa 70% of Freiburg's land for forests and other green uses (e.g. water protection).

### Vancouver – urban quality of life

Vancouver's transport achievements also began in the 1970s with popular concern – in this case about the trade-offs between urban highways and quality of life. After banning all new highways in the city, Vancouver pursued a path of urban development that led to a complete reverse of transport trends and to world quality of life top ranking with cities like Vienna, Zurich and Geneva that also boast superb mass transport and highly attractive public realms. Crucial to this success have been intense citizen participation, regional support (e.g. zoning, financing, land grants, etc.), and land development integrated around mass transport that is led by public-private partnerships.

*Cities need space – and people need to access the city. But spatial and transport planning are tied together with a range of vital choices for ecological footprints and nature conservation.*



PHOTO: GALINA BARSKAYA



# CITIES ARE AT THE FRONT LINE of the renewable energy revolution



*Preventing climate change requires a renewable energy revolution. Cities both small and large are leading efforts to transition away from oil and coal to use more solar, wind, and alternative energy, as seen with this wind park in Öresund, outside Copenhagen, Denmark.*

Preventing climate change requires a renewable energy revolution. Cities both small and large are leading efforts to transition away from oil and coal to use more solar, wind, and alternative energy, and to increase energy efficiency.

Urban governance has proved results through strategies like smart metering, building energy audits and retrofits, car-share/cycle-share networks, hybrid and biofuel fleets, adopting LEED (*Leadership in Energy and Environmental Design*) standards for government buildings, and climate-smart green purchasing programmes.

## **San Francisco – Many small steps**

San Francisco and many cities in its metro area have responded to the energy-savings call with hundreds of modest yet meaningful steps. All city building projects must be energy efficient and meet the LEED Silver standard. The city has enabled fast-track permitting for energy-efficient green buildings, and there are rebates for solar- and water-efficient technologies. A green purchasing programme begun in 2005 now covers over 1,000 products. The entire city vehicle fleet, from ambulances to street sweepers, uses biodiesel. City-provided parking spaces help foster car-share networks. San Francisco has one of the highest mass transport riderships in the US, and is moving toward an all-electric bus and streetcar fleet powered by the city's hydroelectric plant. The city also promotes cycling with arterial cycleways, street markings helping cars and bikes share lanes, and bike-friendly traffic-light timing.

## **Cape Town – Selling greenhouse-gas savings on the carbon market**

Cape Town, South Africa, recently completed an initiative to equip 10% of all households with solar water heaters. The *Kuyasa Project* fitted 6,300 homes with solar water heaters, insulated ceilings, and energy efficient lamps. The investment was financed by selling carbon emissions reductions (CER) certificates on the international carbon market through the UNFCCC Clean Development Mechanism. Part of the investment cost was borne by residents, but the new solar heaters mean each household will save approximately USD 100/yr.

## **Baoding– better than carbon neutral**

Baoding, China, is home to more than 200 companies manufacturing photovoltaic panels, wind turbines, and energy efficiency solutions. Growth in those industries has brought thousands of jobs to the city in recent years. The solar panels and wind turbines Baoding exports reduce global GHG emissions more than the city's own emissions add to it, such that Baoding has been estimated to be better than carbon neutral.

As a member of the WWF *Low Carbon City Initiative* (LCCI) Baoding is also working to further reduce its own CO<sub>2</sub> emissions by using its own technology locally: traffic lights and street lights, among other city infrastructure, are powered by solar energy, and solar panels are ubiquitous.



PHOTO: ANDRÉ MASLENNIKOV / IBL

# CITIES ARE MEGA-CONSUMERS



Humanity is today straining the limits of the planet's carrying capacity. Humans are such a successful species that 97% of all vertebrate biomass is humans and their domesticated animals. Over 80% of the land surface area is under direct human influence.

Cities are mega-consumers. They draw in huge amounts of resources from other places. As their footprints spread further and hide in increasingly complex supply chains, cities can unknowingly participate along with the thousands of other cities in creating major environmental harm.

Through informed policies for sustainable consumption cities can address in advance issues of environmental sustainability and global equity.

### **Green Purchasing by the City Government in Vienna**

Local authority government are in a strong position to set a positive example on green procurement. The city of Vienna, for example, has the *ÖkoKauf Wien* ("EcoBuy Vienna") green purchasing program. The city has formed working groups for different product categories to identify concerns and what green purchasing standards to apply. The city has evaluated everything from soap and fire extinguishers to furniture and fleet vehicles. A key feature is a ban on tropical forest products.

### **Meat-free days in Ghent**

Ghent, Belgium, promotes a meat-free day every week (Thursday), an idea now being copied by many other cities like Bremen, Helsinki, San Francisco, Cape Town, and Sao Paulo. Meat consumption is associated with greenhouse gas emissions from livestock and other environmental problems, e.g. water scarcity, and pollutants. Cutting meat consumption has additional benefits for public health and animal welfare. Ghent uses a range of strategies to promote its *Donderdag Veggiedag*. Vegetarian food is the default option on Thursday in schools and municipal lunchrooms. New city maps show where to eat meat-free food, and star chefs have joined the extensive campaign.

*Cities are mega-consumers. They draw in huge amounts of resources from other places. Through informed policies for sustainable consumption cities can address in advance issues of ecological sustainability and global equity.*



PHOTO: PAUL MATTHEW PHOTOGRAPHY

# ON ONE PLANET, WASTES ARE RECYCLED



*On 1 planet we cannot throw stuff away and forget it. It is still there, and can come back in air, water or food. We need to repair, reuse or recycle, and make sure wastes are safely re-absorbed by sinks.*

Given that we have one interconnected planet, we cannot throw stuff away and forget it. It is still there, and can come back in our air, our water, and our food. We need to repair, reuse and recycle, and make sure that wastes are safely re-absorbed by sinks.

Sinks are parts of the environment that can absorb wastes and pollutants. Examples are trees that can absorb pollutants in air and water, forests that absorb CO<sub>2</sub>, and wetlands that absorb urban sewage. The planet's sinks have limits to their absorption.

Waste management is the city's need to deal with its wastes in a sustainable way:

- Reducing flows, minimizing waste.
- Caring for sinks, not overloading them. Rivers, soils, wetlands, trees, and other natural sinks provide waste management services when they are properly functioning.
- Converting sinks into sources. A leading closed-loop solution is using wastes for energy. A wetland can provide food. A recycling centre can provide economic and social benefits.
- Education and eco-citizenship are frequently essential for urban waste management and maintenance of sinks.

### **Curitiba: Garbage that is not garbage**

In Curitiba, Brazil, waste management did not have a budget for a standard recycling plant, so it found a way to turn the negative spiral into a positive one through its programmes *lixo que nao è lixo* (garbage that it is not garbage) and *cambio verde* (green trade). The city created complementary currencies to reward people for separating their organic and non-organic recyclable wastes and bringing them to waste stations where they exchanged these for bus-tickets, food, and school-books. Participation among Curitiba households reached 70% in the 1990s. Curitiba's strategy turned waste into a resource. It also provided large numbers of jobs for previously unemployed people in recycling work.

### **The East Calcutta Wetlands model: integrated wetland systems**

Health risks from untreated wastes are among the most persistent problems for developing world cities. A low-cost, ecosystems-based approach has developed over several decades in Calcutta using aquaculture to treat wastewater. The East Calcutta Wetlands is the world's largest wastewater-fed aquaculture system: 2,500 hectares in a 12,000-hectare waste recycling area, producing 20 tons of fish per day. This closed-loop solution has important requirements: industrial wastes with heavy metals and other toxic substances cannot safely be remediated, nor can fish fed on human wastes be eaten raw. But there are multiple benefits. The city preserves wetlands and biodiversity at the same time as the wetlands provide food and employment.



PHOTO: DIEGO CERVO



# ADAPTATION, RESILIENCE, MITIGATION



Global climate change carries huge risks, for food and water security, for example. Some impacts will be felt distinctly at the city scale, such as extreme weather events like heatwaves, floods, storms, landslides, and droughts. Urban populations are particularly vulnerable to extreme weather events due to their often higher risk locations, on e.g. coasts or slopes. This has led many cities to engage in urgent action, both to mitigate the extent of climate change, and to adapt and become more resilient ahead of climate change.

### **Adaptation: Making Cities Resilient**

Resilience for cities against climate change is a risk-reduction priority associated with positive benefits, because preparation and adaptation are usually constructive for economic, social and environmental goals. This can be seen in the ongoing UN programme *Making Cities Resilient: My City is Getting Ready*, that also features a 1 million safe hospitals and schools campaign. Some 600 cities are already participating in the programme that highlights the essential need for organisational and physical infrastructure, and for the maintenance of ecosystems in and around cities that provide buffers against extreme weather events.

### **Low Carbon City Initiative in China**

Baoding and Shanghai are participating in a pilot project to reduce the urban carbon footprint. WWF's *Low Carbon City Initiative* (LCCI) is a partnership among cities, agencies and businesses aimed at exploring models for green development via energy efficiency, renewable energy, and other initiatives. LCCI encourages technology transfers and other exchanges between China and other countries. Pilot projects in Baoding and Shanghai include eco-buildings, urban planning, energy efficiency in office buildings, energy saving campaigns, networking in knowledge management and technology collaboration. The LCCI contributed in 2008 to China making the concept of the *Low Carbon City* a cornerstone for its future environmental operations.

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# Urban solutions for a living planet

Learning to live in cities for a one planet future

## CITIES

Cities are the epicentre of sustainable development. Working with cities is critical for achieving sustainable global footprints and conservation of biodiversity.

## BIODIVERSITY

Cities impact biodiversity directly and indirectly through their lifestyles and consumption patterns.

## ECOLOGICAL FOOTPRINTS

Smart, efficient cities can reduce footprints while raising quality of life.

## INNOVATION

Cities have strong abilities to learn and innovate – and competitive pressures to do so.

## STEWARDSHIP

Well governed and well designed cities are more sustainable along every dimension. Good governance rewards itself.

## SYNERGIES

Urban problems multiply – so can solutions. Many world-leading systems for sustainable urban life have begun with that insight.



### Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

[wwf.se](http://wwf.se)

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