POCACITO

european post-carbon cities of tomorrow

STRATEGY PAPER

SHARING EU URBAN SOLUTIONS AND TECHNOLOGIES WITH NON-EU AND EMERGING CITIES

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no. 613286.

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Manuscript completed in June, 2015

Document title	STRATEGY PAPER: SHARING EU URBAN SOLUTIONS AND TECHNOLOGIES WITH NON-EU AND EMERGING CITIES
Work Package	WP6
Document Type	Deliverable
Date	11 June 2015
Document Status	Final Version

ACKNOWLEDGEMENT & DISCLAIMER

The research leading to these results has received funding from the European Union FP7 SSH.2013.7.1-1: Post-carbon cities in Europe: A long-term outlook under the grant agreement n°613286.

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AB	Advisory Board
CA	Consortium Agreement
CC	Consortium Committee
DOW	Description of Work
GA	Grant Agreement
PCG	Project Coordination Group
PO	Project Office
WP	Work Package

I INTRODUCTION

The aim of this strategy paper is to show how experiences from EU post-carbon cities as well as urban technologies can contribute to developing post-carbon cities, especially in non-EU emerging countries. The report therefore screens urban sustainability plans in selected emerging countries and then assesses where planned solutions match with EU best practices. The paper assesses which technologies, processes or policies can be transferred to cities in emerging countries.

Cities in Europe are often smaller than megacities in the US and China or other parts of the world. Also, Europe's urban population is largely accumulated in small- and medium-sized cities. Thus, cities in Europe significantly differ from cities located in other areas of the world (European Commission, 2013).

Nevertheless, there are many cities in Europe which are regarded as being successful in, e.g. providing a high quality of life, efficiency, cleanness and prosperity. Technologies, processes or policies implemented in European cities which are considered successful may therefore be shared with cities of non-EU and emerging countries and a greater effort to identify and exporting such technologies, policies and processes should be made (European Commission, 2013). This paper therefore aims to make an attempt in this direction.

II THE CHALLENGES OF POST CARBON CITIES

II.I THE ROLE AND CHALLENGES OF CITIES TOWARDS A POST-CARBON SOCIETY

In a post-Kyoto context with no global and legally binding international climate agreement likely to be agreed upon anytime soon, bottom-up initiatives to mitigate greenhouse gas emissions will be of critical importance. According to Bloomberg (2014), cities are likely to play an important role as they have significant mitigation potential. "*The need to deepen the ambition of national emissions pledges from current pathways to ones consistent with limiting warming to 2 degrees Celsius has sometimes been called the emissions gap*"(Bloomberg, 2014, p.12). According to Bloomberg, 2014 urban action may play a strong and important role to close the gap as Figure 1 shows (the difference between the blue and dotted green lines), thus by at least 10% in 2030, and by approximately 15% in later years, if construction of sustainable urban infrastructure continues. Greater reduction is possible if cities strongly focus on strengthening sustainable urbanisation actions such as controlling electricity supplies and distribution networks, controlling transport modes, promoting low carbon-lifestyles (e.g. product purchasing, food consumption , etc.) or controlling waste water treatment (Bloomberg, 2014).

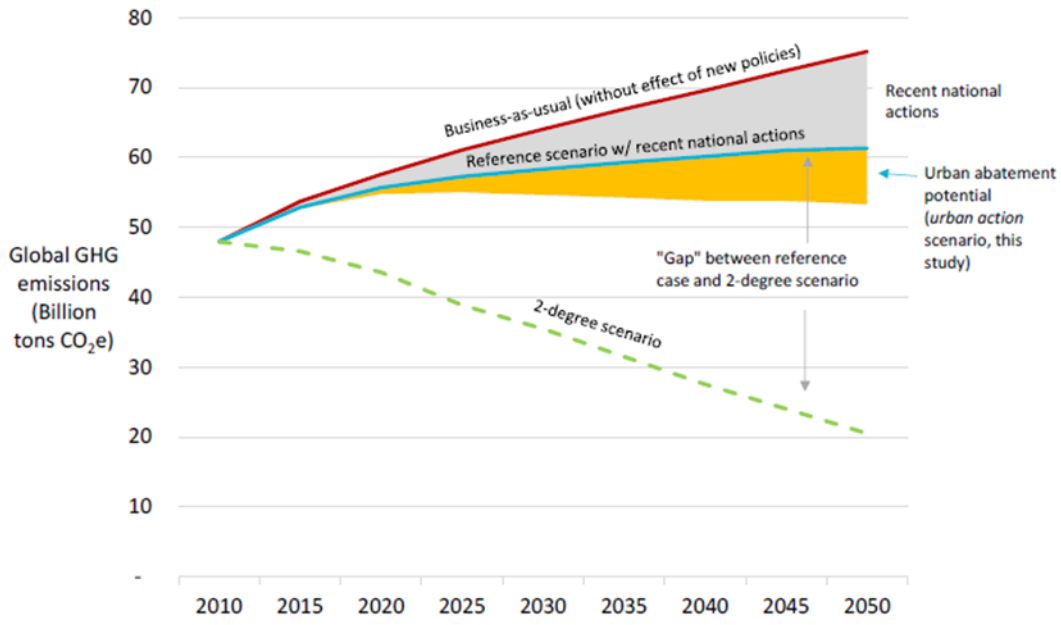


Figure 1: Global GHG emissions until 2050 (Bloomberg M. R., 2014)

The World Bank report "cities and climate change: an urgent agenda (2010)" emphasises that the infrastructure of 2050 is being built today, but the world of 2050 will be very different. The report states that urban population will increase by about another two billion citizens, thus mostly of whom which are likely to be stressed by urban challenges such as food and water scarcity, health, education and employment opportunities (World Bank, 2010). As stated by the World Bank (2010), 80% of world's energy production is consumed in cities. As development proceeds, the World Bank (2010) also concludes that greenhouse gas emissions will be more and more driven by the energy services required for lighting, heating and cooling as greenhouse gases emitted by industrial activities will decline. Estimates of the International Energy Agency (IEA) which are cited in the same report, currently account for over 67% of emitted greenhouse gases being linked to energy-related activities. This percentage is also expected to increase to 74% by 2030 (World Bank, 2010).

Also, in 2014, the number of residents in urban areas has been surveyed as much higher than in rural areas. In 2014, 54% of the world's populations are settled in urban areas, thus accounting for about 3.9 billion people. In comparison, in 1950 the percentage of the world's population living in urban areas has been surveyed as 30%, and is estimated to reach 66% in 2050 (about 6.3 billion people) (United Nations, 2014).

According to the United Nations (2014), from a geographical perspective, North America (where 82% of the population lives in urban areas) followed by Latin America and the Caribbean (80%) as well as Europe (73%) are home of the most dwellers living in urban areas (2014 values). In contrast, only 40% of Africa's and 48% of Asia's population live in urban areas. However, in contrary to the other regions, urbanisation in these areas is much faster. As the urban population of the world is expected to increase by more than two-thirds by 2050, nearly 90% of the increase is projected to take place in the urban areas of Africa and Asia (Figure 2) (United Nations, 2014). Thus, it is estimated by the United Nations (2014) that the percentage of the population living in urban areas will increase up to

56% in Africa and 64% in Asia until 2050. Also as stated by the United Nations (2014), although the percentage of the population living in urban areas in Asia is much lower than in North America, Latin America and the Caribbean, and Europe, 53% of the world's urban population is aggregated in this region. In contrast, only 14% of the world's total population is aggregated in Europe. Thus, in past decades, the world's largest cities have been located in more developed regions. Today's mega cities on the contrary are more aggregated in developing regions of the global south (United Nations, 2014).

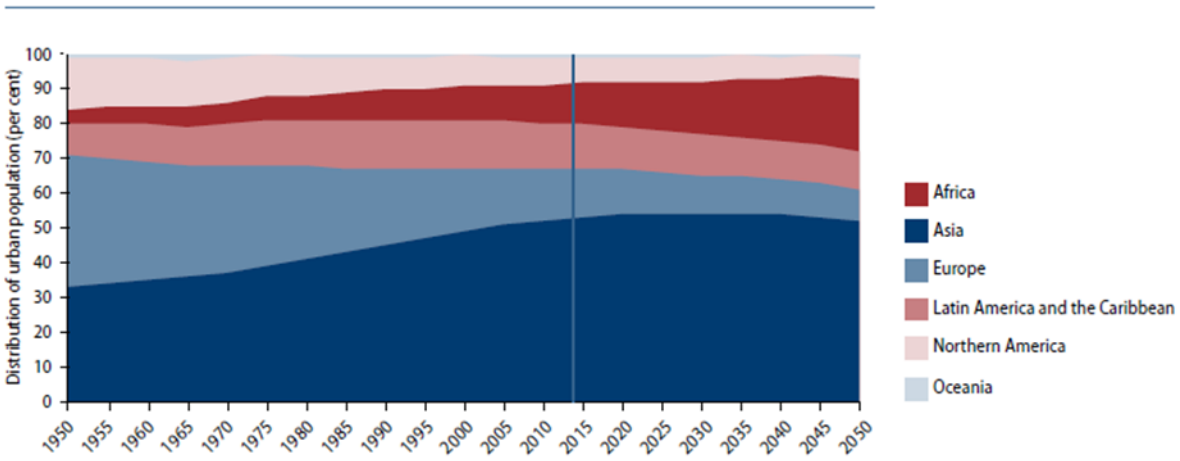


Figure 2: Global distribution of urban population among continents, where Asia will continue to host nearly one half of the world's urban population (United Nations, 2014)

Thus, different social and economic framework conditions, geographical circumstances, and levels of urbanisation, among others, are leading to slightly different urban challenges for different regions, although they are likely based on similar urbanisation trends (United Nations, 2013). Based on data from the Department of Economic and Social Affairs of the United Nations (2013), the following passage tries to highlight the varying urban challenges of cities located either in developing or developed regions.

In developing regions, fast growing cities are challenged by an increase in additional resource needs as well as the need for capacity development in local governments. Access to main public services such as, e.g. electricity, water, sanitation, health care, etc., needs to be provided for all dwellers, which still remains low in cities, especially in low- and middle-income regions. This is making access to public services one of the main challenges of growing cities in emerging regions. On the contrary, in developed countries where access to public services for city dwellers is comparatively high, efforts are directed towards increasing the efficiency of energy and water use as well as waste reduction and the enhancement of recycling systems. This is based on the fact that, although wealthier cities may have better functioning resource systems than cities in developing regions, wealthier populations mostly have higher resource needs, resulting in a larger ecological footprint in cities located in developed regions (United Nations, 2013).

Thus, facing urban challenges in emerging countries calls for increased investment in infrastructure, such as roads, water, sewers, electricity, and services including as schools, public transportation and

health care, whereas urban challenges in developed countries call for increased investment in, e.g. renewable energy, buildings, improved electricity and water efficiencies. Waste reduction and enhancing recycling systems are key issues for urban areas throughout the world, regardless of whether they are located in a developing or developed region (United Nations, 2013).

According to United Nations (2013) financing such investments is also quite different in developing and developed regions. Whereas poorer cities depend on international cooperation as well as on additional resources to support green technology adaption or provide access to different kinds of public services, richer cities need the right policies to be implemented in order to promote investment in actions such as renewable energy deployment or enhanced efficiency in resource use (United Nations, 2013).

The next section, based on United Nations (2013), shows the most significant urban challenges in more detail with regard to sustainability, thus comparing the impact of these challenges on cities in developed (such as European cities) and developing regions.

SOCIOECONOMIC INEQUALITIES

According to United Nations (2013) socioeconomic inequalities in a city lead to inequalities in, e.g. access to basic services, job opportunities, etc. This is mainly a big issue in cities in developing countries where most dwellers do not have sufficient access to basic public services. Therefore, the gap between rich and poor tends to be much higher than in cities in developed regions. (United Nations, 2013)

SPRAWL AND WEAKENED CAPACITIES

Rising sprawl in urban areas leads to a larger increase in the carbon footprint of cities. Sprawl mostly emerges when richer citizens decide to live on the outskirts of a city where they can have bigger homes, private cars, etc. This is mainly an issue in cities in developed regions. Weakened capacities are mainly an issue for small cities located in developing countries as they mostly have very weak economies and insufficient communication with more economically dynamic cities, thus making it difficult for them to provide adequate access to public services for all citizens. (United Nations, 2013)

ENERGY ACCESS

Developing regions of low- and middle-income countries are often lacking access to public services, including access to energy/ electricity (United Nations, 2013). Also, if energy access in such regions is ensured anyhow, it is mainly based on cheap and “dirty” technologies such as, e.g. wood and charcoal for cooking. Such use of cheap fuels is linked to increased deforestation, pollution and health risks, making energy access a multiple challenge in sustainable development (United Nations, 2013). According to United Nations (2013), especially in growing cities located in developing regions, where increasing urbanisation often leads to an increase in “poor” dwellers, providing access to “clean” modern energy services is gaining importance. However, such cities do not often have enough capacity or financial resources to respond this challenge (United Nations, 2013). The Department of Economic and Social Affairs of the United Nations (2013) also estimated that there

are about 680 million people in developing regions who do not have access to modern energy services.

Richer cities, already having access to energy/ modern energy services, on the contrary, are facing the challenge to reduce energy inefficiency and wasteful energy consumption and to increase the share of renewable energy technologies, in order to push further sustainable development (United Nations, 2013).

IMPACTS OF NATURAL HAZARDS

Generally, natural hazards linked to climate change have increased in the last decades, not only in intensity, but also in frequency. Most natural hazards have occurred in developing regions where the number of persons affected and human lives lost tend to be much higher than in developed regions (United Nations, 2013). According to the United Nations (2013), in the last years, middle-income countries such as China, India, Indonesia, the Philippines and Vietnam have been mostly affected by floods and storms. Cities located on the coastline of Africa and South, East and South-East Asia have been affected by sea level rise, flooding as well as salt intrusion in river flows and ground water, which impact clean water quality (United Nations, 2013). Another example stated by the United Nations (2013) shows that cities located near glaciers have suffered from glacier melting, which affects hydroelectric production and the water supply of those cities.

Besides the highlighted urban challenges above and the different effects on cities in developing and developed regions, there are various other main urban trends, which may lead to different urban challenges in different regions. Table 1 below summarises a few specific main urban trends and corresponding challenges for cities in developing as well as developed countries (based on Department of Economic and Social Affairs of the United Nations, 2013).

According to the EEA (2012), climate change is also strongly linked to other socioeconomic changes. For example, regional water scarcity has been identified to be steered by demographic trends, such as on-going urbanisation and competing water demand from the public and sectors, such as industry and agriculture. Also, the EEA (2012) stated that an aging population increases the number of people vulnerable to heat waves. Increasing urbanisation endangers natural flood management by decreasing natural flood zones and increasing the number of homes and business actually located in flood-prone areas. Thus, the EEA (2012) concludes that, under current climate conditions, the socioeconomic changes described above increase the vulnerability of people, property and ecosystems. Climate change and not undertaking any adaption measures are projected to intensify these issues (EEA, 2012).

Table 1: Varying urban challenges for cities in developing and developed regions (United Nations, 2013)

MAIN URBAN TRENDS	CHALLENGES	
	Developing regions	**Developed regions**
	SOCIAL	
By 2025, the urban population will live mainly in small cities (42%) and medium-sized cities (24%)	Improve access to housing, water, sanitation; improve public infrastructure; foster institutional capacity	Social cohesion
Number of people living in urban slums continues to grow	Reduce number of urban poor and disease risk; improve social cohesion; reduce youth unemployment	Reduce urban unemployment due to economic crises (of youth in particular); provide adequate housing in poor neighbourhoods
Inefficient use of public services (water, electricity)	Improve waste and recycling management; support consumption of local produce; change overconsumption patterns of high-income households	Change overproduction and overconsumption styles; improve waste and recycling management
Ageing	Create productive employment for older persons	Fiscal pressure to reduce health costs; improve productivity
	ECONOMIC	
Inequality and financial fragility	Create policy space for inclusive development; reduce underemployment; promote economic diversification	Reduce unemployment; boost economic growth; strengthen international cooperation
Food insecurity	Improve access to food; increase productivity	Reduce food waste
	ENVIRONMENTAL	
Energy access	Provide access to clean energy and reduce use of “dirty” energy in poor households; discourage high-energy consumption in high-income households	Reduce overproduction and overconsumption to sustainable levels
Climate Change adaptation	Reduce impact on livelihoods; reduce carbon emissions; generate financial resources for adaptation	Upgrade disaster risk prevention systems; reduce carbon emissions to sustainable levels, reducing urban heat island effects

Source: Department of Economic and Social Affairs of the United Nations Secretariat (United Nations, 2013)

III EU EUROPEAN AND INTERNATIONAL CITY INITIATIVES/NETWORKS

A Climate Summit for Mayors was convened in December 2009 during COP 15 in Copenhagen. This was the first time that a large group of mayors convened to discuss climate change and it sent a strong signal that cities are at the forefront of climate change mitigation and adaptation actions. The Summit for Mayors was organised jointly by the city of Copenhagen, C40, and ICLEI: 79 cities participated with 67 mayors and deputy mayors. Since then, the Summit for Mayors convenes frequently in different locations.

Additionally, in 2010, the Europe 2020 strategy for smart sustainable and inclusive growth was approved by the European Council, thus highlighting the role of regional and local authorities in contributing to the 2020 strategies target achievement. A commitment to promote the development of smart cities throughout Europe was incorporated within this strategy (Manville et al., 2014, European Commission, 2011). As a result, several programs, plans and networks such as, e.g. the European Partnership on Smart Cities and Communities, the European Strategic Energy Technology Plan and the topics of the EU Framework Programme for Research and Innovation (Horizon 2020) have been established incorporating the relevance of smart cities and thus triggering the development of various smart city initiatives within Europe. According to a recent study of the European Parliament (Manville et al., 2014), 51% of EU28 cities with ≥ 100,000 residents have already proposed or implemented smart city initiatives. City initiatives are mostly focusing on smart environment and smart mobility.

Below, a few examples of European low-carbon and sustainable city initiatives are introduced, followed by a few important international low-carbon and sustainable city networks that trigger sustainable and low-carbon city development, not only at the European level, but also at a global scale.

III.I EUROPEAN INITIATIVES SUPPORTING SUSTAINABLE CITY DEVELOPMENT

III.I.I COVENANT OF MAYORS

The Covenant of Mayors describes itself as “the mainstream European movement involving local and regional authorities, voluntarily committing to increasing energy efficiency and use of renewable energy sources on their territories” (Covenant of Mayors webpage, 2014). The movement was launched in 2009, just shortly after the 2008 EU Climate and Energy package was decided, and aims to promote local authorities in implementing sustainable energy policies. By signing the Covenant of Mayors, signatories (cities of various sizes) voluntarily commit to meet and exceed the European Union’s CO_2 reduction target of a 20% cut in CO_2 emissions by 2020. Thus, the main focus of the Covenant of Mayors is to contribute to climate change mitigation via actions adopted at the local level and raise awareness of climate change mitigation among local authorities, local stakeholders, and local citizens as well as local elected representatives (Covenant of Mayors webpage, 2014) In

fulfilling their commitment, signatories have to prepare a "Baseline Emission Inventory" that quantifies CO_2 emissions and must submit a "Sustainable Energy Action Plan" within a year after signing the Covenant of Mayors. In addition to the main target of reducing CO_2 emissions, other co-effects arise from progress in city development under the Covenant of Mayors city initiatives. Among them are the creation of skilled and stable jobs, the prevention of delocalisation, the creation of a healthier environment, greater energy independence, enhanced economic competitiveness, etc. (Covenant of Mayors webpage, 2014).

As signatories do not always have the possibility to realise planned energy efficiency and renewable energy related actions in order to fulfil their commitments, self-contained public administrations as well as networks that are in a position to offer support have received a special status within the Covenant of Mayors (Covenant of Mayors webpage, 2014). As stated on the movement's webpage (Covenant of Mayors webpage, 2014) Covenant Coordinators (provinces, regions, national authorities) assist signatories in strategic, financial and technical challenges. Covenant supporters (network of local authorities) maximise the impact of initiatives via, e.g., promotional assistance and experience sharing. Covenant coordinators and supporters, in turn, are assisted by the Covenant of Mayors Office, which is managed by a consortium of experienced city networks led by Energy Cities (Covenant of Mayors webpage, 2014).

As stated by the Covenant of Mayors webpage (2014), lately, the number of signatories from non-European countries, including signatories originating from EU neighbouring countries from Eastern Europe, the Southern Caucasus and Central Asia, has increased. In response, the East Office of the Covenant of Mayors has been established. The East Office receives funding from DG Development and Cooperation of the European Commission, thus enabling the provision of sufficient assistance to these signatories in the implementation of energy efficiency and renewable energy planning to fulfil their commitments under the Covenant of Mayors (Covenant of Mayors webpage, 2014). Currently, in addition to EU28 and EEA countries, the Covenant of Mayors covers eleven countries in Eastern Europe, the Caucasus region and Central Asia, and ten countries in Maghreb-Mashreq. Furthermore, the Covenant of Mayors is also used in the framework of the EU-China Urbanisation Initiative + ECLINK project as well as for relations with India (Covenant of Mayors webpage, 2014).

The latest data show that already more than 6,000 signatories (about 190 million citizens) have joined the Covenant of Mayors initiative; of those, about 4,000 have already adopted a Sustainable Energy Action Plan (Covenant of Mayors webpage, 2014).

Source/Webpage: www.covenantofmayors.eu

III.I.II URBACT

URBACT, which is jointly financed by the European Union (European Regional Development Fund) and Member States, aims to enable numerous European cities to collaborate in developing solutions to counteract urban challenges (URBACT webpage, 2014). Thus, it works as a European exchange and learning platform for European cities to achieve sustainable urban development. Via URBACT, good practices, solutions and experiences should be shared among cities and lessons should be learned from participating cities, which can then be adapted to each city's own context (URBACT, 2014a). According to the initiatives webpage (URBACT webpage, 2014), URBACTs duty in this process lies especially in coordinating exchanges, analysing and capitalising on learning, disseminating

information and outputs as well as funding project operations, thus enabling an exchange of knowledge between all stakeholders involved in urban policy throughout Europe. Currently about 500 cities from 29 different countries are URBACT members (URBACT webpage, 2014).

From 2014, URBACT will start its third round. URBACT III will last from 2014 to 2020 and it will cover all of the 28 member states of the European Union as well as Norway and Switzerland. The URBACT III programme is coordinate in focusing on four main objectives (URBACT, 2014b):

- Capacity for Policy Delivery: cities capacity improvement (to manage sustainable urban policies and practices in an integrated and participative way)
- Policy Design: improvement of the design of sustainable strategies and action plans in cities.
- Policy Implementation: improvement of the implementation of integrated and sustainable urban strategies and action plans in cities
- Building and Sharing Knowledge: to ensure that practitioners and decision makers at all levels have increased access to knowledge and share know-how on all aspects of sustainable urban development in order to improve urban development policies.

All of URBAN III activities will be built upon the strengths developed in URBACT II.

Source/Webpage: urbact.eu

III.I.III REFERENCE FRAMEWORK FOR EUROPEAN SUSTAINABLE CITIES (RFSC)

In response to the signing of the "Leipzig Charter on Sustainable European Cities" by the European Ministers responsible for urban development in 2007, the Reference Framework for European Cities (RFSC) was established in 2008 (RFSC webpage, 2014). The aim of creating the RFSC was to take the aim and recommendations of the Leipzig Charter to improve policy-making on integrated urban development and put them into practice. Through close collaboration among Member States, European institutions and European organisations representing cities and local governments, the RFSC came out as an online toolkit designed to assist cities in promoting and implementing urban sustainable development (RFSC webpage, 2014).

By offering a city assessment with characteristics and features from existing actions to promote sustainability, the online tool starts by assisting the city in characterising its current situation regarding sustainability. Various tools and questions guide the user (politicians, city managers, planners, citizens, businesses, etc.) in reviewing and reflecting on their previous approach to sustainable development and lead to questions and tools that assist in adopting an integrated urban development approach (RFSC webpage, 2014). The RFSC offers indicators and visualisation tools that may help monitor the progress of a city as well as document its sustainable development. Thus, the RFSC should also work as a platform for European cities, local authorities and professionals to exchange experiences and good practices in order to assist each other in achieving sustainable city development (RFSC webpage, 2014).

In doing so, the Reference Framework for European Sustainable Cities is not place-specific, which means it can be used as an open and flexible instrument, adaptable for the needs of each city. It leaves it to the user to pick and choose what suits their political, geographic, economic, environmental and social situation. It can thereby also be used by a lot of different kinds of users:

from small as well as large cities, intermunicipal bodies, territorial institutions, stakeholders and urban or territorial institutions, among others. It is free of charge for all possible users (RFSC webpage, 2014).

Source/Webpage: www.rfsc.eu

III.I.IV EUROPEAN SUSTAINABLE CITIES & TOWNS CAMPAIGN (AALBORG CHARTER, AALBORG COMMITMENTS)

The European Sustainable Cities & Towns Campaign was launched in 1994 in Aalborg, DK as part of "Aalborg Charter" of the time (European Sustainable Cities & Towns Campaign webpage, 2014). According to the European Sustainable Cities & Towns Campaign, the "Aalborg Charter" as an urban environmental sustainability initiative, was the outcome of the first conference on European Cities & Towns. Inspired by the Local Agenda 21 (United Nations action plan with regard to sustainable development), it was developed to follow the European Union's Environmental Action Programme "Towards Sustainability", which was established in 1993. The "Aalborg Charter" was thereby divided into three parts: the first covering the consensus declaration of European Cities & Towns towards sustainability, the second addressing the creation of the European Cities & Towns campaign, and the third highlighting the engagement of the initiative in the Local Agenda 21 process. Since then, about 3,000 local authorities from more than 40 countries have signed the Charter (European Sustainable Cities & Towns Campaign webpage, 2014).

In the years after the formulation of the "Alborg Charter", its content has been constantly enhanced and led to the development of the "Aalborg Commitments" in 2004. The aim of the "Aalborg Commitments" was to create a better common understanding of sustainability and to establish a framework to be used at the local level in order to achieve local sustainability. Also, while the "Aalborg Charter" was more declaratory, the "Aalborg Commitments" are more practically based and are able to be used as tools in the strategic sustainability target-setting process (European Sustainable Cities & Towns Campaign webpage, 2014).

According to their webpage (European Sustainable Cities & Towns Campaign webpage, 2014), the European Sustainable Cities & Towns campaign is thereby a bottom-up movement whose mission is to assist knowledge exchange among cities, collect information on local sustainability actions and serve as an interface between the European Union and the local sustainability movements based on the "Aalborg Charter" as well as the "Aalborg Commitments".

Besides the introduced initiatives, there are a variety of other similar smart city initiatives located in Europe. The above introduced initiatives should serve as an overview of European smart city initiative possibilities and give a first picture of EU urban solutions and the direction of their impacts.

III.II INTERNATIONAL NETWORKS SUPPORTING SMART CITY DEVELOPMENT

At the global scale, several networks for urban solutions exist, which feed and support the establishment of sustainable city initiatives globally and thus also at the European level. Below, a few global networks are introduced, which have gained significant popularity all over the world.

III.II.I ICLEI – LOCAL GOVERNMENTS FOR SUSTAINABILITY

The international association ICLEI was found in 1991 with the aim to support cities, towns, and urban regions in their efforts to achieve sustainable development. It was established by local governments from more than 43 different countries at the World Congress of Local Governments for Sustainable Future in New York (ICLEI, 2014). According to their webpage (ICLEI webpage, 2014), ICLEI services include, e.g. technical consulting, training, information services to build capacity, knowledge sharing as well as support in the implementation of sustainable development. ICLEI's mission is to support member cities and local government in achieving significant improvements in global sustainability with a particular focus on environmental conditions through cumulative local actions. All ICLEI programs are voluntary. ICLEI members include more than 1,000 cities of different sizes, located in 84 countries all over the world. The ICLEI World Secretariat is located in Bonn, Germany and is supported by a dozen other regional and country offices. ICLEI is a non-profit membership organisation (ICLEI webpage, 2014).

Source/Webpage: www.iclei.org

III.II.II WORLD MAYORS COUNCIL ON CLIMATE CHANGE (WMCCC)

The World Mayors Council on Climate Change is a partnership of local government leaders aiming to address climate change and related issues of global sustainability (WMCCC webpage, 2014). In parallel to the 11th UNFCCCC Conference of Parties in Montreal and soon after the Kyoto Protocol entered into force, a dozen pioneering mayors developed it in 2005 (WMCCC webpage, 2014). According to their webpage (WMCCC webpage, 2014), the World Mayors Council on Climate Change has more than 80 members. Membership is open to mayors as well as equivalent leaders at municipal levels of government. The purpose of this network of local governments is especially focused on reducing greenhouse gas emissions. The network strengthens political leadership on global sustainability by promoting collaboration among local sustainability leaders and is the prime political advocacy force of cities and local governments on global sustainability matters. The World Mayors Council on Climate Change offers local governmental leaders support in enhancing their climate and sustainability leadership capacities by promoting their climate and sustainability actions to a broad audience. Politically, it also steers the development and implementation of mechanisms that support local climate and sustainability action. The World Council on Climate Change is headquartered in Bonn, Germany (WMCCC webpage, 2014).

Source/Webpage: www.worldmayorscouncil.org

III.II.III C40 CITIES CLIMATE LEADERSHIP GROUP

To address climate change by developing and implementing policies and programs to reduce greenhouse gas emissions as well as climate risks is the main aim of the global network C40 Cities Climate Leadership Group (C40 webpage, 2014). The network consists of various large and engaged cities spread all over the world that are committed to addressing climate change and taking actions to reduce greenhouse gas emissions. Among such cities are, e.g. London, Berlin, Copenhagen, Hong Kong, Seoul, Tokyo, Johannesburg, Buenos Aires, Rio de Janeiro, Los Angeles, Houston, and Jakarta (members of the C40 steering committee, which provides strategic direction and governance for C40)

as well as various other cities worldwide (C40 webpage, 2014). According to their webpage (C40 webpage, 2014), the C40 Cities Climate Leadership Group works as a platform to create and share knowledge supporting sustainable city development. Collaborating cities may connect with each other, share knowledge, technical expertise or best practices on successful policies and programs, drive effective actions on climate change or benefit from C40 research. Thus, the C40 Cities Climate Leadership Group aims to support city governments in implementing meaningful and sustainable-related local actions that will help to mitigate climate change globally. C40 Cities Climate Leadership Group was established in 2005 and is mainly located in New York, London as well as Rio de Janeiro (C40 webpage, 2014).

Source/Webpage: www.c40.org

III.II.IV UNITED CITIES AND LOCAL GOVERNMENT (UCLG)

Headquartered in Spain, Barcelona, the international organisation, United Cities and Local Government (UCGL), understands itself to be the "united voice and world advocate of democratic local self-government, promoting its values, objectives and interests, through cooperation between local governments, and within the wider international community" (UCLG webpage, 2014). Thus, the aim of UCGL is to represent and defend the interests of local governments on the world stage. Currently, various cities of different sizes are members of this organisation and profit from activities in various areas, including, e.g., activities addressing climate change, urban sustainability, urban strategic planning, etc. The organisation was founded in 2004 and has worked since then as an umbrella organisation for cities, local governments, and municipal associations throughout the world (UCLG webpage, 2014).

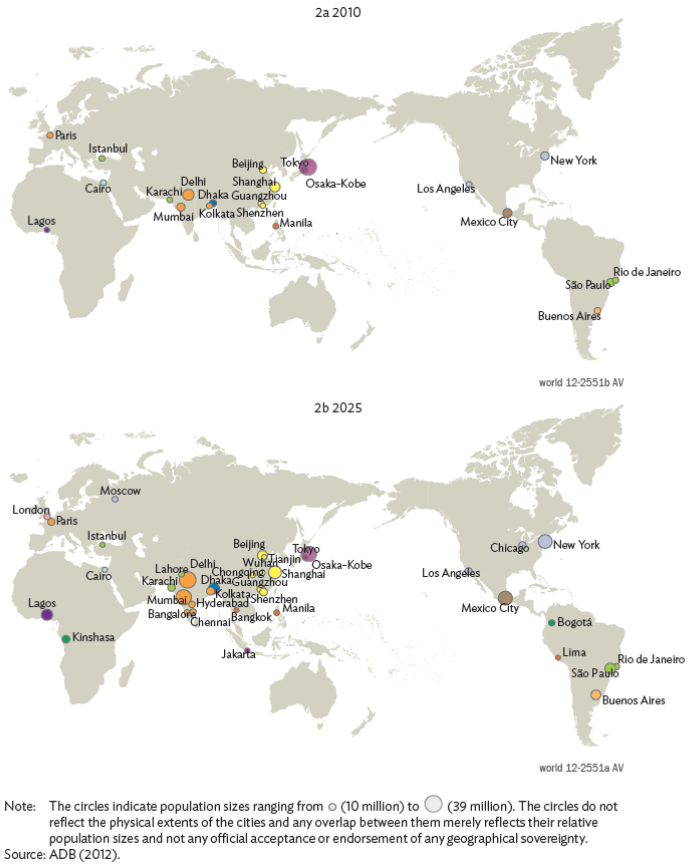
Source/Webpage: www.uclg.org

IV OVERVIEW AND SYNTHESIS OF EMERGING COUNTRIES' PLANS AND TECHNOLOGY NEEDS

As already stated in the previous chapter, current population growth as well as urbanisation is seen to mainly occur in the world's emerging regions. According to Jelili (2012) this is also projected to continue in the future. By 2030, the world's developed urban regions (Europe, Australia, Japan and North America) are expected to have their populations stabilise. By this same year, cities in developing regions are estimated to host 80% of the world's total urban population. Additionally, developing countries are expected to account for 93% of the world's urban population increase in the 21st century (Jelili, 2012). As a consequence, cities in these regions are expected to be under significant pressure to achieve sustainable as well as liveable development in the future. Sustainable technology and planning needs for cities in emerging countries must also be met in order to be able to sufficiently react to ongoing challenges.

Figure 3 below gives an overview of projected world megacities (cities with a population exceeding 10 million) development in 2025, which is expected to mainly occur in developing regions (Asian Development Bank and Inter-American Development Bank, 2014).

Figure 3: World's megacities, 2012 and 2025



Note: The circles indicate population sizes ranging from ○ (10 million) to ◯ (39 million). The circles do not reflect the physical extents of the cities and any overlap between them merely reflects their relative population sizes and not any official acceptance or endorsement of any geographical sovereignty.
Source: ADB (2012).

Source: Asian Development Bank and Inter-American Development Bank (2014)

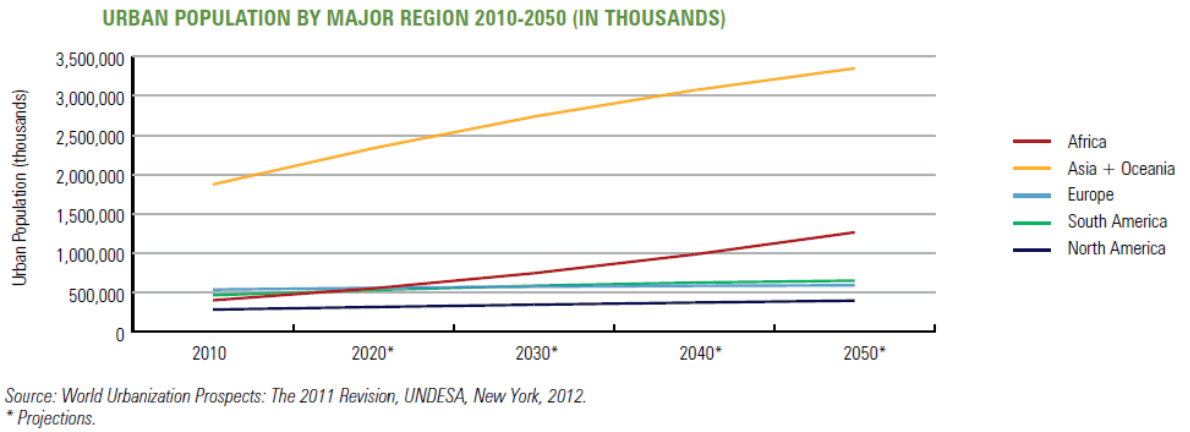
Figure 3 also clearly displays that the main centres of megacity development by 2025 will occur primarily in the developing regions of Asia and Latin America, but also in Africa. The following text describes in more detail city needs and sustainable development plans to address the main underlying challenges of these three regions. This chapter provides an overview and synthesis of emerging country plans and technology needs in response to urban challenges occurring in Africa, Asia, and Latin America.

IV.I URBANISATION IN EMERGING COUNTRIES OF AFRICA, ASIA AND LATIN AMERICA

The underlying urbanisation development in the regions needs to be assessed in order to understand the varying technology and policy needs as well as the sustainable city development plans in the observed regions. Similar or varying developments thereby lead to similar or differing plans and needs for different regions. Based on these, European countries can build on transferring proper technologies, policies or processes. Thus, before giving an overview of regional plans and technology needs, current and future urban development in these three regions is briefly introduced.

Figure 4 below gives an overview of urban population by major region 2010-2050. It shows that for 2050, the highest urban population is expected to be found in Asia and Oceania, followed by Africa and South America (United Nations Human Settlements Programme, 2014).

Figure 4: Urban population by major region 2010-2050



Source: United Nations Human Settlements Programme (2014)

The growth rate of cities in Africa is one of the highest in the world. The global share of the urban population is expected to rise to approximately 20% in 2050, meaning that around 1.26 billion urban dwellers will be living in African cities at that point in time. Also, over one-quarter of the world's 100 fastest growing cites are currently located in Africa. The highest population increase is thereby expected to happen in middle- and small-sized cities. (United Nations Human Settlements Programme, 2014)

As seen in the figure above, Asia already has the highest urban population in the world, which expected to remain constant in the future. To date, half of the world's megacities are located in Asia (12 out of 21). As in Africa, the highest population increase is expected to take place in middle- and small-sized cities in Asia. Latin America is the second most urbanised region in the world (after North America) and currently has the highest urbanisation rate in the developing world (Asian Development Bank and Inter-American Development Bank, 2014).

V EXPORTING URBAN BEST PRACTICES AND TECHNOLOGIES

This chapter aims to assess which urban technologies and best practices could potentially be exported from the EU to emerging countries. It acknowledges that beyond technologies, concepts, plans, regulations, policies and experiences from the EU can be of great interest to emerging countries.

V.I TECHNOLOGIES

There is a range of technologies in which the EU has the know-how that aligns with the needs and plans of emerging countries. The selection of the technologies includes mostly technologies where the EU has a potential competitive advantage, not only in respect to emerging countries, but also other industrialised countries such as the US or Japan.

Particular technologies that the EU could export to emerging countries include:

- Low-carbon buildings (incl. passive houses)
- Bioenergy technologies
- Waste water treatment
- Urban logistics decentralised off-grid renewable energy projects
- Adaptation technologies (e.g. mitigation of urban heat islands etc.)

V.I.I LOW- OR ZERO-CARBON BUILDINGS

As stated by Zeiss (2014) the European Union is a pioneer in improving the energy efficiency in buildings. Already in 2002, the Energy Performance of Buildings Directive (EPBD) was presented by the European Commission. Under the EPBD, energy certification schemes for buildings had to be introduced and building regulations in general needed to be upgraded by all EU member states. In the meantime, the European Union introduced a new Energy Efficiency Directive (EED), thus imposing legal obligations for all EU member states to establish energy saving schemes. This new directive is known as the EPBD recast (Zeiss, 2014).

According to Zeiss (2014), within the new directive, the EU is also especially focusing on "nearly zero energy" buildings. "Nearly zero energy" buildings are defined as buildings generating, on average, energy from renewable that is equal to the amount of energy annually consumed. Under the new Energy Efficiency Directive, new buildings (except public buildings) need to be designed to be close to nearly zero energy consumption by 2020/2021 at the latest. Public buildings, however, need to be close to nearly zero energy consumption already by 2018/2019 (Zeiss, 2014).

Currently, the most important policies in the field of energy efficient and sustainable buildings are urban heating targets. As China, for example, has a need for knowledge and experience regarding energy auditing, energy efficient processing/ machineries and green buildings development, it may highly benefit from foreign (e.g. European) expertise in energy efficient buildings (EU SME centre, 2011).

V.I.II URBAN LOGISTICS AND INTELLIGENT TRANSPORTATION SYSTEMS

Urban logistics are becoming increasingly important in the EU and a couple of best practices are already available such as London, Lyon or Malmö (Konstantinopoulou, 2010). "*U urban logistics are the part of the supply chain process that plans, implements and controls the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption in order to meet customer requirements"* (Konstantinopoulou, 2010, p.6).

In order to avoid negative effects of urban freight transportation in city centres, concepts of city access restrictions have become more and more important. As a consequence, many cities introduced various forms of "access control schemes" (Konstantinopoulou, 2010). According to CITYLOG (2010) such "access control schemes" aim to restrict certain types of traffic by predefining areas during specific time spots (time restrictions/ time delivery windows, weight and size regulations, environmental zones, night deliveries and lorry lanes).

Smart technologies and "Intelligent Transport Systems (ITS)" in particular are key enablers for urban mobility planning and the EU is gaining know-how in this area, which may be relevant for emerging countries. They support policy makers in achieving their policy objectives and managing concrete traffic operations. They also help end-users by providing them with informed choices on mobility. Improvements are gained due to rerouting of traffic in rush hours or based on random incidents on the highway system. Also global positioning systems for tracking and communication will be expanded in future. Currently, such systems are already used by trucking firms and package delivery companies to track vehicles and parcel flow. In the future, global positioning systems are planned to be widened for providing information during accidents thus helping to reroute vehicles more efficiently. Also, automated vehicle location, automated bills of lading and electronic vehicle tagging will become a task of such systems. Thus, global positioning systems of the future will help to enhance freight transport within cities (Konstantinopoulou, 2010).

V.I.III WASTE WATER TREATMENT

The EU also belongs among global leaders when it comes to waste water treatment technologies. The five largest global companies in the water treatment sector are from the EU (EPEC, 2011). In the EU, demand drivers in the waste water treatment industry include the Water Framework Directive, Drinking Water Directive, and the Urban Wastewater Treatment Directive.

According to EPEC (2011), waste water treatment includes the

- Treatment of water and wastewater for microbial and chemical contaminants (e.g. filtration, chemical disinfection, advanced oxidation)
- Monitoring of water quality for microbial and chemical contaminants (e.g. labs, test kits, probes and analysers); Wastewater treatment plants will increasingly adopt secondary or tertiary treatment processes.
  Sludge treatment, which was only incorporated into the water treatment process by the end of 2010 and lags behind sewage treatment

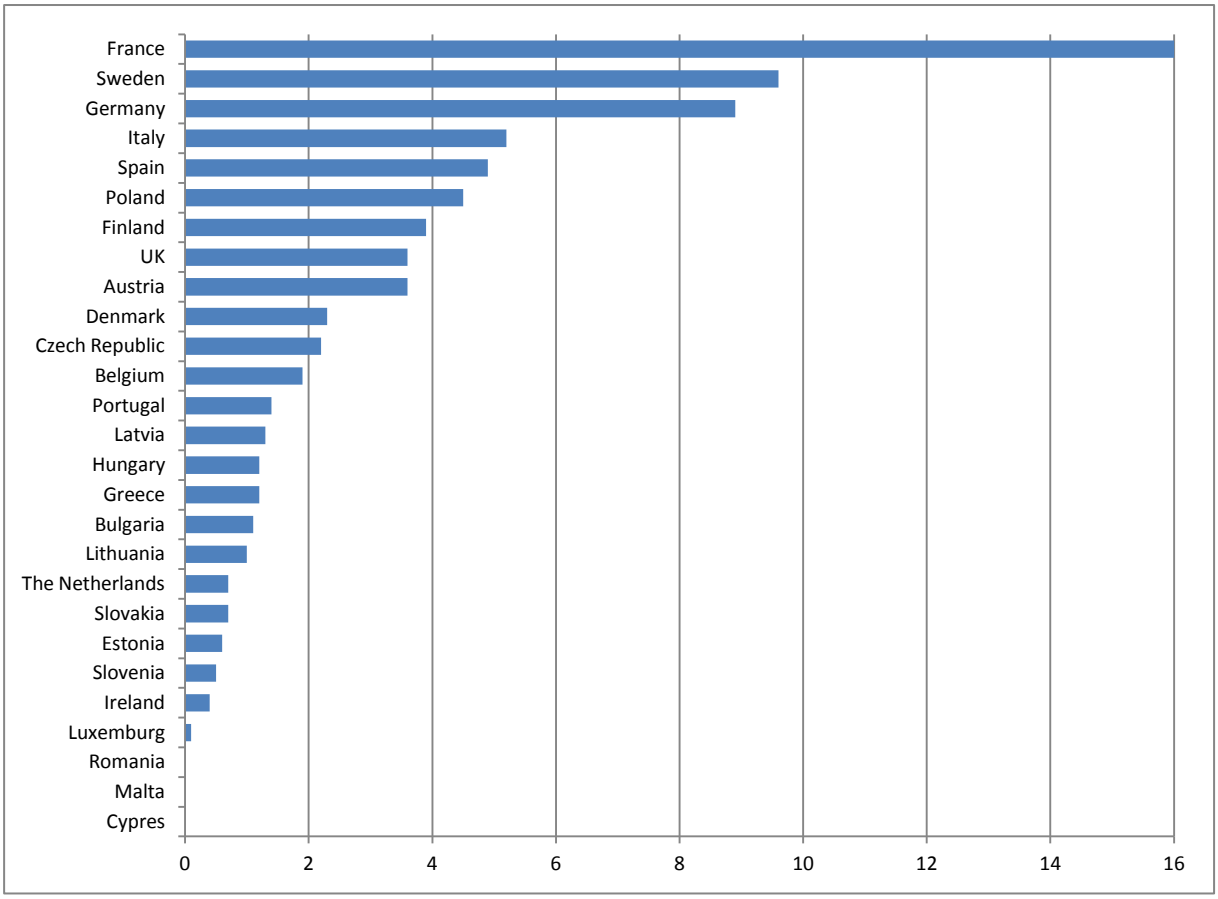
A large export market for EU technology providers can be found in China (EPEC, 2011). Almost all urban areas in China are either already constructing wastewater treatment facilities or planning to do so in future. Large projects are especially being planned or already constructed in cities such as Beijing, Tianjin, Chongqing, Guangzhou, Shenzhen and Liuzhou. Also, as wastewater treatment plants of the last decade mostly do not have facilities for sludge treatment and disposal, China is also experiencing issues in dealing with municipal waste water sludge, where EU technology could be used in future (Canada's Pacific Gateway, 2008).

V.I.IV BIOENERGY TECHNOLOGIES

European companies developed a wide range of bioenergy technologies in the last years, which are fully able to compete on the world market. These include (EREC, 2007):

- Heat-market technologies (mainly residues from forestry operation and from wood processing such as log-wood, wood chips, pellets, etc.). In the very near future, all types of agricultural residues will be able to be pelletised.
- District heating technologies
    - The fundamental idea of district heating is to connect multiple thermal energy users through a piping network to environmentally optimum energy sources, such as combined heat and power (CHP), industrial waste heat and renewable energy sources such as biomass, geothermal and other natural sources of heating and cooling. Some countries, particularly in Scandinavia, show a significant penetration of district heating of over 50% of the heat market. However, district heating has still only a small fraction of the total heat market of the European Union (EU).
- Co-generation of heat and power and trigeneration (heating, cooling, power) based on solid, gaseous and liquid biomass, is the simultaneous generation of electricity and heat.

According to IEA ETSAP (2010), technologies, such as CHP based on biomass, waste and biomass co-firing in coal fired power plants, are also rapidly growing. As example, IEA ETSAP (2010) stated that in Germany, biomass-based CHP grew about 23% per year from the period of 2004-2008. New plants are thereby especially characterised by high performance steam parameters and efficiency. Depending on the type of fuel, the capacity of biomass CHP plants varies considerably: from tens of kWe up to a few MWe electrical capacity regarding biogas anaerobic digesters and from few MWe to 350 MWe capacity for biomass-fired CHP plants (IEA ETSAP, 2010). Also, small- and medium sized CHP plants are in contrary to larger plants mostly based on locally available biomass. Larger and coal/biomass co-firing power plants are more likely to depend on imports (IEA ETSAP, 2010). As Biomass CHP plants are already market ready, biomass integrated gasification combined cycles (BIGCC) are just entering the market as the industrial demonstration phase is almost finished. Advantages of such biomass integrated gasification combined cycles (BIGCC) would thereby include high technical and economic performance (IEA ETSAP, 2010). Such new improvements of CHP technologies (BIGCC as well as trigeneration) are emerging technologies in the EU, which have high potential to be exported to non-EU regions or other countries of the world, thus regarding its advanced steam parameters as well as its high efficiency (IEA ETSAP, 2010).



Source: Statistics Austria, 2011

Figure 5: National targets for solid biomass energy use for heat generation within the EU (here given in kt oil-equivalents)

Figure 5 shows that in some EU countries, significant amounts of biomass are used for heating purposes. The EU has developed corresponding technologies over the last 15 years that could be exported to emerging countries.

According to the IEA (2011), biomass co-generation has already become an important source of co-generated electricity in various countries. Its share in co-generated electricity is thereby mainly depending on local circumstances such as the size of the local forestry industry, etc. Thus, in Europe, countries such as Finland, Norway, Sweden and Switzerland are having the highest proportions of biomass co-generation in co-generated electricity.

In some countries, biomass co-generation already represents a significant share of co-generated electricity — a trend that may reflect local circumstances. As biomass resources are abundant in countries that have a large forestry industry, it is expected that such countries should have the highest proportions of biomass in the fuel mix for co-generation. These include Finland, Norway, Sweden and Switzerland. According to the EREC (2007) report, the EU expects to export bioenergy technology to countries such as China, Brazil and India in the short-term as well as Asian countries such as Indonesia, Central and South American countries and the Caribbean region in the medium-term.

V.I.V CLIMATE CHANGE ADAPTATION TECHNOLOGY AND SOLUTIONS

In the last year, urban adaptation has gained attention in the EU. For example, cities have started to prepare for an increased frequency of flooding, etc.

Options for adaptation measures are thereby numerous. They may be either linked to technological and engineering projects ("grey measures"), ecosystem based ("green measures") or linked to behaviour, management and policies ("soft measures") (EEA, 2010).

According to EEA (2013), within the European Union already all three types of adaptation measures have been introduced thus resulting in know-how of the EU in all three categories, whereas especially expertise in "grey" measures has been gained. To effectively adapt to climate change, however, combining all three types of adaptation measures is seen as most effective. To doing so, territorial and physical planning have to be integrated (EEA, 2013).

Coming back to the example of adaptation measures linked to preparing for an increased frequency of flooding, in various EU member states, "room for the river" concepts have been implemented. Those concepts aim to give more room for river overflows in specific areas and can be realised via different actions such as e.g. lowering floodplains, relocating dykes or allowing artificially reclaimed land to be re-submerged (EEA, 2013).

V.II PROCESSES

In the EU, a string of bottom-up dynamics to implement low-carbon measures in cities was visible that, in the case of the "Covenant of Mayors", was triggered by a top-down dimension. Latest data show that with already more than 6,000 signatories (about 190 million citizens), the Covenant of Majors showed how important it is that decisions are also made at the local level, a level where measures are being implemented and have to be supported. The bottom-up activities and instruments proved to be flexible and were adaptable for each city's own needs. A similar dynamic could emerge in emerging countries in which there are democratic decision making processes.

In January 2015, European policymakers said the Covenant of Mayors should go global and the EU could remain a leading example (Covenant of Mayors webpage, 2014). Additionally, there are other European initiatives such as URBACT that enable know-how transfer within the EU and could serve as a model for other regions of the world.

V.III LIMITS OF TRANSFERABILITY

Transferability and the export of technologies depend on technological, political and socioeconomic preconditions in the host countries. The building stock, for example, may be very different across countries. Also, technological solutions proven in the EU may not be sufficiently useful in other cultural contexts. In the case of decentralised solutions, political top-down governance structures may hinder their implementation.

In recent years, transferring policy and operational measures for transport and urban development between cities have increased significantly, thus also within Europe. Driving force for this increase in Europe among others have been various EU-funded projects and networks (e.g. ICLEI). Experience

gained within Europe may thereby be used in expanding transfer across Europe's boarders to cities located in other regions of the world and backwards. Effective policy transfer is thereby strongly dependent on existing framework conditions such as technological, economic, political and cultural conditions. These framework conditions may thereby also differ per region and city – therefore, the approach to policy transfer needs to be adapted accordingly (Gyergyay & Boehler-Baedeker, 2014).

VI OVERVIEW OF EMERGING COUNTRIES' LOW-CARBON CITY PLANS AND COMPARISON WITH EU STRENGTHS

VI.I OVERVIEW OF EMERGING COUNTRIES' LOW-CARBON CITY PLANS

Within the POCACITO project, a survey of selected emerging countries' low-carbon and sustainability plans and projects was made. Details can be found in chapter IX: ANNEX – CITY PROJECTS. This chapter gives a brief overview and compares the focus areas with the EU's strength in urban technologies and solutions.

Table 2: Areas and technologies targeted in low-carbon city plans for selected emerging countries (based on chapter IX: Annex – City Projects)

COUNTRY	AREAS AND TECHNOLOGIES
China	Technology needs in China span over many different areas. Chinese cities are demanding not only *more efficient energy and waste water use, sustainable transport systems that reduce congestion and an increase in energy efficient buildings,* but also for sustainable urban design in many other areas. Low-carbon technologies are therefore a key topic in Chinese sustainable urbanisation which include: • *low-carbon buildings* • *low-carbon transportation* • *low-carbon lifestyles* • *sustainable development of urban industrial economy* • *urban public services system* • *urban infrastructure investment* • *solar driven lighting systems* • *green energy schemes* • *etc.* A future key topic of Chinese sustainable urbanisation is to increase *energy efficiency in buildings*. Energy efficient buildings may highly contribute in

COUNTRY	AREAS AND TECHNOLOGIES
	achieving non-industrial carbon emission reductions. Reducing CO_2 emission in the non-industrial sector in China is quite important as industry continues to decrease and China's service sector increases, thus resulting in the need for carbon emission reductions in the non-industrial sector. As a growing service sector highly demands for new office buildings, energy efficiency in buildings may help to contribute to the reduction of carbon emissions in future.
South Africa	Various low-carbon technologies are included in South Africa's low-carbon city plans. Actions especially cover: • *sustainable building projects* • *"greening the city" programmes* • *energy efficiency activities* • *low-carbon transport and* • *water and waste management actions* In the area of "greening the city" programmes, various actions have already been implemented, which cover actions linked to establishing urban agriculture as well as greening roofs and expanding green areas. In the area of sustainable building projects, actions linked to the use of low-carbon materials such as ensuring energy efficiency through a greater use of natural lights, ventilation and improved insulation of hot water pipes, walls and roof spaces have been favoured. With the exception of Johannesburg, most South African cities are lacking in the implementation of sustainable transport activities. In general, low-carbon technologies implemented in South Africa must be straightforward and cheap to implement.
India	Indian cities generally demand *basic services as well as a sufficient and affordable transportation infrastructure.* Thus, key topics of low-carbon and sustainability plans primarily cover actions regarding: • *affordable housing* • *clean water access* • *the improvement of essential urban infrastructure (e.g. water and sanitation) as well as* • *sustainable transportation offers* However, there are also sustainable urbanisation projects linked to: • *renewable energy development* • *waste water collection and* • *solid waste management*

COUNTRY	AREAS AND TECHNOLOGIES
	Low-carbon strategies of Indian cities are therefore present into all sectors of urban planning and development.
Philippines	Local city initiatives are focusing especially on sectors such as *infrastructure, spatial planning, energy, water and waste management with* a social development aspect for poverty reduction. Another key topic for cities is to *increase public transportation* and the *use of alternative fuels* while simultaneously reducing the use of private cars. Projects currently in the planning stage or already implemented are focusing on activities such as: • *increasing renewable energy facilities* • *construction of waste-to-energy plants* • *enhancing eco-business* • *retrofitting municipal buildings, streets, parks and households with efficient light bulbs (CFL light)* • *increase sustainable transport (rapid bus transit systems, E-tricycles)* • *increasing urban gardening and urban farms* • *etc.*
Indonesia	To keep up with expanding cities and growing demand in Indonesia, increased *housing, water, commercial building and transportation infrastructure* is required. Thus, many city projects in Indonesia focus on activities such as *low-carbon and sustainable transportation*, *energy, waste and water infrastructure* as well as general *sustainable urban management programmes*. In particular, improvements in infrastructure are highly necessary. As a result, implemented/planned city plans in Indonesia are focusing on a lot of different specific actions. Among them are e.g.: • *energy, transport and traffic management programmes* • *water and waste management programmes* • *urban policy* • *institutional and capacity development* • *sustainable landscape planning* • *sustainable transportation* • *energy efficiency actions* • *waste to energy conversion* as well as • *improved access to infrastructure, economic and social services* • *etc.*
Vietnam	Vietnamese City plans are taking steps in sectors such as *spatial planning, energy and transportation* as well as *infrastructure development.* Specific

COUNTRY	AREAS AND TECHNOLOGIES
	activities cover e.g.*:* • *energy efficiency programmes* • *sustainable transportation* • *energy efficient building construction* • *expanded access to basic services such as improved drainage waste water collection and treatment services and public transport* • *etc.* City projects also plan to focus on green technologies and green areas while promoting social inclusiveness. Further infrastructure development as well as generally effective and sustainable management of urban services is favoured.
Israel	City initiatives in Israel are working to achieve lower energy use as well as access to basic services. Pilot projects in some cities cover areas linked to: • *sustainable transportation* • *smart lighting* • *city energy monitoring and management* • *wide bandwidth "free Wi -Fi"* • *an information data centre* • *Smart Grid* • *smart water cycle* • *socioeconomical academic researches* and • *adopting international standards* Local as well as imported technologies are being used. Additionally, the following are also targeted in various city plans: • *waste management* • *solar energy and photovoltaic cells on public structures* • *expansion of bike paths* • *power consumption reduction and* • *energy efficiency in lighting and transport* • *etc.*
Brazil	Needs of Brazilian cities cover: *access to basic services, retrofitting of infrastructure, housing availability* and *access to transport networks*. Thus a lot of different sustainable city projects in Brazil focus on actions linked to: • *efficient transport systems* • *waste management* • *sustainable housing* • *sustainable urban planning* • *expansion of green areas and urban foresting*

COUNTRY	AREAS AND TECHNOLOGIES
	• *education* • *flood control* • *energy efficiency actions* • *etc.* However, technologies such as energy efficiency or general energy based technologies are not yet frequently included in city plans. Thus, the implementation of such technologies is strongly required in the future.

All examined countries are focusing on sustainable transport, access to basic services, urban infrastructure enhancement, "greening the city" projects and water and waste management actions. The distribution of other specific technologies is highly linked to specific country/city needs. Most of the examined emerging countries are still face enormous problems with poverty and access to basic services. For example, China has already started to focus more on energy efficiency programmes. In other countries, energy efficiency is also advancing, but the focus is still on providing access to basic needs (access to basic services, infrastructure improvements, sustainable transport, housing availability, etc.).

The EU's strength in urban technologies and solutions may benefit the countries that have been examined to help them in implementing efficient, cost-effective and systematic measures in order to achieve specific sustainable urbanisation goals. By examining the needs and focuses of the different countries which have been examined here, similar needs and focuses can be found in other emerging regions of the world. The EU's strength in urban technologies and solutions may be beneficial to these countries as well.

VI.II COMPARING THE EU'S STRENGHTS WITH EMERGING COUNTRIES' LOW-CARBON CITY PLANS

The overview above (Table 2) shows that low-carbon city plans in emerging countries mainly focus on building, urban planning, water and transportation, even if the concrete actions differ by country and city. This partly aligns with EU strengths and best practices and, in principle, opens up the opportunity for technology export from the EU to emerging countries.

Some of the EU's technology strengths are not yet sufficiently considered in emerging country plans, such as bioenergy technologies or adaption. Regarding buildings, energy efficiency measures are an aim of many emerging countries, but this rarely includes zero-carbon buildings. Urban logistics and intelligent transport systems are other areas in which the EU has initial experiences. These may become important issues in emerging countries in the future.

EU strengths are not limited to specific technologies, but also include solutions and successful implementation processes as discussed in the previous chapter that can be a model for emerging countries.

VII CONCLUSIONS

Cities will play an increasing role in future efforts to reduce greenhouse gas emissions and increase sustainable practices as more and more people globally will live in urban areas. Europe is a worldwide leading region regarding urban low-carbon development and climate change adaptation. The EU has initiated successful processes that complement top-down strategies with local bottom-up activities to create dynamic implement measures, one such initiative being the Covenant of Mayors. On a technological level, the EU is leading in several areas such as low-carbon buildings that are mandated by the EU, energy and climate polices, bioenergy technologies, in which the EU has a strong domestic market, waste water treatment, urban logistics, and adaptation technologies. The report shows that low-carbon city plans in emerging countries mainly focus on buildings, urban planning, water and transportation, even if the concrete actions differ by country and city. This partly aligns with EU strengths and best practices and, in principle, opens up the opportunity for technology export from the EU to emerging countries. Transfer of technologies, however, depends on a range of factors including technological, political and socioeconomic preconditions in the host countries. Such preconditions also apply to the export of soft measures and the transfer of technologies or processes requires careful planning and a good understanding of host country framework conditions. Some of the EU's technology strengths are not yet sufficiently considered in emerging country plans, such as bioenergy technologies or adaption. Regarding buildings, energy efficiency measures are an aim of many emerging countries, but this rarely includes zero-carbon buildings. Urban logistics and intelligent transport systems are other areas in which the EU has initial experiences. These may become important issues in emerging countries in the future and the EU should observe developments in emerging countries carefully.

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IX ANNEX – CITY PROJECTS

IX.I CHINA

Background

China is the world's most populous country. As of September 2013, it had a population of over 1.36 billion, not including Taiwan, Hong Kong and Macau (World Population Review, 2014e). Today, almost half of all Chinese live in urban areas and the number is expected to grow in the coming decades. According to some predictions, it's likely that almost 70% of Chinese will live in urban areas by 2035. Most of them are concentrated in the east of China, often in coastal cities (see Figure 6).

In China, 90 cities have a population of more than 1 million people. The five largest Chinese cities with their last confirmed population are (World Population Review, 2014e):

1. Shanghai, a municipality (2012: 23.7 million)
2. Beijing (2012: 20.7 million)
3. Tianjin, (2010: 12.9 million)
4. Guangzhou (2013: 14 million)
5. Shenzen (2010: 10.4 million)

As of 2013, China is the world's second-largest economy by both nominal total GDP and purchasing power parity and is also the world's largest exporter and importer of goods.

Challenges

In recent decades, China has suffered from severe environmental deterioration and pollution. China is the world's largest carbon dioxide emitter (Chestney, 2013). The country also has water problems. Roughly 298 million Chinese in rural areas do not have access to safe drinking water and 40% of China's rivers had been polluted by industrial and agricultural waste by late 2011 (The Earth Institute, 2011). Urban air pollution is a severe health issue in the country; the World Bank estimated in 2013 that 16 of the world's 20 most-polluted cities are located in China (World Bank, 2013).

In absolute numbers, China's urbanisation is characterised as follows: Rapid economic growth and development progress within cities has been triggered by about 260 million people migrating from rural areas to cities. Despite rapid urbanisation China was able to counteract common urban challenges such as urban poverty, unemployment and squalor in the early stages. But with continuing urbanisation, challenges such as rising inequality, environmental degradation and the increasing lack of natural resources was unavoidable. In counteracting such challenges, China needs to implement new concepts of sustainable urbanisation. This has been e.g. already started via the introduction of the China's 12th Five-Year Plan promoting sustainable cities (World Bank, 2014f).

National Initiatives

Already back in 1984, the China Society for Urban Studies (CSUS) was established. It is a national, non-profit and academic organisation formed freely by urban researchers, scholars, practitioners, research and educational institutions and enterprises and a wide range of governmental agencies in social, economic, cultural, environmental, planning, construction and management fields. The purpose of CSUS is to meet the needs for China's healthy urbanisation and sustainable urban development and to organise and lead its members toward comprehensive research on fundamental rules of urban development. CSUS is associated with the China Ministry of Housing and Urban-rural Development and receives guidance from and is overseen by its operational authority, the China Science Association, and by the Ministry of Civil Affairs, the authority in charge of corporation registrations.

Another national initiative, the Urban China Initiative (UCI) was founded in 2010. The aim of UCI is to develop a think-tank serving as platform for identifying, sharing and implementing effective urban solutions within China (UCI webpage, 2014). The Columbia Global Centre/Beijing will provide additional support to the Initiative's operations. The UCI Initiative maintains a strategic partnership with the Chinese Society of Urban Studies and the Institute of Urban and Environmental Studies (IUE) under the Chinese Academy of Sciences and will be advised and funded by leading domestic and multinational corporations. Specific aims targeted under UCI are to (1) provide the best and most innovative source of urban solutions in China, (2) cover the world's best professionals on urban development and (3) being the head of China's national, provincial and local dialogues on urban challenges (UCI webpage, 2014).

In 2010, the first Urban Sustainability Index (USI) was published. This index established a uniform, fact-based methodology for assessing and comparing China's cities in their efforts to achieve sustainable economic development and has since been published every two years (UCI webpage, 2014).

City Projects

Despite the lack of a standard definition of a low-carbon city, the majority of Chinese cities have set low-carbon goals. Stated in Li et al. (2012), 276 of the 287 cities in China with municipality status have proposed low-carbon or Eco-City Goals (Figure 6). Of these, more than half have begun construction projects in an effort to fulfil these goals, while more than a quarter have specific plans for action in the near future.

Source: Li, Xun, 2011, Introduction to low-carbon cities in China, presented at the Institute for Building Efficiency Roundtable Discussions, August 4 2011.

Figure 6: Overview on cities in China that have officially proposed low-carbon (dark pink) or eco-cities goals (light pink) in China (Li et al., 2012)

Country Conclusions

Needs for further sustainable urbanisation programmes are still present in China although numerous sustainable city projects have already been implemented. Recognising that resource depletion and pollution have become costly barriers to further development, China's leaders have set ambitious targets for controlling both. A further key challenge of future sustainable city development in China is to reduce carbon emissions from non-industrial sectors. Increasing the energy efficiency of buildings, for example, may highly contribute to achieving non-industrial carbon emission reductions and is therefore one of the key topics to be addressed in China's future sustainable urban development.

CITY INITIATIVES

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Jilin City Municipal Area (North-East China)	Low Carbon Development Roadmap for Jilin City	Low Carbon Zones	First official research area in China for developing a methodology for and piloting low carbon development	www.lowcarbonzones.org/jilin.html
Shanghai	Green Energy Schemes for Low-carbon City in Shanghai	World Bank (approval date March 20, 2013 – Closing Date December 31, 2018)	The higher-level global environment objective of the Green Energy for Low-Carbon City Project in Shanghai Project for China is to support Shanghai's low-carbon city development by promoting green energy schemes with a focus on Changing district. The project has two components: a) a technical assistance and incremental support for near zero-emission buildings component funded by a Global Environment Facility (GEF) grant; and b) a low-carbon investments component funded by the International Bank for Reconstruction and Development	http://www.worldbank.org/projects/P127034/green-energy-schemes-low-carbon-city-shanghai?lang=en
Qingdao	Sustainable Mobility	World Resource Institute (WRI)	The city government has developed a low-carbon strategy that includes more efficient energy and waste water use, transport systems that reduce congestion and sustainable urban design. The blueprint lays the foundation for Qingdao to meet its target of reducing carbon intensity by 45% by 2020. To guide development, the city government has set specific emission reduction targets for each energy-intensive sector.	http://www.wri.org/our-work/top-outcome/major-chinese-city-plans-future-around-low-carbon-development

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Tianjin - Sino-Singapore Tianjin Eco-City (SSTEC)	case study of an emerging eco-city in China	World Bank	The Sino-Singapore Tianjin Eco-city's vision is to be a thriving city which is socially harmonious, environmentally-friendly and resource-efficient. It is a flagship cooperation project between the governments of Singapore and China and is planned for 350,000 residents. The SSTEC project has received significant attention because of its aim to become a "model eco- and low-carbon city that is able to be replicated by other cities in China; Its strategy is also captured in a lot of different documents, e.g.: National Water Saving City, National Environment Protection Model City, Tianjin Eco-City Planning Guideline, Tianjin Eco-City Construction Action Plan, etc.	http://www.tianjinecocity.gov.sg
Shanghai	case study cities "Essential Buildings" – The Emergence of "Low-Carbon Cities" in Post-Industrial Urban China		The Shanghai Post-Expo Area is the city's pilot area for the introduction of these low-carbon technologies. From 2006 to 2010, in preparation for the World Expo, Shanghai renovated a large downtown area. This area became the low-carbon model city. SPEA is oriented toward three major uses: conventions and exhibitions, a corporate headquarter zone and eco-tourism	https://de.scribd.com/doc/195864284/Issue-Brief-Low-Carbon-Cities-in-China-pdf
Hangzhou	case study cities "Essential Buildings" – The Emergence of "Low-Carbon Cities" in Post-Industrial Urban China		This comprehensive low-carbon plan is comprised of "a low-carbon economy, low-carbon buildings, low-carbon transportation, low-carbon lifestyles, low-carbon environment and low-carbon society = "six-in-one" vision of low-carbon Hangzhou. Also, Hangzhou is one of the first cities in China to have placed the natural environment at the centre of its development strategy and its achievements in sustainability and pioneering efforts are unparalleled in the country.	https://de.scribd.com/doc/195864284/Issue-Brief-Low-Carbon-Cities-in-China-pdf

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Liangijang New Area, Chongqing			Low-carbon city model; heavy industry accounts for roughly two-thirds of Chongqing's industrial sector by GDP and the city has spent a tremendous amount of resources to enhance industrial energy efficiency in the past. While the energy savings achieved through technological upgrades are impressive, Chongqing has now turned to macro-economic restructuring for more substantial reductions in carbon emissions in the local economy.	https://de.scribd.com/doc/195864284/Issue-Brief-Low-Carbon-Cities-in-China-pdf
Boading			A pilot low-carbon city designated by the NDRC, the city is home to several of the largest manufacturers of wind turbines in the world and is also the global leader in photovoltaic solar module manufacturing. Boading was an early champion of low-carbon businesses. Following the City of Solar Energy and Electricity Valley plans, Baoding introduced a comprehensive low-carbon city plan in 2008, including ways to deal with air and water pollution. However, environmental protection is not the only goal. Boading plans to retrofit government office buildings as low-carbon demonstration projects, featuring energy-saving light bulbs, solar driven lighting systems, digital office networks and HVAC and building management systems – the plan calls for all public buildings in the Baoding area to be retrofitted by 2020 and also includes measures for community planning and transportation	https://de.scribd.com/doc/195864284/Issue-Brief-Low-Carbon-Cities-in-China-pdf
Guangzhou	2020 Development Strategy for New Urbanization in Guangzhou	UCI, entrusted by Guangzhou Municipal Development and Reform Commission	This project sums up the hands-on experience of Guangzhou in pushing ahead with the urban citizenship of migrant workers in an orderly manner, optimisation of urbanisation layout and format, enhancement of city sustainability and promotion of integrated rural-urban development. It also analyses its advantages and the challenges it faces, and proposes suggestions on relevant policies.	http://www.urbanchinainitiative.org/en/research/flagship.html

IX.II SOUTH AFRICA

Background

With a rapidly growing population in the last decade, South Africa's population had hit the 50 million mark in 2011, whereas the 2014 estimate was 53.1 million. Currently, it is listed as the 24th most populous country in the world (based on absolute population numbers) (World Population Review, 2014c). South Africa is one of the most urbanised countries in Africa. Sixty-two percent of the national population is accumulated in cities (2011 value), whereas it is expected that this proportion will increase in upcoming years, reaching about 71% in 2020 and continue to grow beyond 2020. The main source of rapid population growth in the last decade in both rural and urban areas has been immigration. South Africa also dominates migration absorption in the whole southern African region (United Nations Human Settlements Programme (UN-Habitat), 2014). Cities in South Africa are driving economic development, especially in metropolitan areas where about 59% of South Africa's economic output is generated (Rogerson et al., 2014). The largest metropolitan cities in South Africa are Johannesburg, Cape Town, Ekurhuleni and eThekwini (Durban), all of them having a population size of around 3 million inhabitants (2014 value) (United Nations Human Settlements Programme (UN-Habitat), 2014).

Challenges

As rapid population growth in South African cities is highly based on immigration, South Africa's urban challenges are mainly focused on managing increasing poverty. Currently, South Africa shows the highest level of inequality in the world (United Nations Human Settlements Programme (UN-Habitat), 2014). Core challenges for South African cities are therefore to expand job creation, develop new opportunities and livelihoods for the country's youth, countervail shortages in energy and water infrastructure as well as shortfall in education and skills and provide sufficient housing possibilities. Besides challenges linked to increasing poverty, rapid urbanisation also leads to other issues such as e.g. transport congestion, environmental pollution, climate change issues etc. (Rogerson et al., 2014) (United Nations Human Settlements Programme (UN-Habitat), 2014). Thus key urban planning challenges in South African as well as all other cities of the southern African region mainly deal with sprawl, substantial housing backlogs, poverty and inequality, segregation, slum and informal settlement proliferation within city centres and on the urban peripheries, inadequate infrastructure and service provision. (United Nations Human Settlements Programme (UN-Habitat), 2014).

National Initiatives

Several initiatives addressing city challenges have been founded in South Africa in past years. Two of these initiatives are introduced briefly here:

In the area of sustainable buildings e.g., the Green Building Council of South Africa has been operating since 2007. Since its foundation, the Green Building Council of South Africa has implemented various projects. For example, the country's first "green street" was established in 2011 where 30 low-income houses located in eThekwini were retrofitted with fitting

ceilings, low energy lighting and kitchen gardens for food growing to achieve energy, health and socioeconomic improvements for its residents. (United Nations Human Settlements Programme (UN-Habitat), 2014).

A further initiative, the African Urban Research Initiative, is not only active in South Africa but also throughout the whole continent. The initiative was launched in 2013 and aims to support research centres in informing policy stakeholders linked to sustainable urban policy and management in an overall African context. In regard to South Africa, the initiative is conducting several projects in Cape Town. Active projects in Cape Town are linked to e.g. urban violence, safety and governance actions, climate change policy, socioecological movements and urban ecosystems as well as actions in various other areas.

City Projects

The most attractive actions to achieve sustainable urbanisation and mitigate greenhouse gas emissions in South African cities are actions linked to establishing urban agriculture, greening roofs, expanding green areas etc., which simultaneously contribute to storing carbon and making a city more liveable. Johannesburg, for example, established the so called “Greening Soweto” scheme in 2010 where about 200,000 trees have been planted and various recreational areas have been created. This concept of “greening a city” has already been adopted by various other cities of South Africa. Other actions in sustainable urban development in South Africa include the building sector, by promoting the use of lower carbon materials, ensuring energy efficiency through a greater use of natural light, ventilation and improved insulation of hot water pipes, walls and roofs spaces. Further important actions in achieving urban sustainability in South Africa are linked to the improvement of transport conditions. In Johannesburg, a priority bus way system conducted using a fleet of low sulphur diesel buses has been established to decrease greenhouse gas emissions but also to counteract traffic congestion and make the use of public transport attractive, especially for those who have been injured in the past using private cars. However, apart from Johannesburg, most cities of the southern African region (including various other cities of South Africa) are lacking in sufficiently developed sustainable transport activities. (United Nations Human Settlements Programme (UN-Habitat), 2014.

Country Conclusions

Sustainable urbanisation projects in South Africa are mainly covering actions linked to “city greening” and sustainable transport, mostly because such actions are straightforward and relatively cheap to implement. Sustainable city needs also address challenges regarding sprawl, substantial housing backlogs, poverty and inequality, segregation, slum proliferation within city centres, etc. which translates into a great need to implement further sustainable urbanisation actions to meet future needs of South African cities.

CITY INITIATIVES

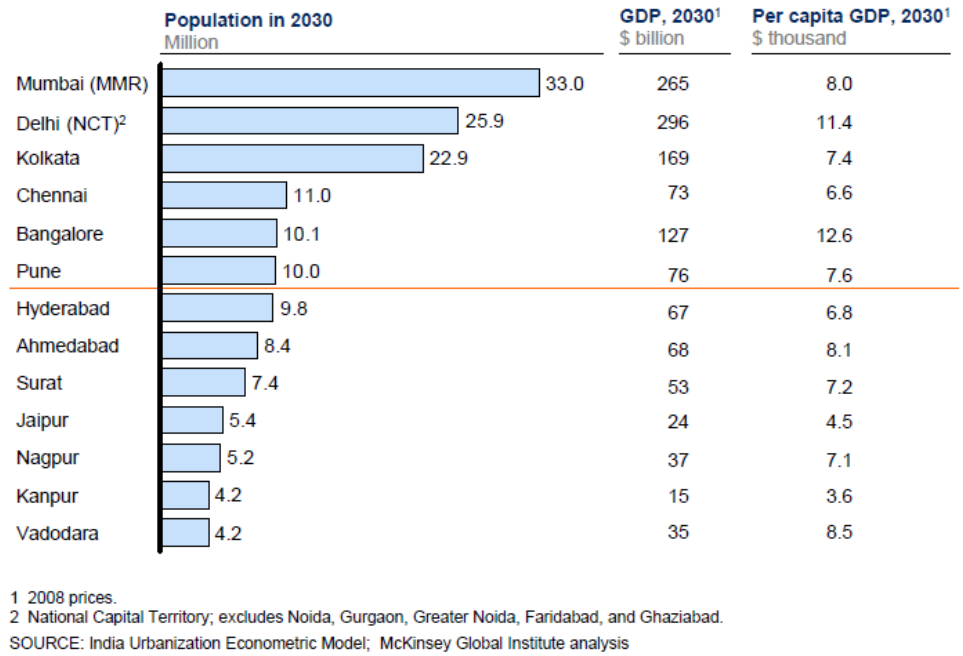
CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Model cities: Steve Tshwete Local Municipality KwaDukua Local Municipality Satellite cities: Mogale City Local Municipality Saldanha Bay Municipality uMhlathuze Local Municipality Nelson Mandela Bay Municipality Sol Plaatje Municipality	Urban-LEDS project	The project's aim is to "enhance the transition of low emissions urban development in emerging economy countries". This aim should be achieved by providing a methodological framework (GreenClimateCities methodology) to integrate low-carbon strategies which can be adopted by cities in emerging economy countries. It is funded by the European Commission and implemented by UN-Habitat and ICLEI	Green Building learning exchange and policy development, Water infrastructure enhancement, energy efficiency activities (e.g. roll-out of hotboxes, roll-out of resource efficiency service packages), Waste management	urbanleds.iclei.org
Cape Town	Low Carbon Central City Strategy	The project is funded by the Swedish International Development Agency (SIDA). Partnership of the Cape Town Partnership , Sustainable Energy Africa and the City of Cape Town	Knowledge sharing	http://www.capetownpartnership.co.za/wp-content/uploads/2014/02/Cape-Town-Low-Carbon-Central-City-Strategy-20140217.pdf
Various cities	Green Building Council South Africa	The Green Buildings Council South Africa aims to ensure that buildings are designed, built and operated in an environmentally sustainable way	Green buildings	www.gbcsa.org.za

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Buffalo City Ekurhuleni eThekwini Johannesburg Mangaung Msunduzi Nelson Mandela Metropole City of Tshwane	South African Cities Network	Exchange of information, experience and best practices on urban development and city management	Knowledge sharing, strategic guidance, monitoring and evaluation, technical assistance	-

IX.III INDIA

Background

With a young and rapidly growing population of over 1.2 billion (World Bank, 2014a; McKinsey Global Institute, 2010), India is the second most populous country in the world and the largest democracy. From 2001-2011, India's urban population grew by 90 million (Wang et al. 2013) to total over 340 million people (McKinsey Global Institute, 2010). By 2030, it is estimated that 68 cities in India will have populations of over 1 million, 13 cities will have populations of over 4 million and the country will have 6 megacities with populations of 10 million or more people (McKinsey Global Institute 2010; see Figure 7). Suburbs that surround large metropolitan areas are growing rapidly, partially stemming from strict urban densification regulations that push businesses and people out of urban cores (Wang et al. 2013). The relatively early onset of "suburbanisation" is a key characteristic of the spatial development of India (Wang et al. 2013).



1 2008 prices.
2 National Capital Territory; excludes Noida, Gurgaon, Greater Noida, Faridabad, and Ghaziabad.
SOURCE: India Urbanization Econometric Model; McKinsey Global Institute analysis

Figure 7: Cities in India with a population of more than 4 million by 2030 (McKinsey Global Institute, 2010)

Challenges

Although centres of the country's economic activities, urban areas in India represent large inequalities and fall short of providing inhabitants with basic services, particularly clean water and affordable housing. Cities in India are among the worst in terms of air pollution in the world, with New Delhi[1] being at the top of the list, followed by Patna, Gwalior and Raipur (Harris, 2014). Sufficient and affordable transportation infrastructure is also lacking, although it is critical to connect metropolitan areas with their neighbouring suburbs and provide access within an urban area.

[1] Although air pollution levels in New Delhi are nearly three times than levels in Beijing, awareness about the issue in India is much lower than in China (Harris, 2014).

Current rates of investments in infrastructure are much less than the amount required to satisfy the existing and growing demands of India's urban population (Wang et al. 2013). If the infrastructure gap is not addressed, the situation in cities could deteriorate, potentially leading to the proliferation of slums, worsening health conditions, economic gridlock via congestion, social exclusion, and negative environmental effects due to growing car use. Effective, long-term, and integrated land-use and transportation planning is necessary to improve the current situation. Furthermore, an improvement in municipal governance and capacities of local authorities is also essential.

National Initiatives

The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was launched in 2005 with the goal to support reforms and development projects that enhance urban infrastructure, the delivery of services, community participation and the accountability of local agencies (Government of India, 2011). However, it has been difficult for many local governments to access funds and implement the projects due to gaps in capacity and technical expertise (McKinsey Global Institute 2010). Under the new government, the JNNURM will be replaced by a Smart City Scheme in which $70.6 billion was allocated in the 2014-15 Budget to build 100 new smart cities in satellite towns surrounding existing cities. These will include:

- High quality utility services such as water and power
- Robust transportation system that emphasises public transportation
- Social infrastructure to benefit inhabitants
- State-of-the-art health and educational facilities
- Facilities for entertainment, safety and security
- Increased energy efficiency and water conservation, and recycling of waste materials[2]

Other national urban development schemes include:[3]

- Urban Infrastructure Development Scheme for Small & Medium Towns (UIDSSMT)
- JNNURM Project Management Information System (PMIS)
- North Eastern Region Urban Development Programme (NERUDP)
- National Urban Information System (NUIS)
- Public Cycle Sharing Toolkit
- Capacity Building for Urban Local Bodies
- 100 MLD Sea Water Reverse Osmosis Desalination Plant at Nemmeli, Chenni
- Brihan Mumbai Storm Water Drainage (BRIMSTOWAD) Project at Mumbai
- Pooled Finance Development Fund Scheme
- Pilot Scheme for Urban Infrastructure Development in Satellite Towns around seven megacities

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2 See the "Draft Conception Note on Smart City Scheme" for more details: http://indiansmartcities.in/downloads/CONCEPT%20NOTE-13-10-2014_mkgnew.pdf

3 Detailed information about the national urban schemes can be found here: http://moud.gov.in/schemes_programmes

- Lump Sum Provision Scheme for the benefit of NER including Sikkim

Country Conclusions

Indian cities are currently lacking sufficient sustainable urbanisation actions. Needs and challenges to cities exist in almost all areas. These include basic infrastructure needs, access to basic services, transportation issues etc. Indian cities can therefore greatly benefit from the adoption of various sustainable city technologies.

CITY INITIATIVES

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Jalandhar, Indore, Raipur, Pimpri-Chinchwad, Pune, Mysore	Sustainable Urban Transport (GEF)	Supported by the Global Environment Facility (GEF), World Bank and UNDP - The project includes the following components: component one provides technical assistance to the Ministry of Urban Development (MoUD) to improve the national, state and local capacity to implement the capacity building elements and the public and non-motorised transport related aspects of national urban transport policy; component two supports design and implementation of demonstration projects in six participating cities (in five states) which will create models of sustainable transport solutions for other Indian cities to replicate.	Sustainable urban transport	http://www.sutpindia.com/ http://www.worldbank.org/projects/P100589/sustainable-urban-transport-gef?lang=en
Various	The Sustainable Urban Transport Project (GIZ-SUTP)	Assist developing world cities to achieve their sustainable transport goals through the dissemination of information about international experience, policy advice, training and capacity building and targeted work on sustainable transport projects within cities.	Sustainable urban transport	http://www.sutp.org/

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Ahmedabad, Bangalore, Chennai, Gurgaon, Hubli-Dharwad, Indore, Jaipur, Mumbai, Mysore, New Delhi, Rajkot, Surat	EMBARQ	EMBARQ is the World Resources Institute's (WRI) signature initiative for sustainable transport and urban development, operating through a global network of centres in Brazil, China, India, Mexico and Turkey. EMBARQ has built its global recognition on its local experience, helping to improve quality of life in cities worldwide.	Sustainable urban transport	http://www.embarq.org/
Chennai, Pune, Bhubaneshwar, Surat, Rajkot and Indore.	Improving Walkability in Indian cities	Assessment of the "walkability index" for six cities in India	Walkability	http://cleanairinitiative.org/portal/projects/India-walkability
more than 70 cities	Financial Institutions Reform and Expansion — Debt and Infrastructure Project, (FIRE-D)	Collaborative effort to improve essential urban infrastructure, primarily water and sanitation, throughout India's cities, financed by USAID/India	Urban infrastructure	http://www.idrc.ca/en/themes/development/pages/ProjectDetails.aspx?ProjectNumber=107344
Two model cities of Thane and Rajkot and six satellite cities	Urban-LEDS	Funded by the European Commission and implemented by UN-Habitat and ICLEI, it has the objective of enhancing the transition to low emission urban development in emerging economy countries by offering selected local governments in Brazil, India, Indonesia and South Africa a comprehensive methodological framework (the GreenClimateCities methodology) to integrate low-carbon strategies into all sectors of urban planning and development.	Low emission development	

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Hyderabad	Climate and Energy in a Complex Transition Process towards Sustainable Hyderabad	Project to formulate a "Sustainable Development Framework" for the metropolitan area of Greater Hyderabad	Mitigation and adaptation strategies by changing institutions, governance structures, lifestyles and consumption patterns	http://www.sustainable-hyderabad.de/
Coimbatore	Local Renewables & Model Communities Network: South - South Cooperation between India, Indonesia & South Africa	ICLEI has developed a local renewables (LR) initiative which steers city governments through the integration of increased EE and RE generation into all city activities.	Renewable energy	http://archive.iclei.org/index.php?id=12629
Howrah, Madurai, Kochi, Visakhapatnam	AsianCitiesAdapt	AsianCitiesAdapt forms part of the International Climate Initiative. The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety supports this initiative on the basis of a decision adopted by the German Bundestag.	Adaptation	http://www.asian-cities-adapt.org/home/

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Chennai, State of Tamil Nadu	Third Tamil Nadu Urban Development Project (TNUDP III)	Aims at improving the delivery of urban services through enhancing the quality of urban infrastructure and strengthening the institutional and financial framework	Water supply, waste water collection, solid waste management, storm water drains, roads and common facilities such as transportation networks, and sanitation facilities	http://www.worldbank.org/projects/P083780/third-tamil-nadu-urban-development-project-tnudp-iii?lang=en

IX.IV THE PHILLIPINNES

Background

As the 12th most populous country in the world, the Philippines has an estimated population of 98.7 million inhabitants (World Population Review, 2014a). By 2050, it is expected that 84% will live in urban areas (UN-Habitat, 2014). Currently, the largest growing urban economic area is Metro Manila. With a population of 11.6 million, this area is growing rapidly in scale and population (World Population Review, 2014a). This is due to the booming economy and growing direct foreign investment of private industries which include financial, commercial, and industrial sectors. The Metro Manila region accounts for a third of the country's GDP. Other small and intermediate cities are expected to experience rapid urban growth, which include Southern and Central regions of Luzon, Visayas and Mindano (OECD 2013).

Challenges

The Philippines, a country of over 7,000 islands, is comprised of 16 administrative regions (OECD, 2013c). The geography of these regions has led to uneven distribution of infrastructure and resources, natural disaster prone zones, and fragmented political systems. Since 2002, the country has averaged 5% annual growth rates. GDP is also seeing an annual growth of about 6%, one of the fastest in the East Asia region, and it increased to 7.1% in 2013 even after being struck by the disastrous typhoon, Haiyan. The country is still working to rebuild the areas that were affected by the storm (World Bank, 2014d). As the country continues to grow, one of the biggest challenges will be inclusive growth policies that span regions. Geography has created a conflict of interest for business, environment and people. The large distance between land areas creates a barrier for conducting business. In terms of road networks, the country's paved road infrastructure is also lacking, making it very hard to transport people and goods (OECD, 2013c). Food insecurities have been a result of poor infrastructure as well (UN-Habitat, 2014). Another area that deserves much improvement is energy (McKinsey Global Institute 2005). If the country is able to address its infrastructure and energy problems, it will further enhance its attractiveness to private foreign investors that the country is seeking to elevate their economy.

Due to the country's intense agriculture sector, uncontrolled deforestation and soil erosion pose major environmental concerns. Air and water pollution in major urban centres are also problematic and will continue to get worse as urbanisation continues (CIA World Factbook, 2014). Although the country has significantly increased access to safe drinking water sources and sanitation facilities, the risk remains high for contracting major infectious diseases. As urbanisation continues at a rapid pace so will the need for resources. In order to avoid irreversible negative consequences to the land, they will need to figure out ways to reduce resource consumption and urban sprawl. The country also relies heavily on imported oil but due to the increase in use of renewable energies, that is slightly decreasing(CIA World Factbook, 2014).

National Initiatives

The Philippines is taking action through a number of initiatives to address the challenges. The first main urban initiative is the *National Urban Development and Housing Strategy* (NUDHS). Unlike past policy documents, this framework has goals to be more strategic and prioritises key urban development issues that play on the nations strengths (UN-Habitat, 2009). The second initiative is the *National Climate Change Action Plan* (NCCAP), which sets forth to help city governments devise green growth strategies and develop local climate change action plans (National Climate Change Action Plan 2011-2028 2014).

City Projects

Due to the fact that current urban areas in the Philippines are already some of the densest areas in the world, local city initiatives are focusing in on sectors such as *infrastructure, spatial planning, energy, water waste management-all included with a social development aspect for poverty reduction.* These urban sustainable development plans are carefully designed with master plans for full optimisation. In the past, the nation has been ill-equipped to create holistic strategies that can focus on sustainable development with consideration for the urban poor. Today, that has become a main focus of urban cities.

Country Conclusions

In urban areas that are already heavily congested with traffic, governments of the cities will need to figure out how to increase public transport, switch to vehicles that use alternative fuels and reduce the number of people who rely on the personal automobile. Although Manila is the largest city in the Philippines and is making great strides on sustainable urban initiatives, other cities in the nation will also need to start devising strategies for future initiatives.

CITY INITIATIVES

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Manila	Clark Green City (CGC)	Bases Conversion and Development Authority (BCDA), a state run company with Philippine Board of Investments (BOI)	Development plan that is expected to be the city's first sustainable community complete with renewable energy facilities, waste-to-energy plant, eco-businesses, rapid bus transit systems, urban farms	http://www.eco-business.com/news/philippines-new-clark-green-city-promises-sustainable-living/?utm_medium=email&utm_campaign=May%207%20newsletter&utm_content=May%207%20newsletter+Version+A+CID_254371ab59a381355d54162cfa534aeb&utm_source=Campaign%20Monitor&utm_term=READ%20FULL%20STORY
Various	National Urban development and housing framework (UND HP)	UN-Habitat, World Bank, UNDP	A national vision for 2009-2016 that focuses on urban development. This plan hopes to facilitate economic growth, strengthen competitive advantage and improve quality of life for citizens	http://www.unhabitat.org.ph/images/stories/downloadable/knowledge_resource_center/climate-change/final%20nudhf.pdf
Various	National Climate Change Action Plan (NCCAP)	Asia LEDS, WWF, UNDP, UNEP	National strategic plan to achieve a country-driven program for integrated climate change adaptation and mitigation.	http://asialeds.org/resources/national-climate-change-action-plan-2011-2028
Manila	Green Transport Revolution	Asian Development Bank	Replacing 100,000 gas burning tricycles with E-Trikes	http://www.adb.org/news/infographics/philippines-green-transportation-revolution
Manila	Mainstreaming Environment for Poverty Reduction	Asian Development Bank	Recycling program that benefits the poor in metro-Manila	http://www.adb.org/news/videos/recycling-profits-poor-philippines

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Manila	Transition Community Initiative Philippines (TCIP)	Various local stakeholders	Urban gardening project	https://www.indiegogo.com/projects/urban-gardening-project-blpc-community-manila-philippines
Various	Philippine Energy Efficiency Project (PEEP)	Philippine Government, Department of Energy and Asian Development bank	Retrofitting municipal buildings, street and park lights and residential households with CFL light bulbs	http://www.iiec.org/index.php/iiec-news/517-implementation-and-dissemination-of-energy-efficiency-measures-in-the-philippines.html
Manila	Clean Air Drive	Clean Air Asia	Promoting the use of non-motorised transportation and alternative fuels to reduce GHG emissions	http://cleanairinitiative.org/portal/CleanAirRide-Manila
Manila	Clean Air Drive	Clean Air Asia	Promoting the use of non-motorised transportation and alternative fuels to reduce GHG emissions	http://cleanairinitiative.org/portal/CleanAirRide-Manila

IX.V VIETNAM

Background

Vietnam has an estimated population of 92.5 million, making it the 14th most populous country in the world (World Population Review, 2014b). Although only 31% of the population lives in urban areas today, it is expected that by 2030, at least half of the population will be living in urban settings (Global Cities Research Institute, 2009). Future economic growth potential is located in two main cities, Hanoi and Ho Chi Minh City, with populations of 2.9 million and 6.4 million respectively. Both will play a pivotal role as urban migration continues (CIA World Factbook, 2014). Other cities that are expected to pave the way for urban development are Haiphong and Da Nang. Due to their different geographical locations, economic trajectories will be different for these cities.

Challenges

Since the transition from a centrally planned economy to a market-based economy in 1986, Vietnam has been reporting annual per capita growth of at least 5.3%, which is faster than any other economy in the world, excluding China. Part of this economic growth can be attributed to the transition from an agricultural economy to a heavy increase in manufacturing and industrial production. However, in light of growing competitive global markets, those manufacturing and industrial sectors are starting to slow and new sources of growth will need to be explored (McKinsey Global Institute 2013). This switch in economic models has lifted many out of poverty, with Vietnam having the 6th lowest poverty percentage in the world at 4.5% (UNDP 2014). Vietnam has already hit 4 of their Millennium Development Goals (MGD) and is on track to attain three more by the time the MGD's expire in 2015 (World Bank, 2014b). Through market liberalisation, which has caused a large shift towards FDI, manufacturing and industry growth, Vietnam has reached their MGD goal of reducing the number of people living on less than $1 a day. However, Vietnam, especially in rural areas, is still plagued by poverty. Major infectious diseases and the number of people living with HIV/AIDS is still relatively high (World Bank, 2014b). Access to basic services such as water and sanitation also needs improvement.

The country is home to a very young population, with 42% of the population under 25 years of age (CIA World Factbook, 2014). A huge contributing factor that has led economic growth is Vietnams' choice to enter into the World Trade Agreement in 2007 which has improved trade relations by making the country a more attractive business partner. The opportunity has also presented a challenge to Vietnam by causing a surge in inflation rates, which led to a state of macroeconomic instability for the country (OECD, 2013a). As cities expand, so does the increased need for land. Land poses a huge obstacle for economic expansion due to the high price attached. One setback for expansions is the corruption among State Owned Enterprises (SOEs), who are the primary owners of land and have created bottlenecks in the land market by inflating prices by around 10% (World Bank, 2014b). The ability to access land is difficult and will continue to put stress on urban services as urbanisation continues.

One huge setback in Vietnam is the lack of training and education in the labour force. As the country switches to more high-tech industries, an even larger skill set will be needed in employees (OECD, 2013a). In 2012, only 16.4% of the work force was properly trained to perform the skills required by the company. Fortunately, the young age of the majority of the population will be a huge asset if they can gain the necessary skills to match the needs that industries require for increased productivity. Although Vietnam's current labour pool is large and boasts an extremely low unemployment rate, overall population rates have slowed and will continue to do so over the next decade (McKinsey Global Institute 2013).

Agricultural practices contribute about 30% to the country's GDP, but cause harm to the environment from logging and slash and burn activities, leading to deforestation and soil degradation. Growing urban industrialisation and population migration are also degrading the environment by increasing CO_2 emissions into the atmosphere at an accelerated rate (CIA World Factbook, 2014). In 2010, the country was emitting 113.1 million tons of CO_2 into the atmosphere and this is expected to quadruple in the next 20 years if current activities and growth patterns stay the same. Vietnam hosts a complex network of rivers. Chances of flooding run high and will challenge the country as climate change continues. Moving forward, the nation and its cities will need an increase in knowledge and coordination from local stakeholders as well as effective mobilisation of resources (OECD, 2013a).

National Initiatives

The government of Vietnam is taking steps and setting targets to address climate change by setting forth various initiatives to restructure their economic activities. At the national level, Vietnam is currently setting out two long-term strategies, Vietnam National Climate Change Strategy (VCCS) and Vietnam Green Growth Strategy (VGGS), committing the country towards a more resource-efficient, cleaner, resilient, low-carbon economy (Asia LEDS 2013). These national level initiatives have an end goal of 2050, by which time they hope to achieve more sustainable communities through changing fuel-structures, urban transportation and incorporating energy efficiency into sectors such as green building and residential housing sectors.

City Projects

The government of Vietnam, along with private-sector stakeholders, are addressing climate change by taking steps in certain sectors such as spatial planning, energy and transportation. Da Nang, one of the country's fastest growing cities, is making strong commitments to sustainability, but is doing so in a more piecemeal fashion because the city is looking to various outside private investors, who are not in coordination with each other, to help develop these city sections. Automobile use here is on the rise so action needs to be taken to combat this increase, such as creating laws to prohibit cars that run on gasoline. Cities also need to focus on adaptation and mitigation to guard against future natural disasters that will become more prevalent as global temperatures continue to rise.

Country Conclusions

As the rate of urbanisation continues to grow and the level of affluence rises, the nation will require an increase in infrastructure and knowledge to support their ambitions of being a strong competitor in global markets. In order to do so, the country will need significant

improvements in their infrastructure. Reform is needed to secure land from SOEs for further development as the country continues to grow. Cities are beginning to see the need for sustainable development and making progress in certain sectors but they need to create a more holistic approach. Otherwise, their current planning initiatives will lead to further exacerbation of the urban poor.

CITY INITIATIVES

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Various	Urban Observatory System in Vietnam	UN-Habitat	Supporting various Vietnam cities and towns to set up a data system for monitoring and evaluating the MDG implementation process for sustainable development, equality, environment friendliness, competitiveness and poverty reduction	http://unhabitat.org/national-workshop-on-project-urban-observatory-system-in-vietnam/
Various	The Vietnam land, services and citizenship (LSC) for the urban poor program	Cities Alliance	Align urban development efforts at the national, city and community level with local partners to scale up inclusive urban development, build capacity to manage urbanisation and empower community organisations	http://www.citiesalliance.org/sites/citiesalliance.org/files/YGS%20Vietnam%20CP%20Flyer.pdf
Various	Vietnam Green Building Council	Green Cities Fund, WGBC	Developed a Lotus rating system specific to Vietnam to foster green, energy efficient building construction and operation and is providing climate adaptation guidance to Vietnam to meet the challenges created by global warming	http://greencitiesfund.org/files/2012VGBCAnnualReportFinal.pdf
Various	Vietnam National Climate Change Strategy (VCCS)	Asia LED partnership, Ministry of Natural Resources and Environment (MONRE) and	Raising awareness for a low-carbon economy by focusing on climate adaptation, gender equality, food security, public health, poverty alleviation and water security. Targeted sectors are energy and transport. 2011-2020	http://lowemissionsasia.org/sites/default/files/pdf_file/DSDS_Green%20Growth%20Session_Vietnam_FINAL.pdf
Hanoi	Sustainable City Development	Inhabitat	Dovetailed project from FTP city in Da Nang for sustainable city planning	http://inhabitat.com/som-wins-master-plan-bid-for-golden-hills-eco-village-in-danang-vietnam/

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Da Nang	Sustainable City Development Project	World Bank	Expand access of city residents to improved drainage, wastewater collection and treatment services, the arterial road network and public transport	http://documents.worldbank.org/curated/en/2013/03/17564973/vietnam-danang-sustainable-city-development-project-scdp
Da Nang	FPT Sustainable City project	Inhabitat	Green city projects that focus on green technology and green areas while promoting social inclusiveness	http://inhabitat.com/som-unveils-green-master-plan-for-ftp-city-in-danang-vietnam/
Ho Chi Minh City	Sustainable urban transport	Asian Development Bank	Upgrading and improving accessibility to city's Mass Rapid Transit lines	http://www.adb.org/news/briefs/viet-nam-sustainable-urban-transport-ho-chi-minh-city
Ho Chi Minh City	Improving Port Infrastructure	Proparco and local authorities	In order to continue with large export markets, the city needs to upgrade port infrastructure	http://www.proparco.fr/lang/en/Accueil_PROPARCO/Activite/PageCacheeAnte2011/Tous-les-projets/Vietnam-2009-Ameliorer-les-infrastructures-portuaires-a-Ho-Chi-Minh
Ho Chi Minh City	Ho Chi Minh City Environmental Impact	Clean Air Asia and Asian Development Bank	Provide capacity building and institutional support for infrastructure development and effective and sustainable management of urban services; environmental improvement and reduction of environmental hazards	http://cleanairinitiative.org/portal/node/642

IX.VI INDONESIA

Background

With an estimated population of 252.8 million (World Population Review, 2014f), Indonesia is the fourth most populous country and the 16th largest economy in the world (McKinsey Global Institute 2012). Much of the economic growth is taking place in Jakarta (est. population 10.187 million in 2013; World Population Review, 2014f) and Greater Jakarta, particularly Bogor, Tangerang and Bekasi, as well as in urban centres with more than two million inhabitants, such as Medan, Bandung and Surabaya (McKinsey Global Institute 2012). Urbanisation is happening at a rapid pace – it is expected that around 32 million people will make the move from rural to urban areas by 2030, increasing the proportion of Indonesians living in urban areas to 71% from the current 53% (McKinsey Global Institute 2012). Urban migration will spur the creation of new cities. Led by Pekanbaru, Pontianak, Karawang, Makassar and Balikpapan, "small middleweight cities" with populations of 150,000 – 2,000,000 will become increasingly important for the economy (McKinsey Global Institute 2012; see Figure 8 for an overview of the fastest growing cities in Indonesia).

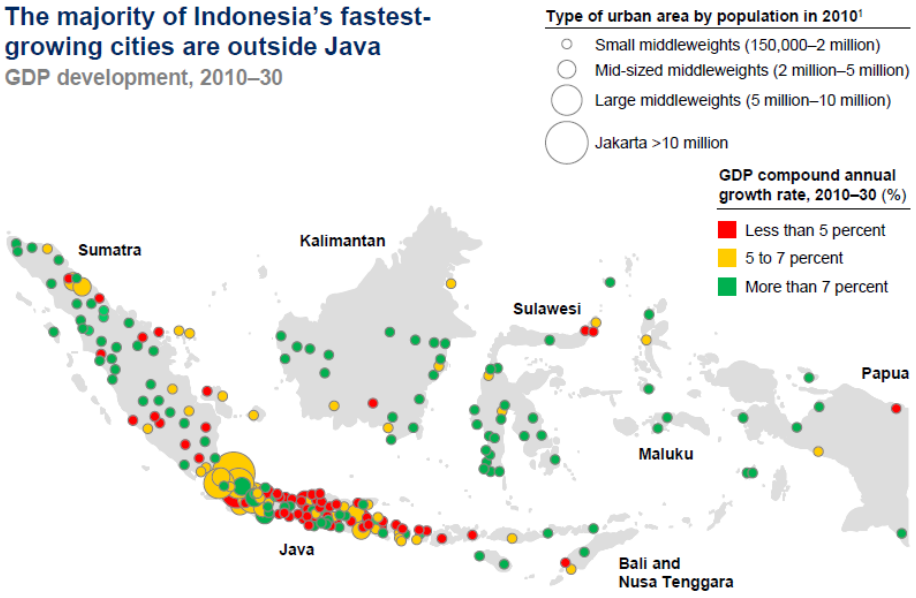


Figure 8: Indonesia's fastest-growing cities (McKinsey Global Institute, 2012)

Challenges

Despite strong economic growth, there are very large discrepancies in terms of income, education and health among the highly dispersed population and provinces – Indonesia is ranked 108th (out of 187 countries) on the United Nations' Human Development Index (UNDP

2014) and may fail to reach many of its Millennium Development Goals (MDG)[4] (World Bank, 2014e). Particular concerns include the high level of people still living below the national poverty line (approximately 12%; World Bank, 2014e), limited access to safe drinking water and sanitation (both in urban and rural areas) and poor health care access and infrastructure, reflected by high infant and maternal mortality rates and the accelerating spread of HIV/AIDS infections (OECD, 2013b; World Bank, 2014e). Historical underinvestment in public infrastructure (health care, transportation, housing and education) is a key area of concern for Indonesia (McKinsey Global Institute 2012; OECD, 2013b) as it hinders inhabitants' access to essential resources (safe water, electricity) and creates significant inefficiencies in supply chains[5] (McKinsey Global Institute 2012; PWC 2013). The country is also characterised by a young population – 60% below 30 years of age – and is expected to grow until 2025 (McKinsey Global Institute 2012). Participation of women in the labour force is around 54%. Internet access is expanding rapidly as is the adoption of new technologies (McKinsey Global Institute 2012), which could help better connect the more than 17,000 islands that comprise the archipelago.

Considering Indonesia's resource-intensive growth, it will become increasingly difficult to satisfy the growing demand for food and agricultural products as a substantial number of Indonesians (an estimated 8 million) will leave their farms and migrate to urban centres (McKinsey Global Institute 2012). Agriculture is already responsible for a large share of deforestation and greenhouse gas emissions; therefore, focus should be placed on enhancing productivity and minimising the conversion of land for agricultural purposes (McKinsey Global Institute 2012). The outward expansion of cities in the form of urban sprawl also places added pressure on land resources. Like food and agricultural products, the demand for energy, materials, water and other key resources is quickly escalating. A significant amount of investment in housing, water, commercial buildings and transportation infrastructure is required to keep up with expanding cities and growing demand (in addition to compensating for current infrastructure deficits). Moreover, intensifying impacts of climate change highlight the need for Indonesian cities to develop adaptation strategies, such as disaster preparedness and management (Arifin, 2013).

National Initiatives

The Government of Indonesia has taken several initiatives to address these challenges. The two main urban initiatives at the city level are the *National Urban Development Policy and Strategy* (KSPPN: Kebijakan dan Strategi Pembangunan Perkotaan Nasional) and the *Green City Development Program* (P2KH: Program Pengembangan Kota Hijau), with an overall vision for urban development outlined in Figure 9. The three main targets to achieve this vision are the 1) realisation of the National Urban System; 2) fulfilment of urban services standards and the realisation of future sustainable cities; and 3) improvement of good governance and institutional capacity (Arifin, 2013). Under the P2KH, 60 municipalities are targeted to develop

[4] See: http://www.undp.or.id/mdg/targets.asp for an overview of Indonesia's MDG

[5] For example, traffic congestion in Jakarta is estimated to account for $1 billion in annual losses and up to half of the piped water supplied in Indonesia is lost in transmission (McKinsey Global Institute 2012).

Green City Action Plans (RKAH) and will receive some support for the implementation of activities mentioned in the action plans (Djoko Kirmanto, Imam S. Ernawi, and Ruchyat Deni Djakapermana, 2012).

Figure 9: Vision for Indonesia's National Urban Development

Source: Arifin (2013)

In addition, the *2011-25 Master Plan for the Acceleration and Expansion of Indonesia's Economic Development* (MP3EI) aims to address connectivity issues and regional discrepancies through several infrastructure projects as well as investments in human resources and scientific research, many of which are to be carried out by local governments (OECD, 2013b; Oxford Business Group 2013; see Republic of Indonesia, 2011).[6] However, many local governments need additional capacity building and training to effectively design and implement assigned infrastructure and educational projects (OECD, 2013b).

Furthermore, public-private partnership (PPP) models are used to spur investments, with the central government offering financial incentives to private investors (Oxford Business Group 2013).

As one of the largest emitters of greenhouse gas emissions, Indonesia pledged to cut emissions by 26% from BAU by 2020 – or 41% conditional on international support (Climate Action Tracker 2011). Reducing deforestation is a key focus for reducing emissions as well as the development of renewable energy resources and promotion of biofuels in the transport sector (Climate Action Tracker 2011).[7]

[6] Following the resignation of long-time dictator Suharto in 1998, Indonesia underwent a widespread decentralization of political and economic powers in efforts to decrease regional discrepancies. However, this may have widened the gap between regions, for instance, in terms of education, and created a need for additional capacity building at the local level (OECD, 2013b).

[7] See Indonesia's Energy Law of 2007: http://www.bkpm.go.id/file_uploaded/uu-30-2007-energy.pdf

City Projects

Many city projects in Indonesia focus on the development *of transportation, energy, waste and water infrastructure and management systems.* Support is also given for development of the action plans in diverse thematic areas as well as for technical assistance in the implementation of demonstration projects and initiatives. Projects also help establish monitoring, reporting, and verification systems and enhance local capacity building. A focus is also given to alleviate poverty and develop the human resources of urban areas.

Country Conclusions

There is a strong need for improvements in infrastructure, which is reflected by many national and city level infrastructure initiatives. Further investments into health and educational services are also necessary to tackle future challenges. ICT has a strong potential to connect dispersed regions and help overcome significant structural barriers created by poor infrastructure; however, city projects with this particular focus were not easily found.

CITY INITIATIVES

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Surabaya	Low-Carbon and Environmentally Sustainable City Planning Project	Co-organised by Surabaya City and Institute of Global Environmental Strategies under "the JCM large-scale feasibility study project for low-carbon development in Asia" funded by the Ministry of the Environment, Japan	Energy management, transport and traffic management, solid waste management and water and wastewater management Identify potential large-scale demonstration projects and establish a measurement, reporting and verifying (MRV) system for measuring the impact of GHG emissions reduction.	http://www.iges.or.jp/en/sustainable-city/20130710.html
Pilot cities of Medan, Menado and Batam	Sustainable Urban Transport Initiative (NAMA SUTRI)	Nationally Appropriate Mitigation Action (NAMA), seeking support for implementation. The initiative seeks to foster sustainable urban transport in Indonesian cities through the adoption of measures to stop the increasing motorisation in the country and diminish existing externalities of transportation	The development of a policy framework for sustainable, low-carbon urban transport; capacity building; the development of guidelines for local planning and the monitoring, reporting and verification (MRV) of measures implemented. High quality public transport, parking management, traffic management, spatial planning; and alternative fuels	http://climate-l.iisd.org/news/indonesia-submits-sustainable-transport-nama/; http://unfccc.int/files/cooperation_support/nama/application/pdf/nama_implementation_indonesia_sustainable_urban_transport_initiative.pdf; http://unfccc.int/files/focus/mitigation/application/pdf/indonesiatransport_nama.pdf; http://transport-namas.org/projects/transfer-partner-countries/indonesia/

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Bogor, Surakarta, Yogyakarta and Palembang	Sustainable Urban Transportation Improvement Project (SUTIP)	Commissioned by: German Federal Ministry for Economic Cooperation and Development (BMZ) Lead executing agency: Indonesian Ministry of National Development Planning (BAPPENAS) Overall term: 2009 to 2016	Environmentally sound, climate-friendly and energy-efficient transport planning systems	https://www.giz.de/en/worldwide/16635.html
Various	Green Cities: A Sustainable Urban Future in Indonesia	Asian Development Bank	Water supply and other municipal infrastructure and services; Urban policy, institutional and capacity development Green city action plans adopted, innovative financing mechanisms developed, urban management partnerships established, small scale pilot projects completed	http://adb.org/projects/details?proj_id=46380-005&page=overview
Various	Sustainable Infrastructure Assistance Program	Asian Development Bank	Energy, Transport Water supply and other municipal infrastructure and services	http://adb.org/projects/46380-001/main
Various	Local Government and Decentralisation Project	World Bank	Municipal governance and institution building	http://www.worldbank.org/projects/P123940?lang=en

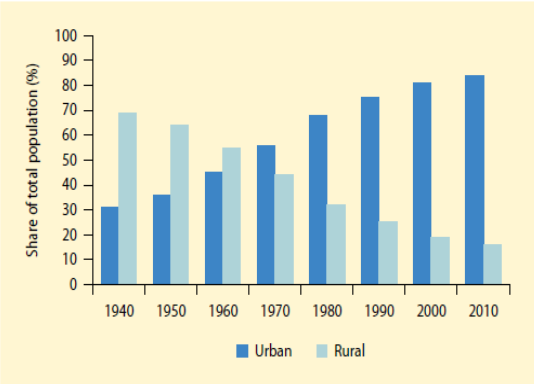
CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Bogor and Balikpapan	Promoting Low Emission Urban Development Strategies in Emerging Economies" (Urban LEDS)	Financed by the European Union and co-implemented by ICLEI and UN HABITAT	Sustainable landscape planning, transportation, energy efficiency, improved solid waste management and conversion of waste to energy	http://urbanleds.iclei.org/index.php?id=641
Jakarta	Kampung Improvement Project	UNDP/World Bank	Community based organisations (CBOs) as project initiators to encourage an active, innovative and self-sustained community in which upgrading could take place. This program is considered to be one of the best urban poverty relief programs in the world for several reasons - one being the low level of investment needed per person (US$118 in Jakarta to US$23 in smaller cities), another being its sustainability. Since its inception in 1969, the concept has spread to 800 cities in Indonesia to benefit almost 30 million people.	http://web.mit.edu/urbanupgrading/upgrading/case-examples/ce-IO-jak.html
Various	The Urban Sector Development and Reform Project	The World Bank	Support local governments in alleviating poverty to stimulate the development of local and regional economies and improve the delivery of sustainable and demand-driven urban services	http://documents.worldbank.org/curated/en/2003/12/5005872/indonesia-urban-sector-development-reform-project-environmental-assessment-vol-4-5-general-guideline-safeguard-framework-environment-book-5-a

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Various	National Program for Community Empowerment	The World Bank	Improved access to infrastructure, economic and social services	http://www.worldbank.org/projects/P118113/third-national-program-community-empowerment-urban-areas-iii?lang=en

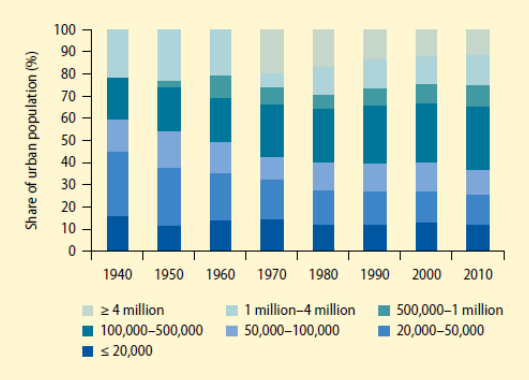
IX.VII BRAZIL

Background

Brazil, with a current population of 202 million inhabitants (estimate for 2014), is the largest country in South America. It is also, in terms of population as well as area, the fifth largest country in the world. Between 1970 and 2010, the population growth rate in Brazil was the largest in Latin America. In 2013, the 200 million threshold was topped and it is currently projected that Brazil's population will peak at around 231 million by 2050 (World Population Review, 2014d). About 90% of Brazil's GDP is generated in cities. In the last decades, Brazil has urbanised very quickly from 36.2% in 1950 to over 80% today (Figure 10). About 85% of Brazil's current total population is aggregated in urban areas which is more than in most European countries (World Bank, 2013). Until 2050, it is estimated that the percentage of Brazil's urban population will increase to 91%. In terms of urban agglomeration, the two largest cities in Brazil are ranked among the top 20 in the world. Sao Paulo (Brazil's largest city) is number five and Rio de Janeiro (Brazil's second largest city) is number 17 (2014 values) (United Nations, 2014). Additionally, about 60% of all Brazilian municipalities today have more than 100,000 inhabitants (World Bank, 2013). Below, Brazil's rapid urbanisation as well as the share of urban population for 1940-2010 is illustrated.



Source: IBGE demographic census, several years.



Source: IBGE demographic census, several years.

Figure 10: Urbanisation and share of urban population in Brazil, 1940-2010 (World Bank, 2013)

Challenges

Historically, Brazil has been characterised by enormous disparities in assets and power. In combination with government failure to address urbanisation problems, today's Brazilian cities are facing huge social and environmental challenges (McGranahan & Martine, 2012). These challenges are mainly caused by five factors: (1) lack of access to basic services such as access to piped water, sewerage, etc.; (2) old connective infrastructure and increasing transport costs; (3) housing deficits; (4) urban density – lack of efficient transport systems and increases in environmental pollution; as well as (5) high poverty and income disparities (World Bank, 2013).

National initiatives

Until the 1950s, governments and policy makers were still caught by surprise by the occurring challenges caused by urbanisation. From the 1960s onwards, a variety of policies to slow and control urban growth have been introduced in the country and Brazil has pioneered highly regarded and much-copied city reforms (McGranahan & Martine, 2012). Various initiatives have been funded to support sustainable urban development in Brazilian cities. The "Cidades Sustentaveis Prgorgram" e.g. aims to raise awareness, mobilise people and provide tools to develop Brazilian cities in an economic, social and environmentally sustainable manner. Also, the US-Brazil Joint Initiative on Sustainable Cities is supporting sustainable urbanisation in Brazil. It was launched in 2011 as an innovative public-private partnership for catalysing investment in sustainable urban infrastructure and expansion of markets for clean technology and services. Besides these two examples, a variety of similar initiatives has been introduced in the country.

City Projects

Several sustainable city projects have already been implemented in Brazilian cities. In Curitiba, the capital and largest city of the Brazilian state of Paraná, for example, sustainable urban planning already started in the late 1960s. A "Bus Rapid Transit (BRT)" system has been introduced, waste management has been improved and parks have been expanded to work as a natural flood system. As a result, Curitiba has become a pioneer in sustainable urbanisation and urban planning. Also, the Rio de Janeiro Low Carbon City Development Program (LCCDP) launched in June 2012 planned the introduction of a "BRT" system. This plan also aims to double the city's network of bike baths, provide widespread access to basic sanitation in the city's most populous area and increase urban foresting. Generally a lot of different sustainable city projects in Brazil focus on actions linked to *efficient transport systems, waste management and sustainable housing*.

Country Conclusions

Although a lot has already been done to move sustainable urbanisation forward in Brazil, especially regarding efficient transport systems, there are still strong needs for connective infrastructure, particularly for short-distance trips. Increased access to housing and general access to basic services are additional needs. Other technologies such as energy efficiency or general energy-based technologies have not yet found their way into most city projects which were reviewed. This leads to the assumption that there is a strong need for implementing such technologies in Brazil's developing urbanisation in the future.

CITY INITIATIVES

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Curitiba	Pioneering city in sustainable urbanization	-	Transport, waste management, flood control	Curitiba, Brazil. A City for people, not for cars": http://www.citiesforpeople.net/cities/curitiba.html
Rio de Janeiro	Rio de Janeiro Low Carbon City Development Program/ World Bank	Launched during the Rio+20 summit, led to business model that can be applied to other cities	Transport, access to basic services, urban foresting	http://www.worldbank.org/en/topic/urbandevelopment/publication/rio-low-carbon-city-program
Various	"Cidades Sustentaveis Program"	Various good practice examples	Sustainable housing, waste management, education, energy efficiency, water supply, green city, etc.	http://www.cidadessustentaveis.org.br/
Belo Horizonte	Belo Horizonte Vision 2030	Pioneering city in sustainable urbanisation	Energy efficiency (TRACE), transport, energy, sustainable buildings, land use, health care, education, etc.	http://www.franceamsud.org/observatorio/images/pdf-20marzo/belohorizonte_sostcity.pdf
Sao Paulo	New strategic master plan 2014	-	Transport, education, culture, health, housing, environment	-

IX.VIII ISRAEL

Background

Israel currently (2013 value) has a population of about 7.8 million inhabitants (World Population Review, 2014g). About 900,000 people are living in Jerusalem and about 400,000 in Tel Aviv, Israel's largest cities.

Challenges

With the expansion of the need for services and the rise in living standards, it became more and more difficult to supply modern services to city habitants.

Major challenges include:

- Scarce land, energy and water resources
- Integrating immigrants
- Non-homogeneous population
- Old infrastructures
- High standards of living.
- Unstable geopolitical neighbourhood
- Israel is an island in terms of energy and other resources
- Population growth is 1.9% a year

The government of Israel set the following goals:

- Supplying modern services to an ever-growing population with growing living standards
- Addressing growing local and global expectations for a sustainable economy with lower use of energy and subsequent greenhouse gas emissions
- Enhancing the use of Internet, communication and management technologies in transportation, water supply, sewage treatment, energy production, supply and use, waste management and other basic public services such as social services and education
- Contributing to public health and cleaner environment in every aspect
- Integrating all data and information produced in the cities and around them
- Promoting the development of green economy and green employment to establish a local market for local needs
- Developing local enterprises (social and economically)
- Enhancing ecologic neighbourhoods within the existing cities
- Upgrading public transportation and promoting green transportation

National initiatives

The state of Israel met this challenge through the establishment of the "Smart Cities Administration". This operates under the mandate of the Prime Minister Office and the Ministry of National Infrastructures Energy and Water. Members of the administration are from all major ministries, unions of local authorities, academia and the Israeli Standards Institute.

The following projects have been implemented or are under preparation:

- Digital Israel
- The “National Water Supply” (whole water cycle)
- The "National Energy Plan“
- Transportation and mobility plans
- New national building codes
- National plan for sustainable development
- National green growth
- Promoting R&D and encouraging of cutting edge technologies
- National plan for smart grids
- Adopting international standards (energy use in buildings, IT, management systems, and infrastructure)

Due to resource scarcity, Israel has prioritised the development of water technologies and energy efficiency (since 1983). More than 170 companies provide solutions. It is the first and the only country for many years that used solar installation (85% of all households), although the use of renewables was limited to that. Israel managed to decrease primary energy per capita by 5% in the last 6 years while GDP grew by 9.6%. Since 2010, a national program to reduce electricity consumption by 20% until 2020 has been implemented.

City projects

According to Hazavdi (2014) sustainable city projects in Israel have been mainly financed for research and development in the areas of: transportation, smart lighting, city energy monitoring and management, wide bandwidth "free Wi -Fi“, an information data centre, Smart Grid, smart water cycle, socioeconomic academic research and the adoption of international standards. Technologies being used in covering above mentioned areas are either locally available or need to be imported [8] .

Country Conclusions

Obstacles in applying smart cities include:

- Central government leaves little space for local authorities
- Regulatory barriers
- Existing old infrastructures in most of the cities
- Socioeconomic barriers
- Cultural barriers
- Insufficient coordination between various data sources, need to be regulated and standardised
- National limitations such as security installations which are located inside the municipal areas

[8] R&D 4% of the GDP (civilian R&D). 47.4% from the Israeli export is High-tech. The water technology in Israel export in 2012 was 2.5 billion US$ and it is increasing, by 2020 it is estimated to be 4 billion US$.

CITY INITIATIVES

CITY	PROJECT	CHARACTERISTICS	PROJECT FOCUS	LINK
Ramla	CES-MED	1. Sustainable Development: Waste management, increased recycle rates (28% today), especially in the organic sector and the construction of bike paths 2. Energy: Reduce energy consumption in street signage, traffic lights, public institutions and educational facilities, use solar energy and photovoltaic cells on public structures.	RES, EE, waste management, transport	-
Rosh-Ha'Ayin	CES-MED	SD: intense population growth driven by immigration, obsolete infrastructure 2. Energy: green energy savings in energy efficiency and power consumption limitations. Installation of solar systems in public spaces, including street lighting and installation of electricity-saving mechanism and devices in all urban public institutions are also planned.	RES, EE	-
Shefa-amer	CES-MED	SD: a sustainable approach to development of historical sites including specific energy management approaches 2. Energy: energy savings particularly in public lighting and transport sectors.	EE	-