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Smart city/How to deal with climate change and cut emissions

Sustainable Urbanization?

It is at the city level that sustainability policies need to be defined and solutions implemented. Over the past decade, many Gulf Cooperation Council governments have actively promoted urban environmental projects. Their uneven results reveal objective limits and contradictory trends

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Since 1987 and the release of the Bruntland Report on sustainable development, concerns over climate change, biodiversity and other global threats have grown, and urbanization is at the core of this global anxiety. The world's urban population, as recorded by the UN, has now reached 4.2 billion, or 55 percent of the total population, and is expected to grow an additional 2.5 billion by 2050. This tremendous urban population will consume considerable resources and emit about 75 percent of the world's greenhouse gases. Cities are a major factor of unsustainability at the same time cities and urban dwellers increasingly suffer from global environmental changes. Gulf cities are no exception to these problems. Record breaking temperatures in Kuwait in 2016 highlighted the unbearable summer heat Gulf cities are facing and will have to cope with. Sea level rise or extreme rainy events may also affect the future of cities in this region. At the same time, governments, international organizations and urban authorities insist that if cities are both the cause and victims of global threats, they can also be the solution. Hence, cities have to be the place for implementing solutions, and policies have to be designed at the city level. These policies must both reduce the urban environmental footprint and unleash the resilience of cities.

Environmental protection through social inclusion

The New Urban Agenda adopted in Quito in 2016 underscored the two-faceted nature of sustainability; i.e., that environmental preservation must go hand in hand with social inclusiveness.

How have Arab Cities and governments moved in this direction? The continuous urban growth in this region of the world, in the face of harsh climatic conditions, has historically been made possible only through an extravagant use of cheap and widely available energy, and to date urban forms and consumption patterns are clearly at odds with sustainable practices. Until recently, there were few signs of ecological concerns in this part of the world, and Arab cities are scarcely present in city networks that are at the forefront of environmental transition. For instance, the C40 Cities Climate Change Leadership Group includes only three Arab Cities: Cairo, Amman and Dubai. Out of more than 1500 members, the Local Governments for Sustainability network includes only 10 from the Middle East and North Africa, five of them from Turkey. Despite this low profile in international arenas, Gulf governments loudly and glitteringly advertise their commitment to sustainable urban agendas, and in the last ten years governments have actively promoted projects and plans that demonstrate their will to implement sustainable strategies. However, their motivations are complex, and impressive achievements have objective limitations and should not hide contradictory trends.

Masdar City represents the first and to date most telling expression of urban sustainability ambitions. The famous carbon-neutral city in the suburb of Abu Dhabi, designed by Norman Foster, was launched in 2008. It uses brand new technologies in building design, energy management, renewable energy, water and waste management, as well as innovative transportation technologies. It is intended to become first a lab, and then a model for future urbanism in the region and beyond. The project indeed became a showroom, as Abu Dhabi also managed to attract the headquarters of IRENA, the International Renewable Energy Agency and to develop spectacular solar projects connected to the neighborhood. As cities in the Gulf region compete against each other in order to attract investments, governments have designed projects that emulate Abi Dhabi's vision. This is the case with the new Saudi towns of King Abdullah Economic City and above all, the futuristic ciity Neom. In Dubai, several initiatives also express the will to compete with Masdar City, for instance the recent Sustainable City megaproject.

Developing renewables and improving efficiency

These urban projects are increasingly integrated into wider strategies aiming at developing renewable energy, as well as energy and natural resources efficiency schemes. All governments in this region have set up targets for renewable energy (RE) production and regularly upgrade them. The UAE targets 27 percent clean energy capacity in 2021 while Saudi Arabia targets 10 percent RE capacity in 2023 and 30 percent in 2030. The continuous decrease of KWh price for solar technologies, both CSP and PV, as shown in the latest bids in Dubai and Saudi Arabia, renders these targets within reach. At the end of 2018 the share of renewable energy has more than quadrupled in four years, from 210 MW in 2014 to 867 MW. But this amounts to less than one percent of electricity capacity.

Governments have also adopted ambitious schemes for energy efficiency. Green building councils have been established in almost every country in the region and they have adopted international standards for energy saving norms, such as Leadership in Energy and Environmental Design (LEED), to the approaches, such as the Pearl rating system in Abu Dhabi. Gulf states have also begun to roll back costly subsidies to fossil fuel, electricity and water. Several cities are also building massive public transportation schemes, and Dubai has been a pioneer and now runs two metro lines. Similar projects are under construction in Riyadh, while Abu Dhabi plans its own system. But these transportation means will in the short term mostly serve the foreign population and not the nationals, who prefer to use cars. Plans for electrifying the automobile system are now actively being prepared, but they require huge additional generation capacities and a complete revamping of the energy distribution system.

Preparing for a post-oil world

There are several differences in the narratives local authorities in this region use to justify their commitment to sustainable urbanization. In contrast to most world cities active in promoting ecological transition strategies, climate change concerns are not prominent in the governments' discourses. Instead the clearest element justifying the move is the necessity to prepare their economies for a post oil future as economic diversification away from fossil energy is necessary. Clean techs and real estate stand at the core of the new green capitalism that unfolds. In this respect, sustainable urbanization appears not as a response to global threats but rather as a concern for the political stability of the countries and a new direction for economies. Abu Dhabi has taken the lead in this orientation with Masdar and other related plans. Indeed Masdar is not only a local project but a company active in the field of renewable energy, one investing abroad and aiming at replicating its technological innovations in other contexts. Prince Mohamed Bin Salman's Saudi 2030 plan very openly seeks to emulate those of his rivals from the Gulf shore.

In the short term, fiscal pressures added to the justification for this long term goal of diversifying the economy. With the slump of oil on in- →

MASDAR CITY
Masdar literally means "the source city." Designed by Norman Foster, it is located in the United Arab Emirates, a few kilometers from Abu Dhabi, and was created with the ambitious goal of being the first carbon-neutral and zero-waste city in the world. It is home to the headquarters of the International Renewable Energy Agency (IRENA).

17,500 MWh
the amount of megawatt-hours of clean electricity produced at Masdar City's 10-megawatt solar plant per year.

The cities of the future

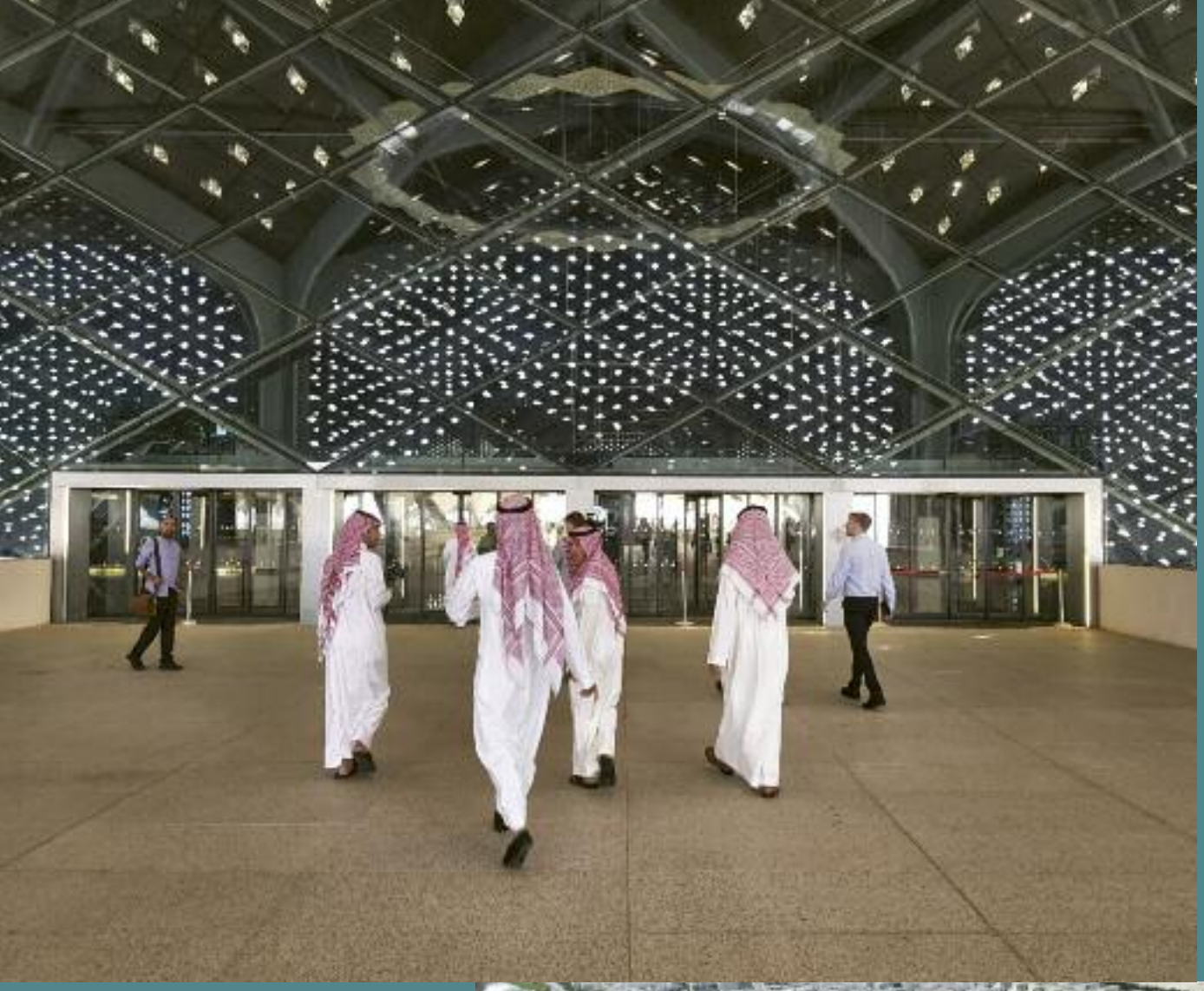
NEOM CITY
This is the latest Asian center on the list of cities designed by Norman Foster and will be built in Saudi Arabia. The plans call for Neom to be built by 2030, over an area of 26,500 square kilometers, and for it to be powered entirely by renewable sources. The project is part of the "Vision 2030" plan.

72.4 GW
It is the amount of energy that the city will produce for energy autonomy, with 100% from renewable energy.

ternational markets in 2014, most oil-based economies in the region experienced fiscal tensions because oil revenues no longer covered social expenses. This strongly affected the more populated states of Saudi Arabia and Oman, where social demands are more heavily felt. Fiscal pressures played a determinant factor in reforming electricity, fuel and water prices, reforms which have been enforced in the last four years.

Having noted the high ambitions Gulf governments express and their original motivations, it is nevertheless necessary to underscore the limitations of those schemes. Four points come to mind: The vulnerability of these urban sustainable projects/markets to real estate cycles remains high. The real estate crisis of 2008-09 administered a blow to Masdar City and highlighted some of the weaknesses of this kind of project, and it was downsized and reprofiled as a more traditional real estate project. New developments remain well below the initially foreseen pace. The project did not fulfill its ambitious technological promises, even if the achievements already represent a strong departure from ordinary planning practices in the region. It is far from being carbon-neutral even if renewable energy and energy savings allow for about a 50% reduction in energy demand. Clearly, other sustainable megaprojects also depend upon foreign investments and stand at risk of similar real estate ups and downs. For instance, the delayed achievements of the futuristic cities KAEC and Neom in Saudi Arabia illustrate their difficulty in convincing foreign investors and the fierce competition between these cities and projects, where returns are determined not only by technological advancements but also by political conditions.

This highlights the political nature of arrangements regulating access to infrastructure and resources in cities of this region and hence a certain level of uncertainty regarding the capacity of local governments to maintain the direction in the face of contradictory demands. For years the political legitimacy of regimes in this part of the world has been linked to the provision of modern infrastructural services at a cheap, if not free, price. As explained above, under fiscal pressures, governments have recently slashed subsidies for fuel, water and electricity. This effort needs to be pursued and expanded. Until now, no major projects have failed over this issue, but it remains sensitive. Beyond that, urbanism remains car-centric and based on individual housing for nationals. This kind of urbanization, even with all its improvements and the increasing availability of renewable energy, remains unsustainable in the long run in terms of resource consumption (land, energy and water). The shortage of available land in the face of strong demand creates political tensions, as al-



KAEC
This is the King Abdullah Economic City, the smart city planned by Abdullah Bin Abdulaziz Al Saud, the sixth king of Saudi Arabia. It is expected to extend over a total area of 173 square kilometers and will be required to implement best practices from around the world, applying them wherever possible.

€51 Million
is the investment of King Abdullah Economic City for the design and construction of a sea water desalination plant powered by solar energy.

SUSTAINABLE CITY
This is an eco-residential experiment located less than 25 kilometers from the center of Dubai. About 3,000 people live here. There are solar panels on the roofs of houses, parking lots and companies, and this generates enough energy to reduce this community's consumption of fossil fuel to zero.

10 MW
is the production of solar energy used to power this city.

ready observed in Kuwait. As stated by researcher Sharifa Alshalfan, because of the "limits on development including access to land and infrastructure, supply in Kuwait struggled to meet rising demand. In 2015, the Public Authority for Housing Welfare had over 106,000 applications on the waitlist for housing, yet from the start of the housing program in 1954 and until 2015, the state was only able to provide 114,600 units. For the state to fulfil the current demand, it would need to develop almost the same amount of housing units it had provided over the past sixty years." The sprawl of the low density Kuwait City connected by hundreds of kilometers of highways creates huge traffic congestion.

Environmental decay around large cities

Another dimension of sustainability pertains to the huge degradation of the local environment around the big cities of the region. The extensive transformation of the shoreline in the Emirates as well as in Saudi Arabia has deeply devastated local ecosystems, for instance, the mangrove areas, also hurt by oil spills. The massive production of desalinated water also produces negative environmental outcomes. Most of the Gulf desalination plants currently use thermal technology, which requires much more energy than osmose reverse technology, and also emits a lot of greenhouse gases (GHG). In any case, for every liter of fresh water, 1.5 liters of brine and various chemical particles is discharged into nearby water, destructing sea life because of the increase of salinity and higher water temperature. The introduction of the newly improved reverse osmose technology fueled by renewable solar energy will gradually improve this dire situation, as the new Taweela unit installed by Abu Dhabi Water and Electricity Authority shows.
The higher share of renewable energy, the improvement of energy intensity and of water use do not mean that the use of resources will decrease in the future. Currently, a city like Dubai emits three times more GHG per capita than New York City. On average, GCC countries exhibit levels of carbon emissions per GDP unit much higher than the world average and beyond East Asian and North American competitors. This is even stronger when considering per capita average. Future trends anticipate an increase in carbon intensity, from 6.96 cubic meters (cbm) of carbon per capita in 2016 for the MENA region toward 7.5 cbm in 2030, while world average would remain below 5 cbm.
The continuous growth of population and urban surfaces in the coming years means that the ecological footprint will continue to rise, even if at a reduced pace. Strictly speaking, urban sustainability in the Gulf remains an elusive promise.