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Sustainable, Smart and Humane Cities: From Utopia to Reality

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1 ABSTRACT

This paper gathers the results of the research undertaken by the authors on the phenomenon of "New Cities" (NCs) conceived during the last thirty years, when urbanism began to be ruled by two basic principles: sustainability and smartness. Eighty case studies were selected from 38 countries on five continents in order to explore this dynamic and to answer the questions that triggered this research. What motivated NCs? What specific response did they adopt? What motivated their implementation or abandonment? Were they able to fulfil their own expectations?

Keywords: sustainability, reality, Utopia, Smart City, resilience

2 THE NEW CITIES: STRATEGIES, PLANNING AND OUTCOMES

2.1 A glance at history

Founding new cities is a strategy known since the earliest civilisations. The decision to build them depended on the coexistence of three conditions: a de facto power that would arrange their execution, sufficient technical knowledge to design and build urban structures, and sustained economic capacity over time to ensure their realisation. Their implantation in the territory depended on the strategic objectives expected from their implementation. From ancient civilisations until the Renaissance, the task of building new cities was functional: cities to centralise monarchic and religious power, bastides to defend frontiers. or colonies to consolidate conquered spaces. The baroque period introduced a new type of city intended for royal leisure, while the 19th century promoted a new urban model: industrial towns and planned bourgeois neighbourhoods. The 20th century introduced the functional city. Consolidating the urban planning techniques enabled to design the urban structures of the future, such as the British "New Towns" and the modernist cities of Brasilia, Chandigarh or Islamabad. The dynamic that transformed the model of the industrial city into the post-industrial one in the mid-20th century displaced comprehensive planning and master planning to give way to sectoral urban projects that were easy to adapt to the changing conditions of the environment. This growth model without general guidelines, included demolition and reconstruction and subsequently urban regeneration. It reached its limits towards the end of the century, when in 1992 the Rio de Janeiro Summit raised the urgency of redirecting the traditional urban model towards the paradigm of the "sustainable city." In parallel to this process, the new technologies developed in the 1990s found new fields of application in the urban domain, leading to the "smart city." Both concepts today underpin the urban planning proposals that public organisations and private companies use to implement the 21th century city, both by transforming existing cities and, especially, by creating new ones.

2.2 The rise of new cities in the world

The fever to build new cities during this period around the world has been astonishing. It was adopted as a panacea to solve the problems of current cities: overcrowding, pollution, traffic congestion, housing shortage, lack of green spaces, economic stagnation, social unrest, to name a few. Starting from scratch represented an extraordinary opportunity for agents with the capacity to do so. It encouraged governments and administrations to devise new policies and strategies, mobilised national and international capital towards new investment niches, and drove the creativity of planners to imagine new urban models. At present, some 200 new cities are either completely, being built or in the planning process. All of them are understood as a means to addressing different urban challenges. This massive-scale phenomenon began in the 1990s. However the realisation of these new cities had to overcome three successive, complex phases - initial decision, drafting the master plan and securing finance - on which the success or failure of the development companies depended,

3 METHODOLOGY

3.1 Literature review

"New Cities" (NCs) are a laboratory for urban analysis and provide an excellent research opportunity to recognise dominant trends in contemporary urban planning and design. Detecting these trends was the aim of our research. It is based on our initial observation of the astounding rise of NCs - visions as well as realisations - since the 1990s, especially in Asia and Africa. During our literature review we found very few academic papers on the NCs phenomenon and had to rely on documentation produced mainly by the protagonists of these NCs. From our literature research we compiled an empirical set of case studies on which we were able to access sufficient information in the public domain to create an analytical framework which would help understand their "raison d'être" as well as reasons for their success or failure. We aimed at a broad geography, but concentrated on Asia and Africa because NCs were most prominent and numerous there,

3.2 NCs typology development

Aware that all the protagonists were keen to present a promising future of their NCs, we discovered that the NCs concept was applied to different types of spatial developments, albeit all of them planned. For that reason, we aggregated this abundant, partial and dispersed information into a single analytical framework, a typology of NCs based on their stated objectives. Moreover, we also related their objectives to the challenges of five macro-categories of "sustainable" and "smart" planning: economic (growth and urbanisation process, project financing), social (societal and demographic structural changes, polarisation), environmental (climate change, greenwashing), technological (digitalisation, artificial intelligence) and political (governance, public and/or private development). When we developed the typology of NCs based on their stated purpose, self-declared objectives and development strategies, it became clear that some cities aimed at several, sometimes contradictory objectives in parallel. We refined the typology accordingly and used it in combination with the sustainable and smart city planning categories to structure our comparison between NCs which were totally or partially implemented and those remaining in the realm of visions and utopias. Predictably, information on financing was scarce, although lack of finance seemed the primary reason for NCs not to be realised.

3.3 Analysis

From the proposals of NCs and their results in practice and by using our two lines of analysis we explored which NCs and why they would lead to concrete implementation or result in ghost cities. We also were able to explore to what extent the techniques used in the conception of these urban experiences have responded to the challenges of planning over the last 30 years and how the utopian designs may influence trends in the urbanism of ideas

4 NCS: SOME INITIAL ISSUES

4.1 What are "New Cities"?

There is no universal definition for the NCs concept, as it refers both to independent urban entities, built from scratch, and to special districts located in the urban fabric of existing cities or in complex metropolitan areas. Both types have master plans specifically designed to meet the strategic objectives of their managers.

4.2 Spatial-temporal distribution

The analysis of the spatial-temporal evolution reveals the interest of different countries in addressing the construction of NCs to solve urban problems of various kinds. Most NCs are concentrated in East and West Asia, with a particular predominance in China, together with Kuwait, Japan, Saudi Arabia, India, the United Arab Emirates and Oman. This is due to their dynamic and prolonged double-digit economic growth resting on exports to Western markets and related rapid urbanisation, especially in Asia, led by China and followed by India later. The situation in Africa is equally notable, albeit with a smaller number of NCs than in Asia. Their prime purpose was to absorb the growing population and rural to urban migration rather than growing economy. Nevertheless, the experiences of Nigeria and Kenya are standing out. The participation of the Americas is scarce, although greater than in North America and Europe or Oceania, where the construction of NCs is negligeable as their economies and cities were more mature and their population stable or even

shrinking. Russia's absence of NCs is more difficult to grasp as it has great development potential based on its rich resources. The starting dates of the projects reveal that the interest of local managers in building NCs began in East Asia in the 2000s and 2010s, with a significant increase between 2010 and 2020. In Africa the trend accelerated between 2010 and 2020, while in the Americas it was between 2010 and 2020, greater in recent years. Proposals of a forward-looking urban nature started to develop after 2015, with new contributions up to the present.

Origin and objectives of NCs

They are various, depending on the environmental conditions that gave rise to them, among them:

- solution of urgent urban problems: overcrowding, pollution, congestion, housing shortages,
- expansion of informal settlements, effects of climate change
- strategies to boost the development of national and regional economies
- internationalisation of the image of countries as economically sustainable and technologically advanced
- real estate developments for business purposes and gated communities.

4.3 Project management

Project management of NCs is undertaken by specific protagonists, according to their own operational characteristics, and is essentially driven by funding.

- categories of protagonists: public - national and regional governments; private – developers,
- real estate companies, technology companies, design companies, rich individuals
- financing: national and foreign capital (notably Chinese, Arab, etc.)
- design of the master plan: national and international consultants specialised in this type of urban
- operations, depending on the type of NC, the size of the project and the number of projected inhabitants
- type of management: top-down, without citizen participation and, in many cases, with processes of eradication of the resident population in the planned development locations.

4.4 Budgets

The key issue for NCs is their financing in view of their extraordinary costs. Although this information is not always available, these values vary widely depending on the scale and characteristics of the project, exceeding billions of dollars in some cases, such as the New Administrative Capital in Egypt, Nurkent in Kazakhstan or Xiongan in China. Most are in excess of millions of dollars, with few projects below this amount, such as Diamniadio Lake City in Senegal, Trans Ganga High-tech City or Dholera Smart City in India. The costs of master plans have a diverse impact on the overall budget, depending on whether they are designed by renowned national or foreign teams.

4.5 Types of NCs

There is no single typology of NCs, given the variety of origins and objectives that drove the urban development proposals. The characteristics of the cases analysed enable us to distinguish between two basic types of NCs: the operational ones - designed to be built in specific spaces according to specific objectives - and the prospective ones, designed to respond to the urban challenges of the future. Some of these NCs are encompassing several categories and many of them claim to be 'smart' and/or 'ecological'.

Operational NCs: according to the global functions that gave rise to the NCs, it is possible to classify them into the following categories:

- Capital NCs, national and regional: the decision to build them responds to the interests of the
- government in power, whether authoritarian or democratic
- Business NCs: urban districts developed mainly by technology companies in existing cities,
- understood as laboratories to verify the application of their own technologies in urban space

- Productive NCs: aimed at regenerating regional economies, globalising national economies and
- attracting investors, set up in areas with more flexible administrative and fiscal systems than in the
- rest of the country
- Real estate NCs: urban developments designed to provide housing and land for all types of activities,
- generally promoted by private companies
- Green NC: projects designed in response to the implementation of specific environmental policies
- aimed at improving the quality of the environment.

Prospective NCs: urban projects designed to solve future challenges – some of them ongoing – are grouped into three generic types:

- Floating cities: in response to the risks arising from rising sea levels
- Techno-futuristic cities: interested in the application of new technologies in the urban environment
- Virtual cities: installed at the interface between the real and virtual worlds.

5 CASE STUDIES: CRITICAL ANALYSIS OF 80 SELECTED

5.1 Operational NCs

5.1.1 National and regional capitals

Regardless of the type of government and the socio-economic situation in the country, the decision to found a new capital city is an eminently political event that embodies the ambitions of its rulers. Malaysia's constitutional monarchy decided in 1995 to build Putrajaya (350,000 pop) as the administrative and judicial capital even though Kuala Lumpur retained its role as the official and legislative capital. Conceived as Asia's first smart city, its development slowed down after the 1998 economic crisis. Myanmar's military dictatorship decided in 2000 to build a new capital in the interior of the country to remove the remnants of Rangoon's colonial past. Naypyidaw (1 million pop), fully developed, is a ghost City, devoid of inhabitants and activities due to its isolation, lack of public transport and high housing and living costs. The same fate befell Amaravati (3.5 million pop), the new capital of the state of Andhra Pradesh in southeast India, whose development, started in 2014, stalled due to the pandemic and lack of funding. Today it is a ghost City with a few government buildings constructed. This is not the case of Egypt's New Administrative Capital (6.5 million pop), promoted by the government in 2015 as the icon of the 'New Republic of Egypt 2030' despite its sky-high costs and the country's deep economic crisis. Partially developed, the settlement of the inhabitants is slowing down due to high housing costs. In 2017 the president of Equatorial Guinea, in power for more than 44 years, decided to build Olaya City of Peace (60,000 pop) in the interior of the country in order to reduce the effects of political instability in Malabo. The fall in the price of petrol stalled the project, which is now barely developed. Faced with the unstoppable collapse of Jakarta, in 2029 the Indonesian government decided to build a new capital Nusantara (1.9 million pop). Located in the middle of the Borneo jungle, the financial collapse of the project seems imminent due to the lack of incentives promised to foreign investors by the current president and the end of his mandate.

Regarding regional capitals, in 2006 the Indonesian government decided to create Dompak (500,000 pop), the new capital of the Riau Islands province. Located in a Special Economic Zone and close to a polluting bauxite mine, the new city barely developed, slowed down by a high-profile corruption scandal and its irreversible environmental damage. Kilamba New City (500,000 pop) was designed in 2008 as the capital of the newly created municipality of Belas, Angola. Despite its advanced state of construction, it failed to attract inhabitants due to a lack of social housing and public transport, turning it into a ghost city. Meanwhile, the creation in 2018 of the New Capital of Ahal Province (70,000 pop), with no final name yet, was a decision of Turkmenistan's authoritarian president. The idea of building the country's first smart city is an ambitious project that began its first phase of development in 2021 despite the country's depressed economic situation.

5.1.2 Business NCs

NCs promoted by companies as experimental laboratories have similar characteristics. Fujisawa Sustainable Smart City (3,000 pop) is an experimental, smart and sustainable district built by Panasonic in 2008 in the Japanese city of the same name. The first of three planned neighbourhoods have been built, forming homogeneous communities belonging to the same technological environment. Also in Japan, Toyota built Woven City (initial 2,000 pop) in 2021 in the city of Susono, designed according to 16 criteria: community, personal mobility, autonomous vehicles, robotics, smart housing, artificial intelligence, service mobility, multigenerational housing, nature, health, hydrogen energy, academic research, cooperation between industries and smart construction. In contrast to the small scale of the Japanese cases, the Chinese communications corporation Tencent planned Net City (80,000 pop) in 2019 within the city of Shenzhen, designed to function as a place of work, residence and social interaction for the workers of Tencent's many companies. It is at the master plan stage and its design responds to government guidelines to respect the spirit of the environment and highlight Chinese characteristics.

5.1.3 Productive NCs

The objectives that drove the creation of these NCs are multiple, although the weight of certain goals allows for a generic aggregation into three sub-groups.

Regeneration and globalisation of national and regional economies: Cyberjaya (140,000 pop) was a pioneering case aimed at revitalising the national economy and transforming it for the digital age. Conceived in 1997 as the centre of Malaysia's "Multimedia Super Corridor", home to leading technology companies, it accommodates foreign staff, but housing remains inaccessible to the local habitants. The city of Songdo (300,000 pop), promoted in South Korea in 2000, was conceived as an alternative international business centre to Seoul and one of the largest public-private real estate developments in the world. However, the attraction of businesses and people was not as expected, as it remains sparsely populated. In contrast, Lingang New City (800,000 pop), a satellite city of Shanghai created in 2003 to support the new port of Yangshan, progressed according to plan.

Examples in Africa are significant. In Kenya, the 2008 development of Tatu City (80,000 pop) into a Free Economic Zone had the dual objective of attracting international business and decongesting Nairobi by capturing the growing national middle class. Its development has been slowed by legal and financial scandals and ownership disputes. Nigeria promoted two NCs for this purpose. Eko Atlantic City (250,000 pop) on an artificial island off Lagos in 2009, to attract big business, train local labour and relocate some of the inhabitants from the sinking capital. Partially developed, it aspires to become a commercial, financial, residential and tourist centre for the region's elites. The Enyimba Economic City (1.5 million pop), located in a Special Economic Zone in 2018, was intended to transform the country into a manufacturing and industrial power. Scheduled to be developed by 2023, it risks stalling as it is unable to secure funding. In Nigeria, Alaro City (30,000 pop) is a mixed industrial and logistics development implemented in 2019 in a Free Trade Zone with the aim of attracting digital businesses and high-income inhabitants. Its development is in its infancy. In Kenya, Konza Technopolis (180,000 pop) was conceived in 2008 as an epicentre of technological innovation for Africa's growing start-up industry. After navigating a heavy bureaucratic burden, only the first phase was launched.

The trade opportunities generated by the Chinese Belt and Road Initiative of a new Silk Road was launched in 2013 to improve connectivity and cooperation on a transcontinental scale, favoured the creation of NCs. The Chinese city of Ordos Kangbashi (1 million pop) was conceived in 2001 as a new economic hub in Mongolia to connect the Silk Road. Built in less than 10 years, it is sparsely populated and is the world's largest ghost city. Nurkent (110,000 pop), in Kazakhstan, started development in 2017 in the Special Economic Zone opposite Ordos Kangbashi but has seen little development. The Colombo City Port project, launched in 2016, aims to be a regional business centre and key hub for the Belt and Road initiative. Located in a Special Enterprise Zone on reclaimed port land, it is scheduled for completion in 2041. In India, Dholera Smart City (200,000 pop) was the first smart city and the largest urban development in the country. Included in the Delhi-Mumbai Industrial Corridor Special Investment Region since 2008, the first phase is being implemented.

Diversification of the economy: The King Abdullah Economic City project (2 million pop), designed in 2005 in the province of Mecca, Saudi Arabia, is an initiative to diversify the oil-based economy. It offers an

attractive environment for foreign investment and pilgrims, and is committed to leisure and entertainment. Development is well below the initial grand proposals. Qiddiyah City, 40 km from Riyadh, was designed in 2019 according to the Saudi Vision 2030 as an entertainment mega-project aimed at diversifying the country's income. In the same vein as Oman has promoted the construction of several NCs. Duqm New City (250,000 pop), near Muscat, was planned in 2018 in a Special Economic Zone. Given its strategic position on the Maritime Silk Road it operates as the China-Oman Industrial Park, including residential and commercial development and is under construction. Khazaen Economic City, planned in 2019 as Oman's first dry port, is the result of the Sultanate's largest public-private partnership to attract new investment and is under initial development. The Yiti Sustainable City (10,000 pop) was planned in 2022 to develop the country's tourism. Seventy-five per cent has been built and it is expected to be completed by 2025. In Ecuador, the Yachay City of Knowledge project (120,000 pop) was a presidential initiative launched in 2014 to build the country's first planned city, centred on a university and specialised industries. Highly politicised, the project was cancelled in 2023 after the change of government.

Model NCs projects: In Japan, the Kashiwa-No-Ha Smart City project (26,000 pop), managed since 2005 by the Urban Design Centre Kashiwa, comprises universities, local authorities and various public and private entities. It enabled the consolidation of a technologically advanced space adapted to different lifestyles, generations and uses. With totally opposite characteristics, the Amhara Model Town in Ethiopia was an experimental project initiated in 2010 by Swiss and Ethiopian architects and urban planners to provide housing and infrastructure for rural migrants to urban centres. Partially developed, it did not attract the expected number of inhabitants. Trans Ganga Hightech City was a 2014 proposal by the state of Uttar Pradesh (India) to create an Industrial Model Township, aimed at attracting investment, made up of productive, residential and commercial sectors, but remains in the pipeline. The Rublyovo-Arkhangelskoye city/district (66,500 pop) was designed in 2016 to decompress Moscow. Located in the outer Kunstsevo district, it was conceived as an International Financial Centre and a benchmark of best practice for the real estate market but remains in the pipeline. In Oman, Sultan Haitham City (100,000 pop) was officially inaugurated in 2023 as a new smart and sustainable district in line with the sultanate's Vision 2040. The aim is to launch similar projects in the Sultanate in the future, but it has not been developed. The Xiongan project (25 million pop) was launched in 2017 by the Chinese government to create a new district between Beijing, Tianjin and Hebei. With an area of 2,000 km2, encompassing more than 60 rural villages, it aims to become the most technologically advanced, best connected and environmentally sustainable city in all of China, targeting the strong domestic market and aiming to consolidate the high-end socialist market economy and is under development. Chengdu Future City, designed in 2021 according to the concept of a "living university", is a project that responds to China's interest in promoting academic education and high-tech industry in high-quality clusters.

5.1.4 Real estate NCs

They constitute the largest number of cases, as the "New City" concept provides private developers with a vision of an urban future in which it is worth living. Given the variety of objectives, the generic classification comprises five sub-types.

Capital city decongestion In 2013 the Emirates promoted the Dubai Sustainable City (2,700 pop), a small mixed residential and business green experiment developed by a private company to meet Dubai's needs is completed. The situation is not the same for Diamniadio Lake City (280,000 pop), a mega-project proposed by the Senegalese government in 2014 to decongest Dakar and promote the country's economic growth. Partially built, it is unaffordable for most Senegalese. In 2014, the Kuwaiti Public Authority for Housing Welfare initiated the Jaber Al Ahmad New City project (80,000 pop) through a tender open to private companies, driven by the growth of Kuwait City and now completed. In 2016, the same administration managed South Sabah Al-Ahmad City (280,000 pop), in the southern sub-region of the country, intended as a gateway to Saudi Arabia. Infrastructure works started in 2023.

Technologically advanced cities: Masdar City (50,000 pop) was the first green and smart city in the United Arab Emirates. Designed in 2006 as a model for humanity, it was a failed project, partially occupied and turned into a ghost city. The Line (9 million pop) is the most ambitious idea of the crown prince of Saudi Arabia. Conceived in 2011, the city is a single building, 170 km long, 200 m wide and more than 500 m

high, stretching from the Red Sea into the desert. Construction of the infrastructure began in 2023 but its realisation is in doubt.

Pastiche cities: Lavasa (300,000 pop) was the first private city built in the Western Ghats of India in the image of the Italian city of Portofino. Started in 2000 as a smart tourist destination, various circumstances turned it into a ghost town. Tianducheng (100,000 pop) is a huge luxury housing complex developed by a real estate company that emulates Paris. Built in 2007 in the suburbs of Hangzhou, China, it has become a ghost City, despite efforts to attract inhabitants and tourism. Shenyang State Guest Mansions (500,000 pop) is a ghost city located 400 km from Beijing. It was a baroque-style luxury housing development started in 2010 and stopped in 2012 due to lack of buyers.

Cities for urban elites: Sabah Al Ahmad Sea City (250,000 pop) was a pioneering project in Kuwait. Work began in 1993 to transform salt marshes into artificial islands and create 200 km of beaches. This massive infrastructure, consolidated and completed in 2021, created new development land. Rawabi (40,000 pop) is Palestine's first smart city, located outside Ramallah and developed by a private company since 2007, despite complex relations with Israel for its construction. An oasis of luxury in the West Bank, it is partially inhabited. Sharjah Sustainable City (5,000 pop) is the first high-end sustainable villa neighbourhood in the UAE, promoted in 2010 by the Sharjah Investment and Development Authority and a private developer. The last phase is under development and due for completion in 2024. Nkwashi satellite town (100,000 pop) is Zambia's largest private development, located in a Multi-Facility Economic Zone close to Lusaka. Projected in 2013 for the emerging middle class, it remains sparsely populated. In Bolivia, the Nueva Santa Cruz (370,000 pop) is a high-end real estate project developed by a Bolivian group since 2022 on the outskirts of the city of Santa Cruz with the assistance of Korean companies. It is under development. A private company was promoting Ho Chi Minh Global City in 2016, a sophisticated new district that will serve as a new "downtown" model for the Vietnamese city of the same name. In the pipeline, it is scheduled for completion in 2026. The proposal for Forest City (700,000 pop), a private city designed on four artificial islands to attract Malaysian residents from Singapore and Chinese real estate investors, was launched in 2016. Only partially developed, it failed to achieve its objectives and is becoming a ghost city.

Delocalised projects: The Parks, a smart and self-sufficient city project (150,000 pop) is a proposal developed for South Africa in 2022 by a private company based in Dubai, without a specific spatial location. The same company promoted a similar project Al Nama (44,000 pop) in 2016 for the city of Riyadh in Saudi Arabia. In 2022, it presented the XZero proposal (100,000 pop) for the southern part of Kuwait. Nexgen (35,000 pop) was proposed for the Eastern District of Cairo in 2023. All these proposals remain in the pipeline.

5.1.5 Green NCs

Designed to respond to sustainability, these NCs have sharply differentiated profiles. Tianjin Eco-City (350,000 pop) was launched in 2008 as a result of efforts by the Chinese and Singaporean governments to demonstrate the benefits of environmental policies in territories unsuitable for human habitation. With 75% of the area developed, it has failed to attract the expected population. The new city of Ouèdo (100,000 pop), in Benin, Africa, was designed in 2013 in response to the initiative to build social housing with sustainable criteria in the metropolitan area of Cotonou, its capital. Development started in 2019. New Clark City (1 million pop) was conceived in 2015 as an eco-city “twin” of Manila, Philippines. Based on climate and disaster resilience criteria, it aims to reduce congestion and pollution in the capital. Work started in 2019. Green City Kigali (150,000 pop) is a new neighbourhood planned for Kigali, Rwanda's capital, in 2017. The proposal with affordable and protected housing, supported by the Rwanda Green Fund and the Green Climate Fund among others is expected to start in 2024. The Orbit, a project to expand the agricultural city of Innisfil, Canada, was developed in 2017. A modern version of the garden city movement, it is in the pipeline, with the first phase planned for 2024.

5.2 Prospective NCs

5.2.1 Floating cities

Artisanopolis (1,000 - 2,000 pop) is a pioneering project of self-sufficient floating platforms, connected to each other and organised according to circular economy principles, devised in 2017 with support from the French Polynesian authorities and US scientific and engineering companies. Floating City (20,000 pop) is a

self-sufficient, flood-proof aquatic city designed in 2022 as a luxury holiday destination, with the collaboration of the Maldives government and the Dutch Docklands company. It is under development since 2022. Biodivercity, consisting of three islands (15,000 and 18,000 pop each) was designed in 2020 to create a “global destination” to facilitate sustainable economic and cultural growth and protect the biodiversity of Penang Island, Malaysia. It is in the pipeline. Dogen City (10,000 pop), a self-sufficient floating smart city project was designed in 2023 by a consortium bringing together industry, academia and government in Japan, scheduled to start in 2024. Oceanix Busan (12,000 pop) is a pilot project devised by a private company for the city of Busan, South Korea, in 2022 with the support of UN-Habitat and the Busan Government, planned to start between 2025 and 2028.

5.2.2 Techno-futuristic cities

Akon City (300,000 pop) is a futuristic city promoted by a rap singer and inspired by the film Black Panther. Designed in 2018, it is geared towards tourism, leisure and culture. The government of Senegal donated the land for its construction, 100 kilometres from Dakar. With no development whatsoever, the city was symbolically launched in 2023. Telosa (5 million pop) is the proposal of an American billionaire to be developed somewhere unspecified in the US desert (Nevada, Utah, Idaho, Arizona or Texas). Based on a reformed version of capitalism and 19th century communal living, the project adopts the principles of the Garden City and the 15-minute city. Smart Forest City (130,000 pop) was conceived in 2019 for Cancun, Mexico, as a carbon-absorbing botanical garden within a contemporary city. The project proposes an urban ecosystem where nature and the city intertwine to act as a single organism.

5.2.3 Virtual cities

Liberland Metaverse, 2022 (Metaverse), a proposal for the Free Republic of Liberland, is a "cyber-urban" city, a digital "twin" of the real world where virtual citizens - avatars - carry out activities without territorial limitations. This idea was also adopted by Tuvalu, a small Pacific Island nation composed of three coral islands and six atolls with a total area of less than 26 km2, threatened by rising sea levels. The project was announced at COP27 in November 2022.

6 PLANNING AND DESIGN CRITERIA

Drawing up NCs master plans offers their designers the opportunity to translate the spatial conditions of “sustainable” and “smart” cities into the urban structures requested by their protagonists. The planning proposals of the eighty NCs case studies respond, to a greater or lesser extent, to providing answers to the following principles: cities being respectful of nature, attentive to social experience, economically advantageous, and assisted by new technologies to facilitate the functioning of day-to-day urban living. What lessons can be drawn from these experiences? What planning and design criteria were used in the drafting of the master plans. Which ones are inherited from functionalism? What are the new ones?

6.1 Traditional criteria

Orthogonality: Most NCs master plans have adopted orthogonal layouts, in some cses adapted to the topography of geographical features of the site. The internal urban organisation based on main roads and secondary streets of different categories continuous to offer maximum functionalism and safety. Other cases (Putrajaya, Amaravati, Nusantara, Kilamba, Yiti, Rawabi, Biodiversity, Chengdu, Qiddiya, Lavasa, Rublyovo-Arkhangelskoye, The Parks, Xzero, Alnama Smart City, Nexgen, South Sabah Al-Ahmad City, Kashiwa-No-Ha Smart City) adopted organic forms, while only a few pursued new radial structures (Lingang New City, The Orbit).

Functional zoning: Except in newly created urban districts owing to their small scale, the urban structures of NCs maintain functional zoning separated into specific uses: central areas for representative, administrative and symbolic functions, secondary centres for specific activities, residential districts with various typologies around activity sub-centres, and peripheral industrial spaces. High densities are dominant and urban infrastructures are designed as a complete range of social facilities providing a wide variety of services. Open spaces maintain their prominence and consume large amounts of land

Symbolism: Metaphors and features of indigenous architecture are used in the design of some NCs, such as the grand civic architecture of Naypyidaw, the 13 squares of Amaravati representing the 13 districts of

Andhra Pradesh, the references to Mughal design and Islamic ornamentation of Putrajaya, those of Indonesian culture of Nusantara, or the traditional village features of Chengdu Future City.

6.2 Recent criteria

Inclusion of nature: Including nature in the urban fabric is the dominant aspect of all projects. It aims at multiple functions: reducing temperature, capturing carbon, enriching biodiversity, managing water and flood control, and increasing the quality of life of the inhabitants. The incorporation of green corridors as structuring elements of the city, instead of the traditional vehicular circulation axes, is a constant in the design of the master plans (Amaravati, Putrajaya, The Parks, Yiti Sustainable City, Ho Chi Minh Global City, Kashiwa-No-Ha Smart City, Net City, Tianjin Eco-City). Including green networks of different types of open spaces is a widespread practice: gardens for food production (Putrajaya, Yiti Sustainable City, Kashiwa-No-Ha Smart City, Xiongan, New Clark City), peripheral arable land (Amaravati), greenhouses (Sharjah Sustainable City, Masdar) or endemic vegetation and hydroponics (Woven City). In some cases, green design prevails throughout the project (The Parks, Xzero, Alnama Smart City, Nexgen

Diversity of neighbourhoods: Although diverse criteria characterise NCs designs at local level, they tend to be multifunctional, pedestrian-centred and organised around community centres that encourage community life based on the 15-minute-city principle (Amaravati, Sultan Haitham City, Lavasa). The quality of the urban landscape is enhanced by the quality of urban design. Sometimes this is achieved by reinforcing the prominence of buildings, as suggested by iconographic proposals in master plans, some also with strong scenographic character (Rublyovo-Arkhangelskoye, Qiddiya, Chengdu, Diamniadio Lake City, Nusantara, Net City).

Climate change mitigation and adaptation: The reduction of energy consumption and CO2 emissions is the declared aim of many NCs. Measures taken in this regard relate to the passive retrofitting of buildings and public spaces, focusing on the layout of buildings, the use of appropriate building materials and the treatment of trees (Masdar, Nusantara, Dubai Sustainable City, Sharjah Sustainable City, Alaro City, Tianjin Eco-City).

New technologies: A main feature of NCs is to apply advanced technologies to the functioning and management of urban services. The inclusion of digital technology, AI, IoT, Big Data and other technological tools enables the monitoring of urban performance, ranging from household and community energy consumption, to mass surveillance for security purposes. Other applications are the provision of charging points for electric vehicles, waste collection and the robotisation of different activities (Fujisawa, Woven City, Net City, The Line.

Social infrastructure: The location of key social facilities is decisive for the internal organisation of some NCs, in particular for university campuses (Nkwashi, Yachay City of Knowledge, business parks and train stations The Orbit, Chengdu Future City).

7 MAIN CRITICISMS

The principles of “sustainable’ and “smart” cities are disrupted in numerous NCs case studies and for various reasons.

Environmental sustainability: The selection of unsuitable sites is the main aspect violating environmental sustainability principles. They are causing severe environmental impacts, such as locating in a swampy area with water scarcity and air and water pollution (Xiongan), massive earthworks for the construction of NCs necessitating intense deforestation with serious effects on biodiversity (Olaya, Lavasa, Nusantara); land reclamation from the sea altering the maritime environment, as well as impairing traditional local fishing (Dompak, Colombo City Port, Eko Atlantic City, Forest City). At the urban design level, lack of passive microclimatic solutions - wide streets, large squares, shading trees, adequate building materials, instead of glass and steel - hamper the increase of environmental quality.

Social sustainability: Adverse collateral effects on the local population undermine the principle of social sustainability, especially when building NCs involves displacement and relocation of the local population, or inadequate economic compensation to landowners (Naypyidaw, Dompak, Xiongan, Trans Ganga Hightech City, Duqm). Lack of social housing and high costs of private housing, aimed in general at the emerging middle classes or high-income groups, are generating significant social bias (Nkwashi, Kilamba, Sharjah

Sustainable City, Forest City, Kilamba New City, Konza Technopolis, Ciberjaya, Eko Atlantic City). Other exclusionary aspects are the construction of safe enclaves to reduce the threat of natural hazards, which are leaving a large part of the population unprotected (Nusantara, Eko Atlantic City). The construction of urban islands is also alien to the context in which they are inserted, as they are occupied by a homogeneous influx of inhabitants whose economic or social profiles differ widely from those of local inhabitants. Other alienating causes are non-inclusive urban designs (Putrajaya, Nusantara). introducing cultural identities alien to the local culture (Lavasa, Tianducheng, Shenyang State Guest Mansions, Rawabi, Ho Chi Minh Global City).

Economic sustainability: Lack of attractiveness prevents companies from relocating their activities in these NCs, as well as their high cost of technological infrastructures, which in some cases limits their realisation, and makes them economically unsustainable (Masdar, Tianducheng, Songdo). Moreover, their smart city approach, which incorporates various technologies based on massive processing of personal data, raises concerns about both the lack of privacy and the limitation of randomness in everyday life (Fujisawa, Woven City, Net City).

8 SUCCESS OR FAILURE FACTORS

Moving from theory to reality is an immense challenge for NCs and, in most cases, there are inevitable changes to their original plans. The slow process of developing NCs over time encourages these changes. Most of the case studies are still at various stages of the development process, a few have failed and some remain ghost cities, waiting to attract funding, people and activities.

The variables that facilitate, slow down or discourage the development of these projects are wide-ranging, with political support being a crucial factor in initiating projects, seeking funding and giving continuity to the process. Securing continued funding is crucial, as the high cost of these ventures is a major burden on the finances of countries, especially those facing economic crises or high levels of poverty. Investors are extremely concerned about political changes, legal problems and bureaucracy that hinders development processes and encourages corruption, as well as lack of credibility of local officials and private developers. They are interested in well-managed projects that are able to adapt to economic stresses and unforeseen problems.

Ambitious or extravagant projects raise many doubts about their viability, both because of technological limitations and possible financing problems. Isolated and badly connected to the rest of the cities, with poor employment prospects and high cost of living, create low expectations for investing in their development. In addition, property speculation - a recurrent fact - does little to help the development of NCs, as it favours price increases and limits the effective occupation of housing and other premises.

NCs begin their development with great effort, dependent on the slow relocation of governmental headquarters, public companies, the establishment of productive activities and the arrival of a population whose presence is the only guarantee of a future dynamic urban life.

9 CONCLUSIONS

9.1 Why NCs and why build them?

The design of today's NCs does not differ substantially from those built before 1990. The British New Towns (1940-1970) were the first references of the current NC phenomenon, conceived to respond to the social demands of the post-war period: to provide housing -by building social housing, and jobs - by facilitating the establishment of companies. The promotion of welfare through the construction of new cities had a direct impact on the type of work of planners and architects and especially their willingness to incorporate innovative techniques into the traditional master plans.

The construction of today's NCs, understood as engines of economic growth, emerged after the crisis of the 1980s, when the process of globalisation shifted the focus of attention first to Asia and the Middle East and then to Africa. Although there are no precise figures, more than 150 NCs are in operation in more than 40 countries, costing billions of dollars and justified as the ideal means to meet the urban challenges of the 21st century. The demands of growing hyper-capitalism and the search for new investment niches to house global corporate wealth were determining factors in the evolution of this process.

Equally important was the role of the international consultants commissioned to design the new urban models for NCs, who initially transferred the latest trends of Western planning and design – a combination of environmental principles (eco-cities) and technological solutions (smart cities) - to the East.

However, the spectacular and iconic images of NCs, designed as showcases of the global economy, took on a completely different trajectory from these initial planning and design criteria. Adopted mainly in the developing countries, they no longer played the same role as in the West and were not given adequate attention for the designs of NCs, which may explain why most NCs are elitist, commercial, superficial and even politically incorrect in Western eyes (1).

9.2 NCs in Asia and Africa

The rise of NCs was spurred both by rapid population growth and urbanisation in these continents and by the need to diversify and stimulate national economies. In general, NCs are conceived as multi-purpose, self-contained and self-sufficient cities, combining spaces for innovation and knowledge with speculative residential and commercial developments for a certain type of inhabitants.

Asian NCs are mostly economic products aimed at promoting the internationalisation of the country where they are located, giving an image of modernity to attract companies and capital, and satisfy the needs of the growing local middle and upper classes, with little impact on low-income groups who, excluded from the process by their ethnicity, religion or socio-economic status, continue to live in the old cities in the same conditions as always (2).

African NCs have more modest objectives, although they were designed as centres for technology, innovation and knowledge for national and regional economic development. The underlying idea is to attract high-tech industries, start-ups and universities, along with a residential and commercial development base that does not address the housing needs of Africa's impoverished urban centres (3).

Although the NCs phenomenon has developed exponentially over the last three decades, a significant number of them are still in the pipeline, facing uncertain futures. Among those that have materialised, many have not progressed beyond the initial phases, and very few have completed the planned development. The attraction of population and activities is a slow and difficult process, which has left many ghost cities in its wake.

The NC urban project and its management

Unlike Europe, where the economic and demographic recession of the 1980s impeded the construction of NCs, displaced the use of master plans and adopted urban acupuncture as a way of intervening in existing cities on an ad hoc basis, Asian and African NCs opted to build from scratch. Devising new settlements on a ‘tabula rasa’ is easy, providing the problems of existing, congested and polluted cities and megacities are removed

Bar exceptional cases, NCs were planned without any public participation. This approach, in which the developer makes decisions, defines priorities, takes on responsibilities and determines the financing model devalues the role of planning instruments, and by excluding citizens and decentralised bodies generates social tensions, grey areas in governance and very limited ownership of the project by users (4).

Master plans, whether conceived by public agencies or private developers, have to be alluring to attract investors and residents. State intervention in the construction of NCs is a key factor, as it can promote institutional changes, remove or relax existing regulations, change planning regulations, create tax exemption zones or coercively expropriate large tracts of land (5). The results of such deregulation have a wide range of adverse consequences, such as social exclusion and increased inequality, spatial fragmentation, environmental degradation and even threats to democratic processes (6).

Displacements of local populations were a common practice given the need to achieve a ‘tabula rasa’. The forced sale of rural properties in the name of economic development, without fair remuneration and without assured relocation of their owners, had significant social and even environmental consequences, as traditional land uses disappeared. Most of the time, displaced people were not able to seek justice, due to lack of laws protecting customary or informal property rights (7).

Once the initial difficulties were overcome, the movement of international capital towards NCs projects, notably Chinese, Russian and Arab. was extraordinary. Controlling the use of such investment is key to

avoiding corruption, bearing in mind that NCs management is in the hands of private companies, bespoke public agencies, public-private partnerships, or similar whose organisational models, financial tools and relations between agents - client, investor, developer, designer, builder and end user - are constantly changing. Africa's special social circumstances called for funding aligned with poverty eradication. In some cases, sought from organisations, such as the World Bank, UN-Habitat or development corporations from different countries.

An accepted fact is the socio-spatial segregation inherent in NCs, owing to their function as socially homogenous and closed enclaves for the middle and upper classes who have the purchasing capacity to enjoy high quality housing and well-designed urban spaces. This elitist factor distances NCs from one of the main principles of the sustainable city: social heterogeneity.

Last but not least, the massive use of technologies and smart devices aimed at improving the living conditions of NCs inhabitants has meant permanent surveillance of their activities and massive use of their personal data. The impact of such intrusion into the privacy of people's lives is the main dilemma of smart cities, and the alienation generated by these technologies prevents smart cities from enjoying the natural dynamism of traditional cities, built over time and to the rhythm of local history and culture.

10 REFERENCES

EXPLANATORY NOTE. Data used towards this paper are drawn from countless sources of information freely available on the Internet. They include promotional documentation issued by NCs protagonists, as well as a variety of other references on the case studies in particular and on the NCs phenomenon in general. Too numerous for all to be quoted only the academic articles are cited.

1 FEMKE VAN NOORLOOS, F. AND KLOOSTERBOER, M." Africa's new cities: the contested future of urbanisation". Urban Studies, Volume 55, Issue 6, 2018 https://journals.sagepub.com/doi/epub/10.1177/0042098017700574

2 GOLDIN, G. "DeCoding Asian urbanism grapples with Asia's unprecedented growth." Metropolis, 2022 https://metropolismag.com/viewpoints/decoding-asian urbanism/?utm_medium=website&utm_source=archdaily.cl

3 MOSER, S. "New Cities: Engineering Social Exclusions", One Earth, Volume 2, Issue 2, February 21, 2020 https://www.sciencedirect.com/science/article/pii/S2590332220300452

4 PROVOOST, M. Why build a New Town? Archis, Volume 34, 2012 http:/Volume #34: City in a Box – Archis

5 SCHLIMMER, S. Building a City from Scratch? Megatrends Policy Brief 2022 06, 2022 https://www.swp-berlin.org/en/publication/policy-brief-06-building-a-city-from-scratch

6 SU, X. Building new cities in the Global South: Neoliberal planning and its adverse consequences. Urban Governance Journal 3, Elsevier, 2023 https://www.sciencedirect.com/science/article/pii/S2664328622000717

7 WAISOVÁ, S. (2022). The Tragedy of Smart Cities in Egypt. ACIG, Vol.1, No.1, 2022.