

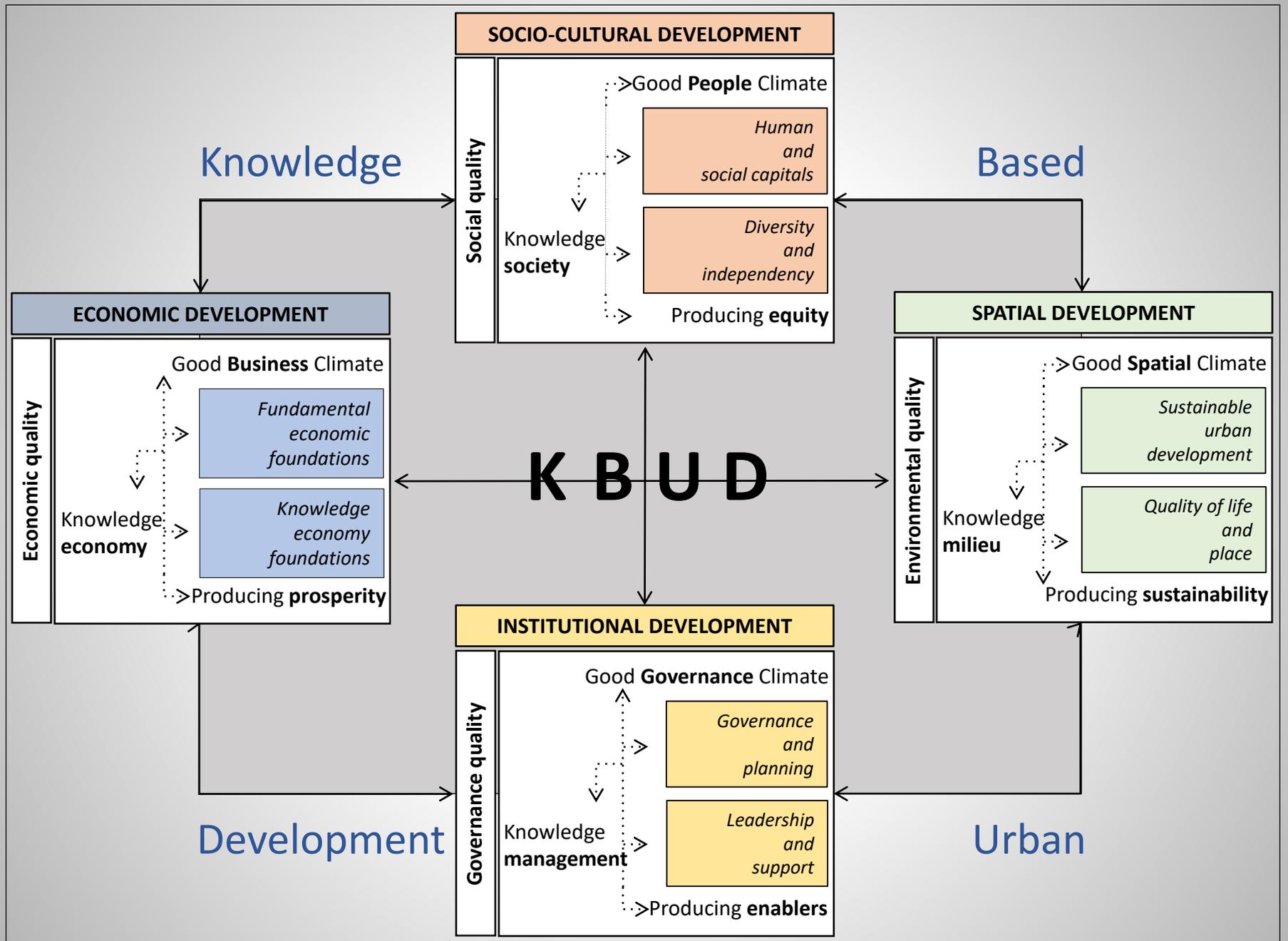
Knowledge-Based Development of Smart and Sustainable Cities

Our and future generations' lives depend on it!

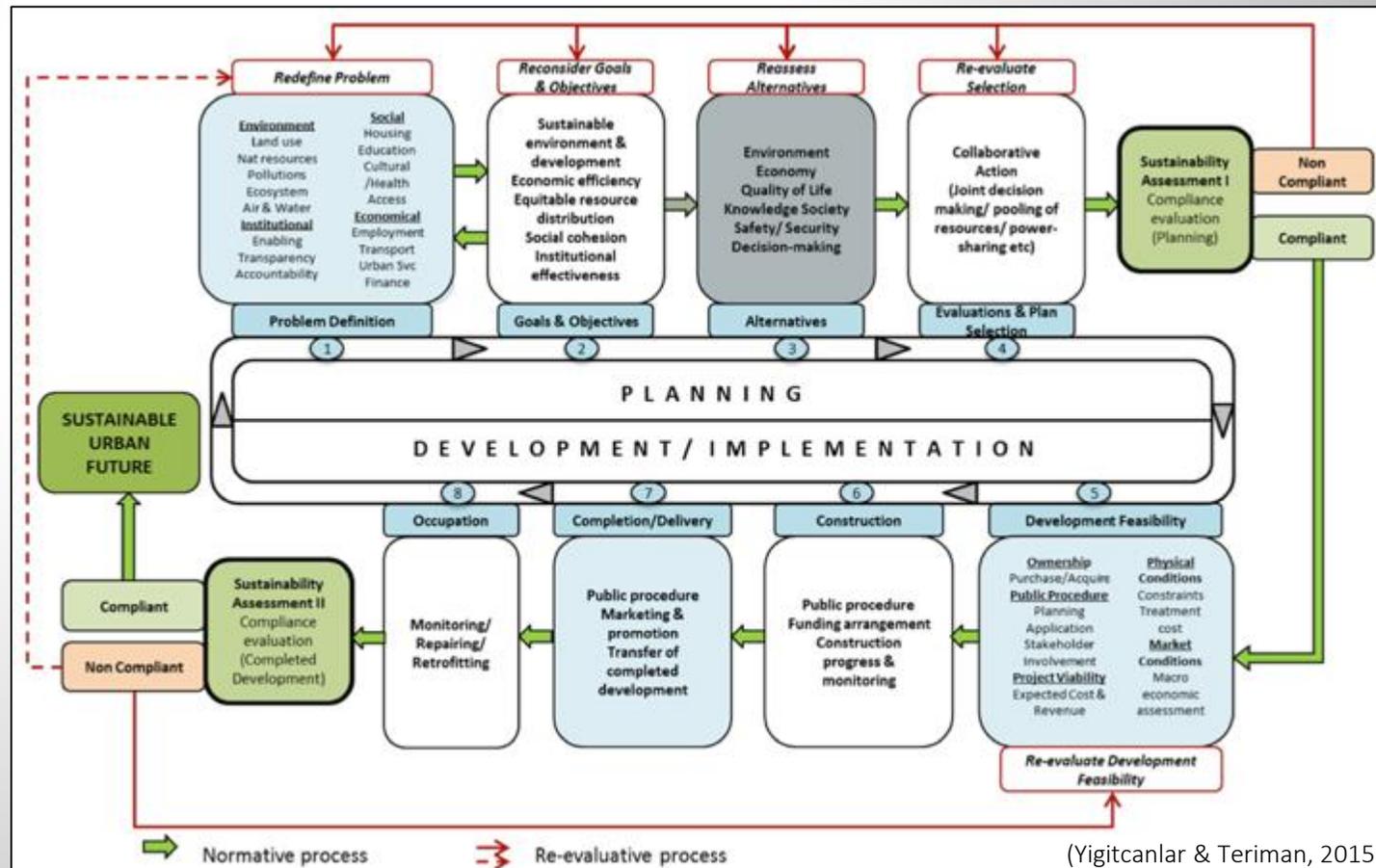
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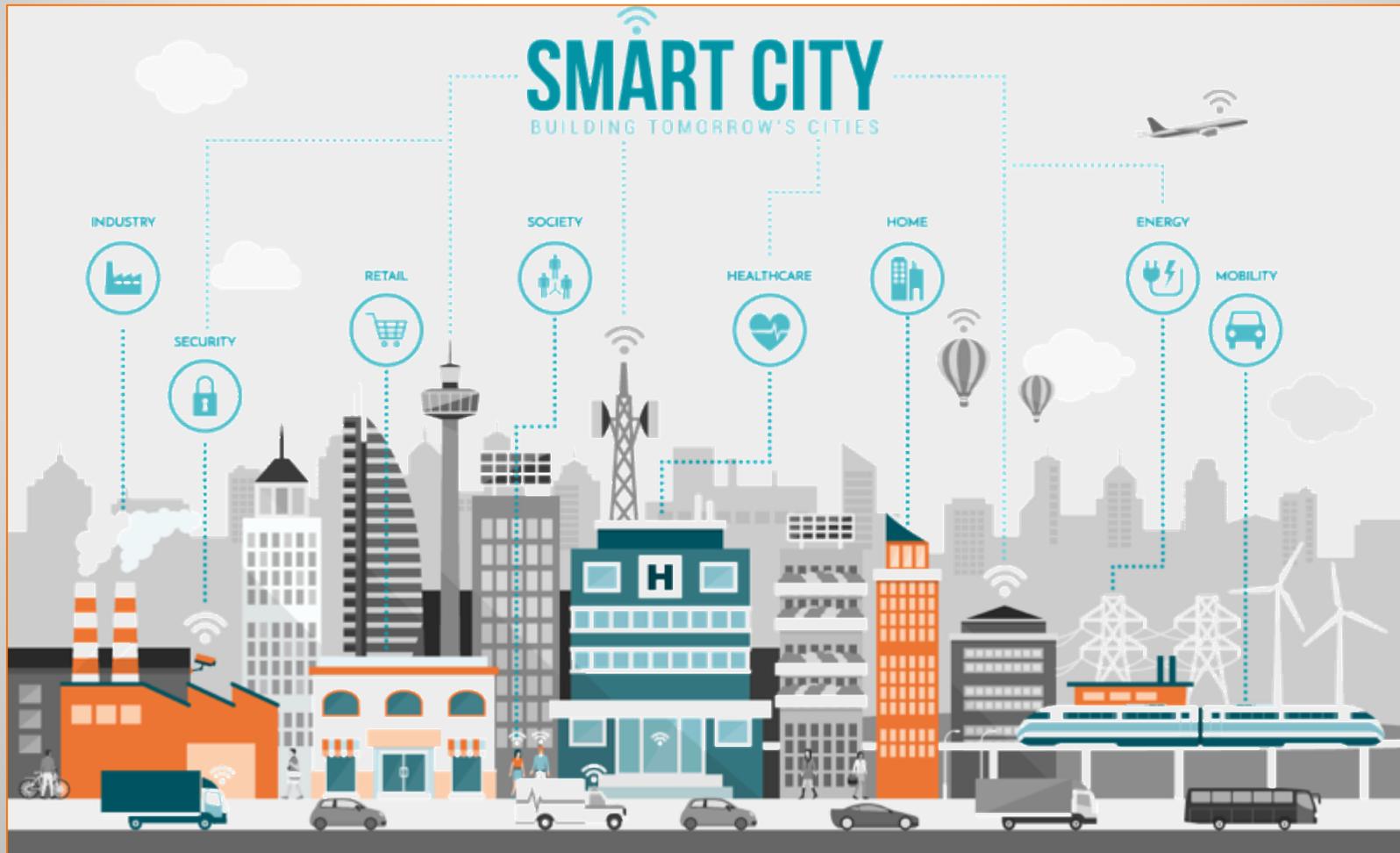




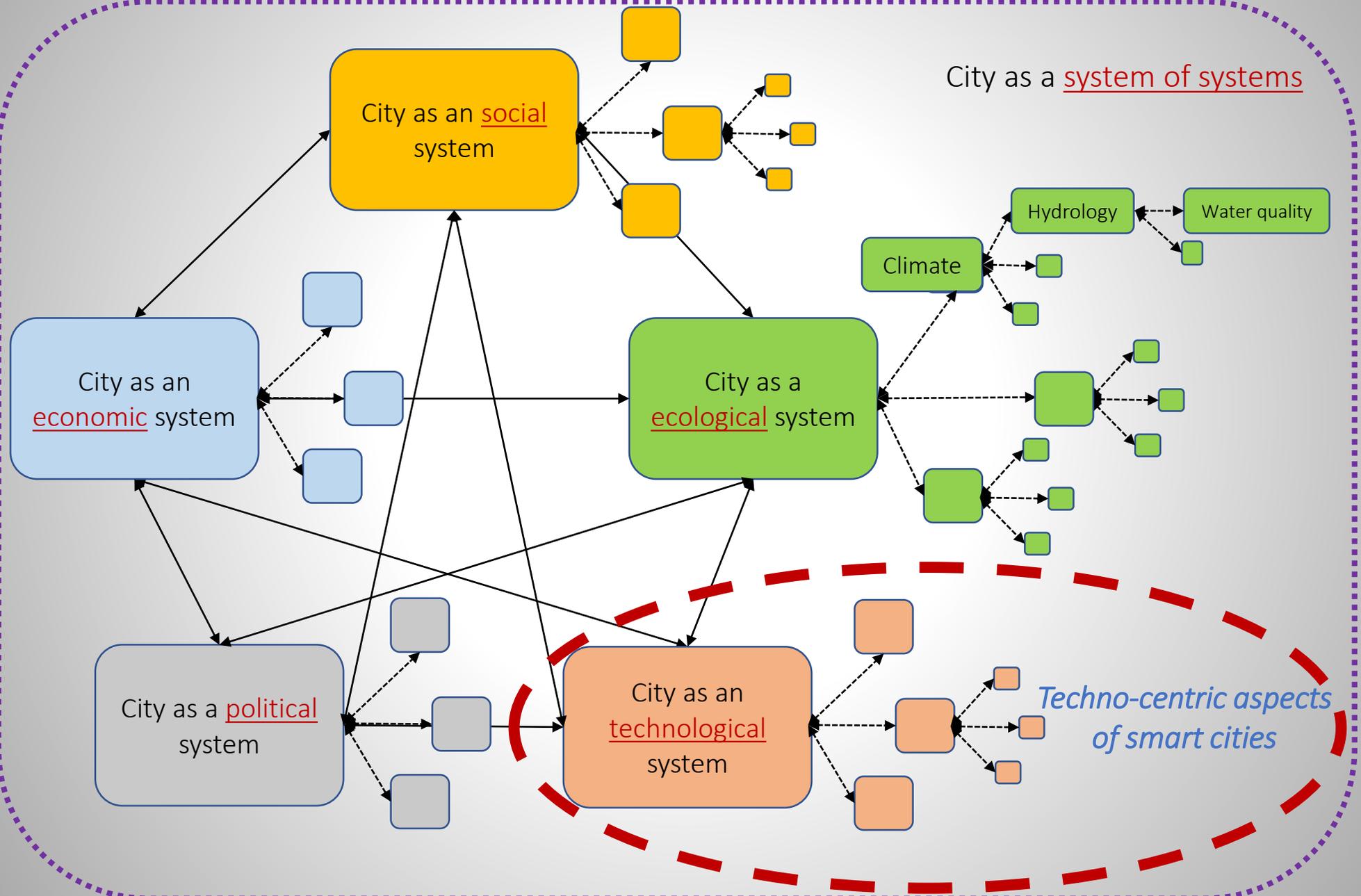
Sustainable Development of Cities



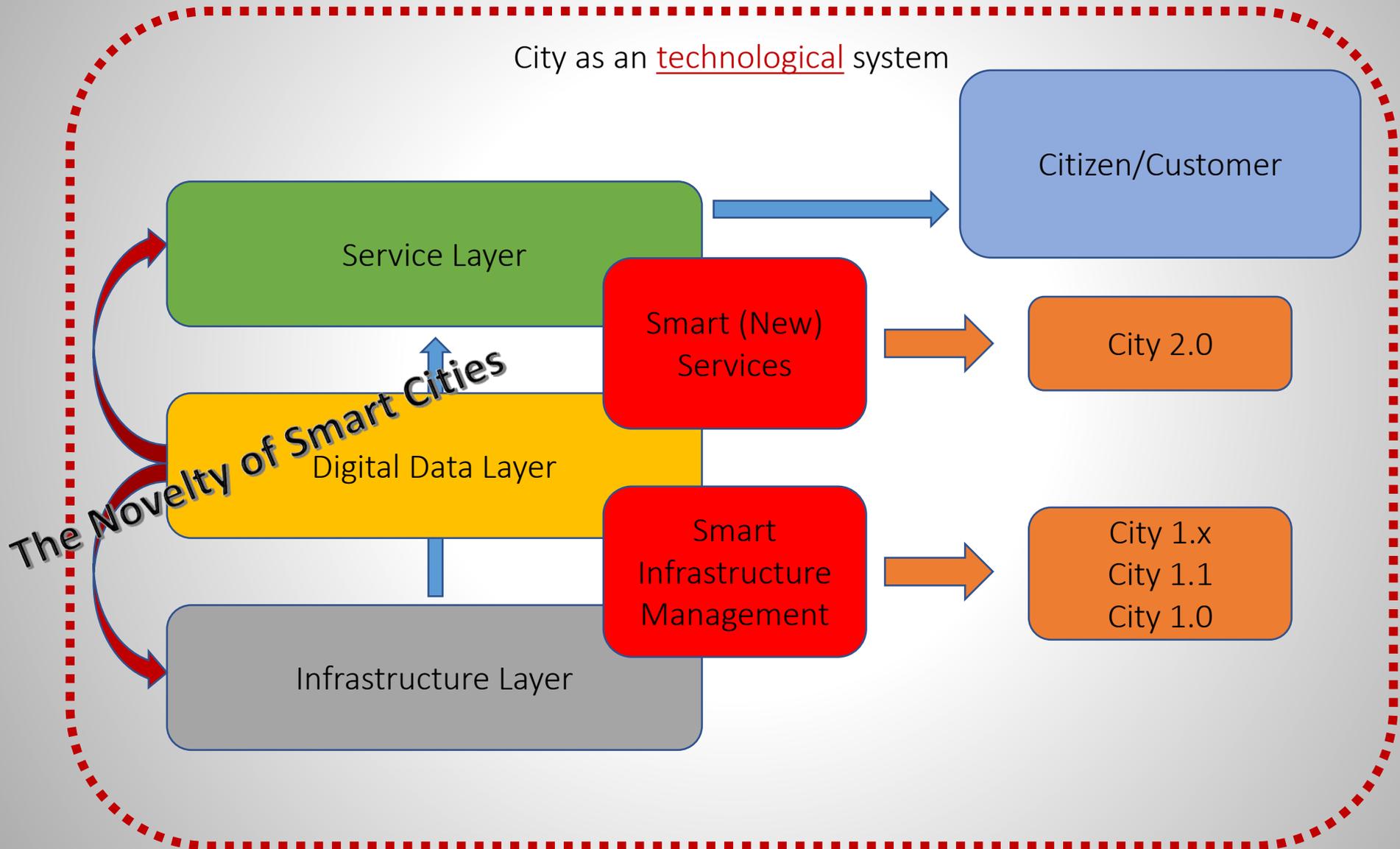
Smart City is an urban locality that employs digital data and technology to create efficiencies for boosting economic development, enhancing quality of life and improving sustainability of the city.



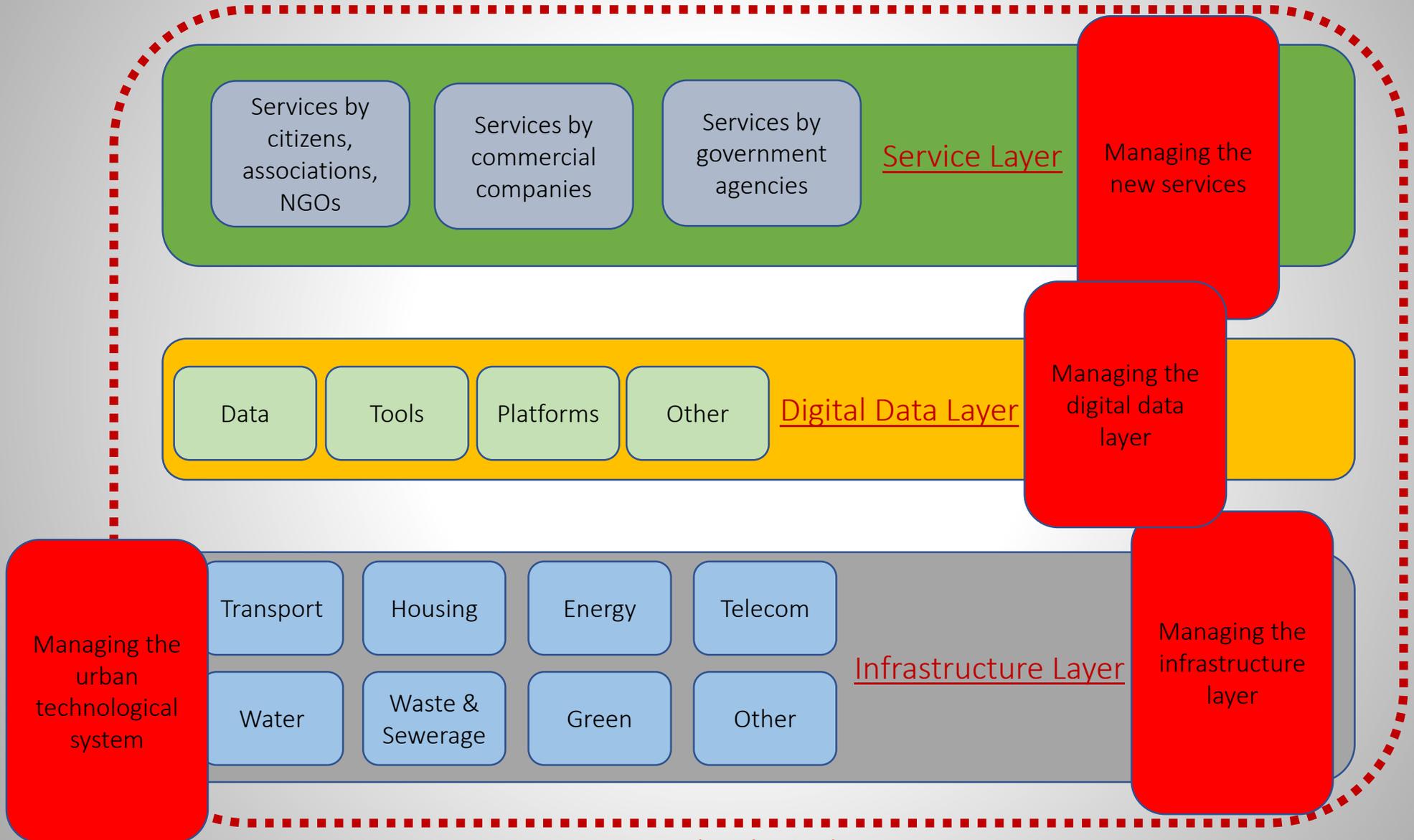
System of Systems of Cities



Layers of Smart Cities



Implications on the Management of Cities



City as an technological system

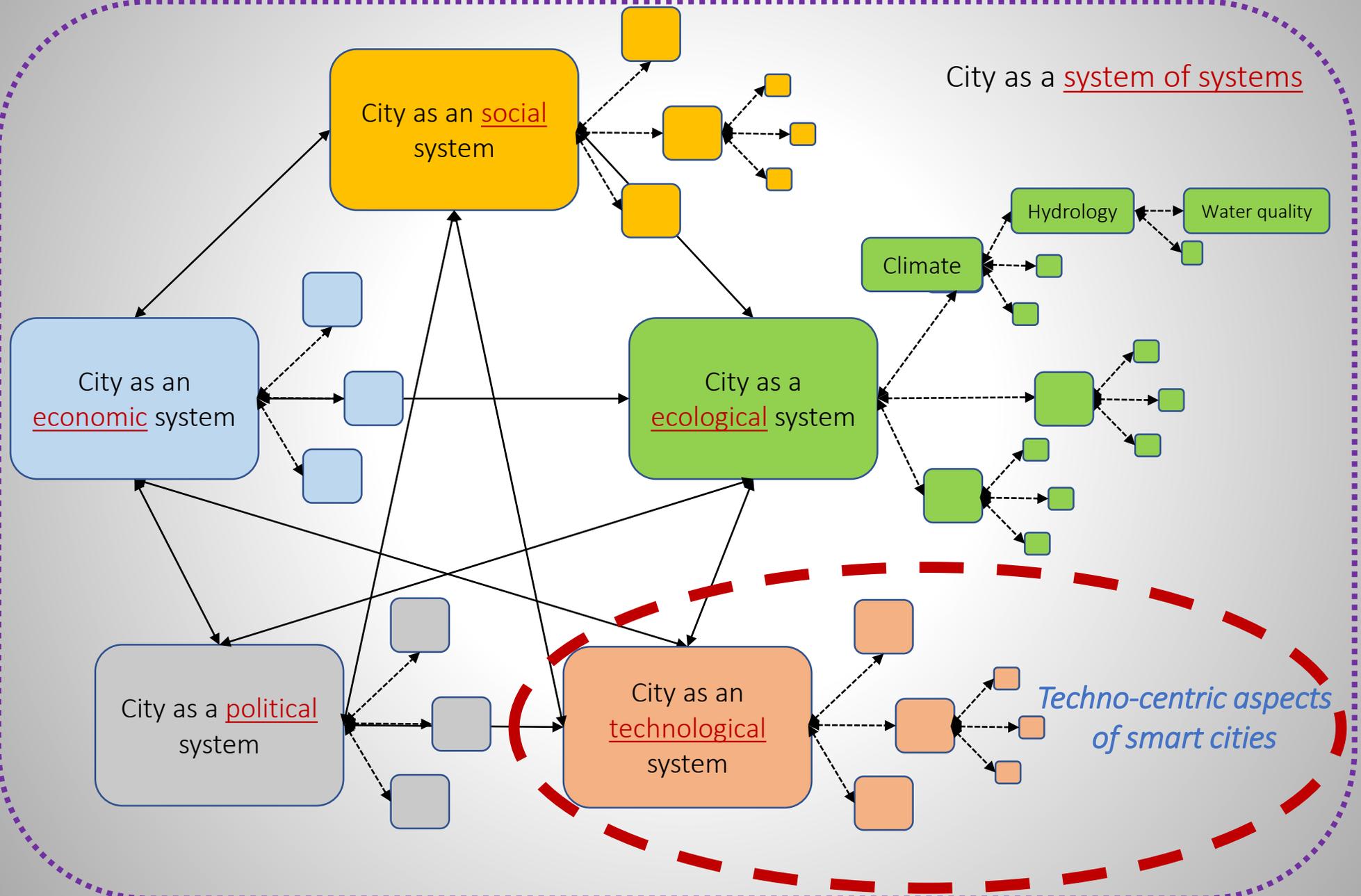
Strategic Decisions for Urban Administrators (e.g., Managers)

| Layer | Technological | Financial | Political | Social | Environmental |
|----------------------|--|---|---|---|---|
| Service layer | Service <u>integration</u> ? (e.g., making it possible services can be linked and bundled) | <u>Competition</u> and/or <u>cooperation</u> ? (e.g., amongst service providers and services themselves) | <u>Criteria</u> for developing services? (e.g., type of services for commerce or problem-solving) | <u>Digital divide</u> and <u>liability</u> ? (e.g., inclusiveness, solutions for disadvantaged, who is liable) | <u>Changing the behaviour</u> or <u>optimise</u> the infrastructure system? (e.g., user vs system) |
| Digital data layer | Which <u>standards</u> ? (e.g., for telecom infrastructure and devices for optimal connectedness) | <u>Pricing</u> of data? (e.g., open data, free data, if not who pays for the data) | Which data <u>regulation</u> ? (e.g., regulated access to infrastructure or services computing against each other) | Data <u>ownership</u> and <u>privacy</u> ? (e.g., owned by operator/citizen/city, and levels of privacy granted) | <u>Lifecycle</u> considerations? (e.g., digital devices have also significant environment impact) |
| Infrastructure layer | How to integrate <u>new</u> and <u>legacy</u> infrastructures? (e.g., smart meter integration with energy infrastructure) | Who <u>pays</u> for the digital infrastructure? (e.g., who pays for smart meters, users or infrastructure company) | <u>Long-term</u> impacts of decisions? (e.g., will the invested technology be there long-time) | Managing <u>externalities</u> ? (e.g., some burden from externalities and some benefit, how to balance) | <u>Lifecycle</u> considerations? (e.g., environmental sustainability of infrastructure systems) |

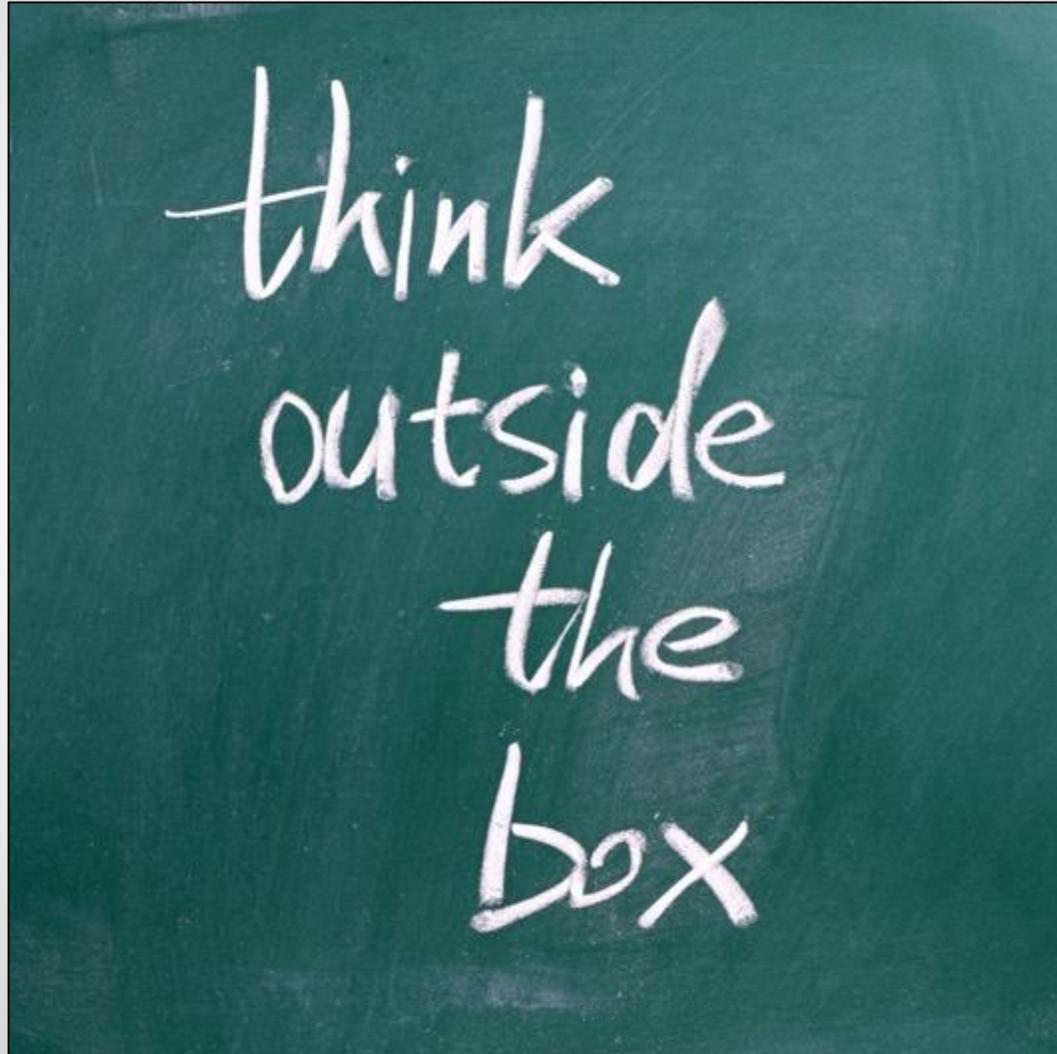
Strategic Decisions for Urban Policymakers (e.g., Mayors)

| Layer | Technological | Financial | Political | Social | Environmental |
|----------------------|---|--|--|--|---|
| Service layer | City as the platform <u>user</u> or as the platform <u>owner/provider</u> ? (e.g., endogenous vs exogenous) | <u>Enable</u> the development or <u>develop</u> services? (e.g., incentives vs full public funding) | <u>Governance</u> of the services? (e.g., existing and newcomer services— sharing economy) | <u>Universal services obligation</u> ? (e.g., what minimal services citizens are entitled to) | <u>Laissez-faire</u> or <u>incentivising</u> green? (e.g., let services evolve or incentivise green services) |
| Digital data layer | Rely on <u>start-ups</u> (local focus) or <u>global</u> players? (e.g., endogenous vs exogenous) | <u>Market</u> driven or public <u>policy</u> driven? (e.g., attract companies or government funded) | <u>Privacy</u> (regulation) and <u>ownership</u> ? (e.g., how much privacy, who owns the data) | Digital <u>literacy</u> : lead or adapt? (e.g., citizens being the leaders of digital literacy or managing the illiteracy) | Broader environmental <u>considerations</u> of digitalisation? (e.g., how much environmental impact it creates and how much good it brings) |
| Infrastructure layer | <u>Existing</u> or <u>dedicated</u> network? (e.g., use existing or develop/buy dedicated one) | <u>Sustainable financing</u> of the infrastructure? (e.g., part of service income to move to infrastructure) | Infrastructure <u>development</u> vs smart city <u>promotion</u> ? (e.g., smart infrastructure vs marketing) | Smart city <u>for whom</u> ? (e.g., for citizens or economic competitiveness of the city) | How <u>central</u> is the environment? (e.g., determines what type of infrastructure to put in) |

System of Systems of Cities



Strategic Decisions for Leaders of the Society (e.g., you)

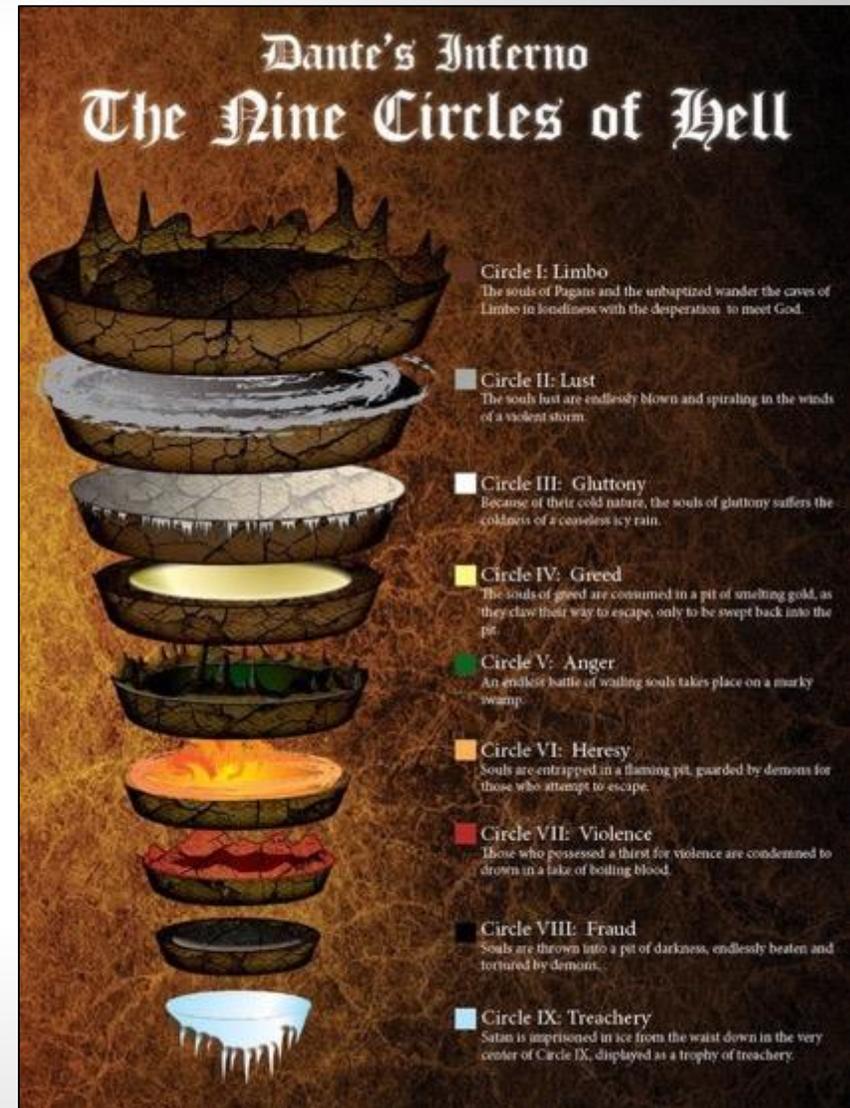


Technology Hacks the City, but Can City Hack the Technology?

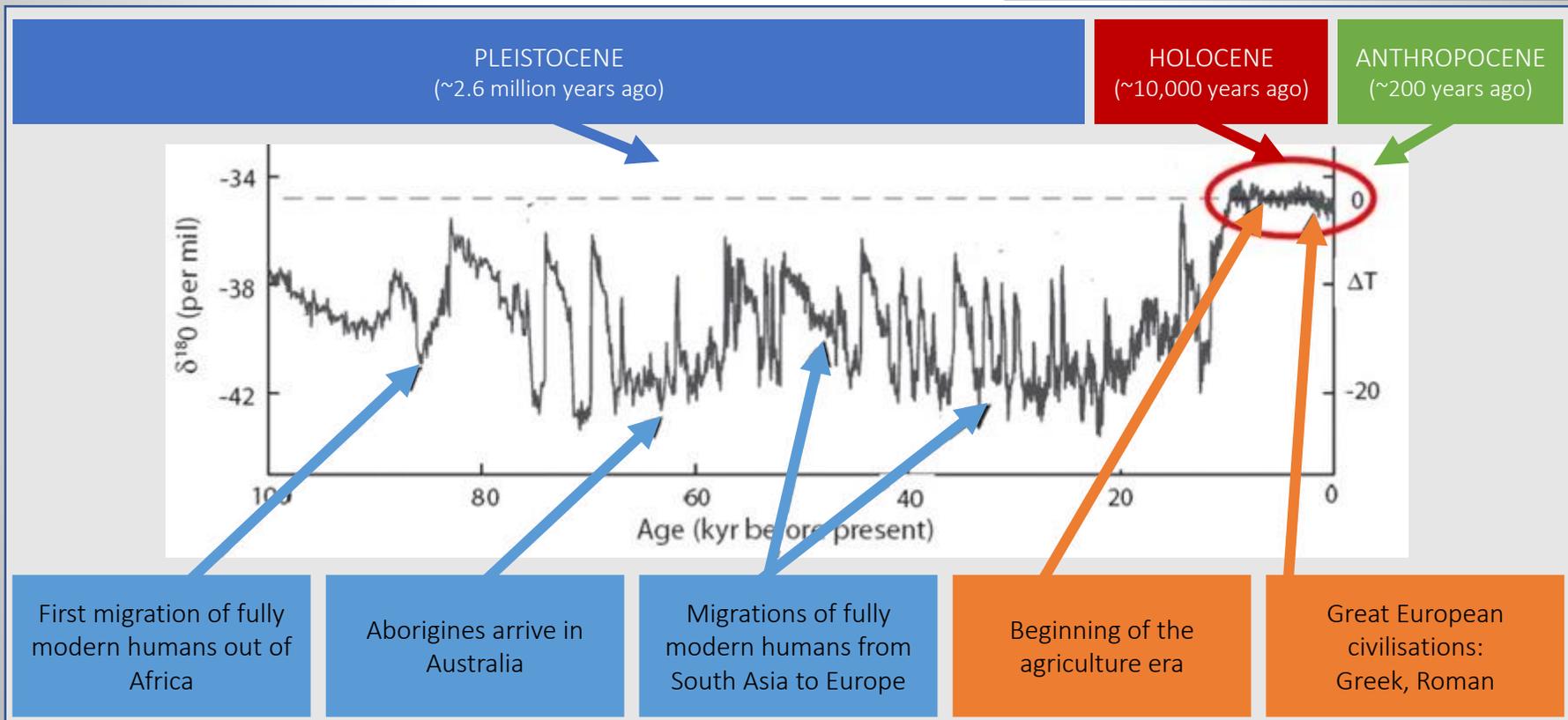
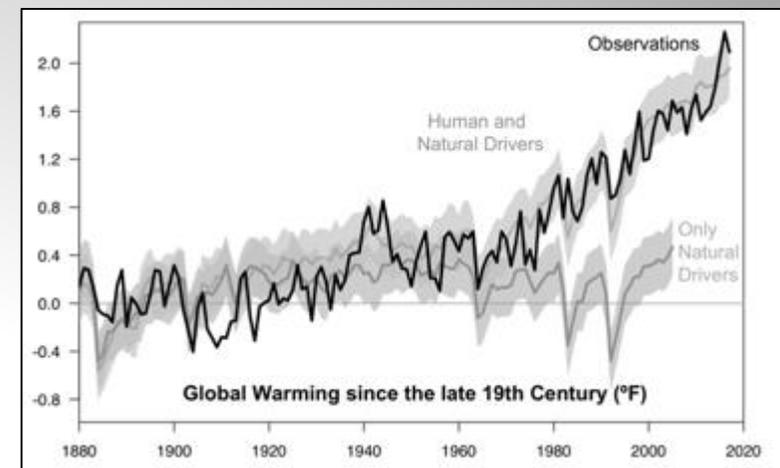


The Hothouse Hell: From Greenhouse to Hothouse

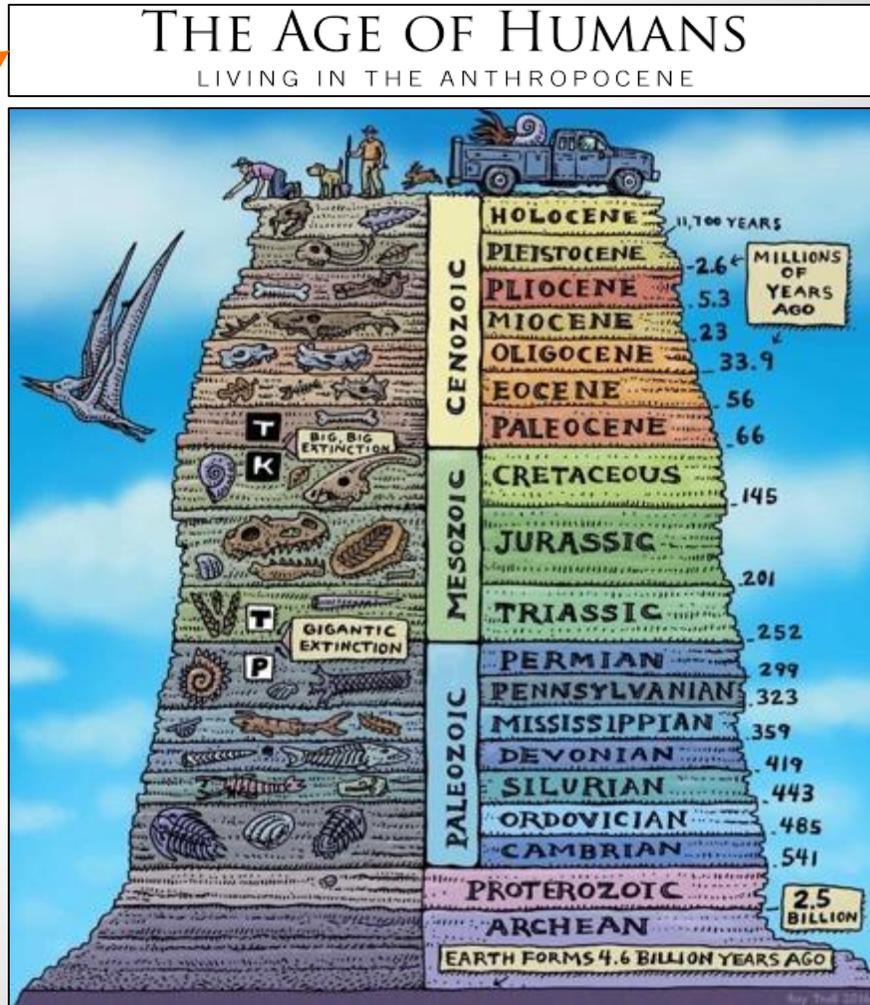
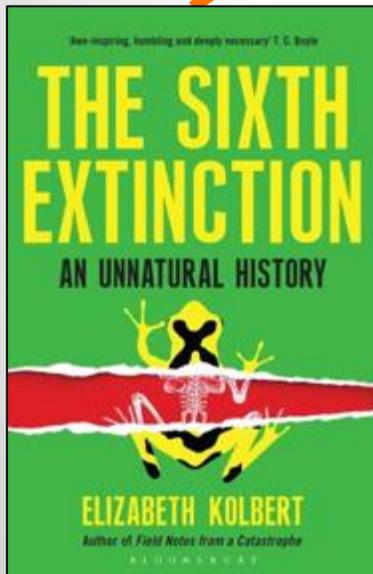
- The earth has been in hothouse states before, and there is not one kind of Hothouse Earth, but several. A little like Dante's circles of Hell, they progress into ever-deeper states of heat and changes to the planet's biosphere and climate. The end **result is undoubtedly hellish**, and even the **early stages would be, for humans at least, decidedly highly uncomfortable**.



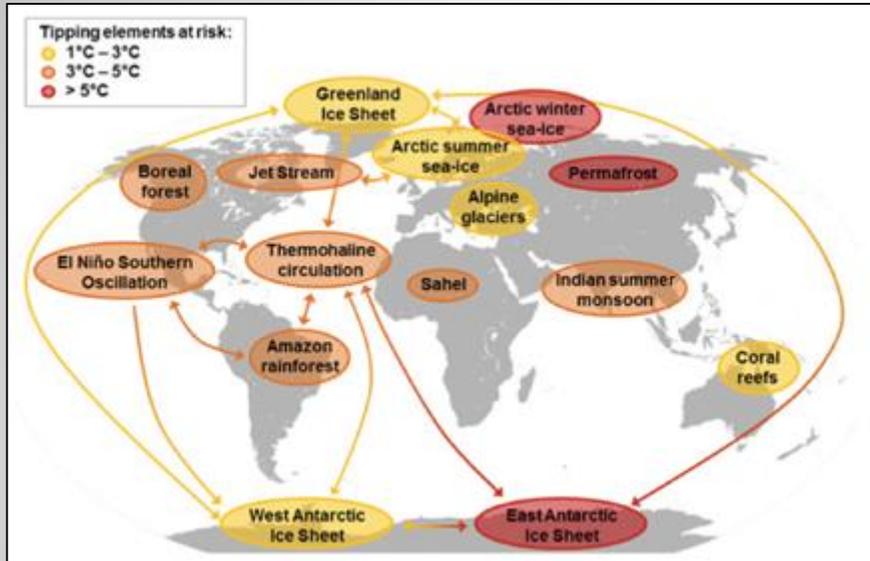
Global Climate Change



The Anthropocene & Urban Ecocide

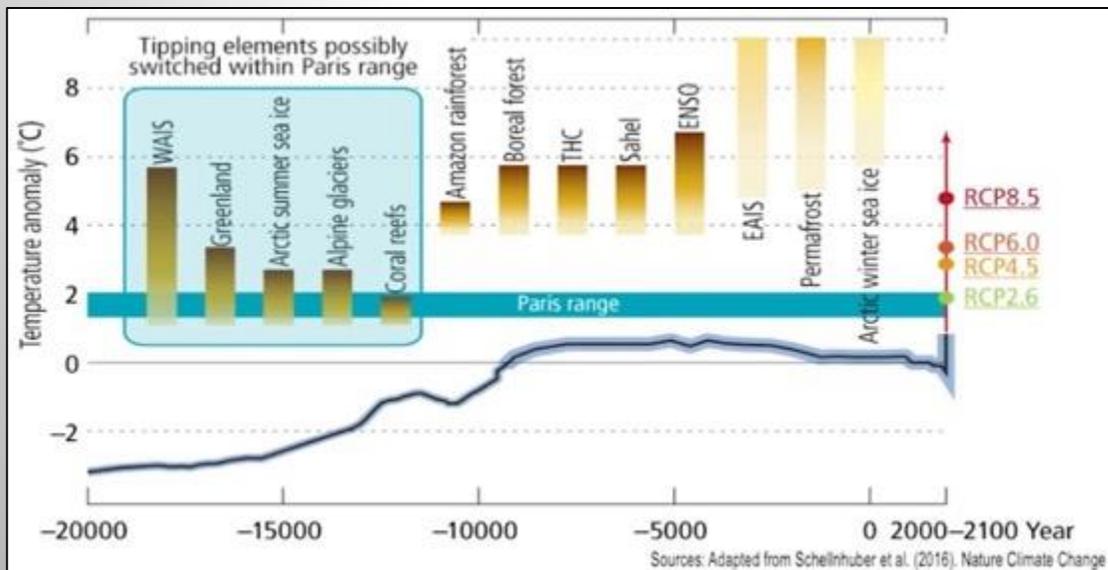


Temperature Raise and Resulting Catastrophes



UNDERLINING REASONS

- Rapid urbanisation
- Increased mobilisation
- Heightened globalisation
- Ruthless neoliberal capitalism
- Vigorous industrialisation
- Intensified agriculture
- Excessive consumption
- Highly materialised lifestyles



Can Smart Cities be the Solution?

- The recent empirical studies reported that smart cities are not after all that smart as they **fail to live up to sustainability** expectations:
 - A recent study on **the UK smart cities** found no evidence that urban smartness contributes to sustainable outcomes (Yigitcanlar & Kamruzzaman, 2018a).
 - Another research on **Australian cities** revealed the smartness of cities does not lead to sustainable commuting patterns (Yigitcanlar & Kamruzzaman, 2018b).
 - Studies on smart cities in **Africa and South Korea**—including Songdo recognised as the world's 'smartest' city—evidenced the environmental downfalls of these ambitious projects (Watson, 2014; Yigitcanlar & Lee, 2014).
 - It is argued that cities cannot be truly smart unless they produce **zero waste** (Zaman & Lehmann, 2013) and make a net positive contribution to the ecosystem (Birkeland, 2012).

What is a Smart City?

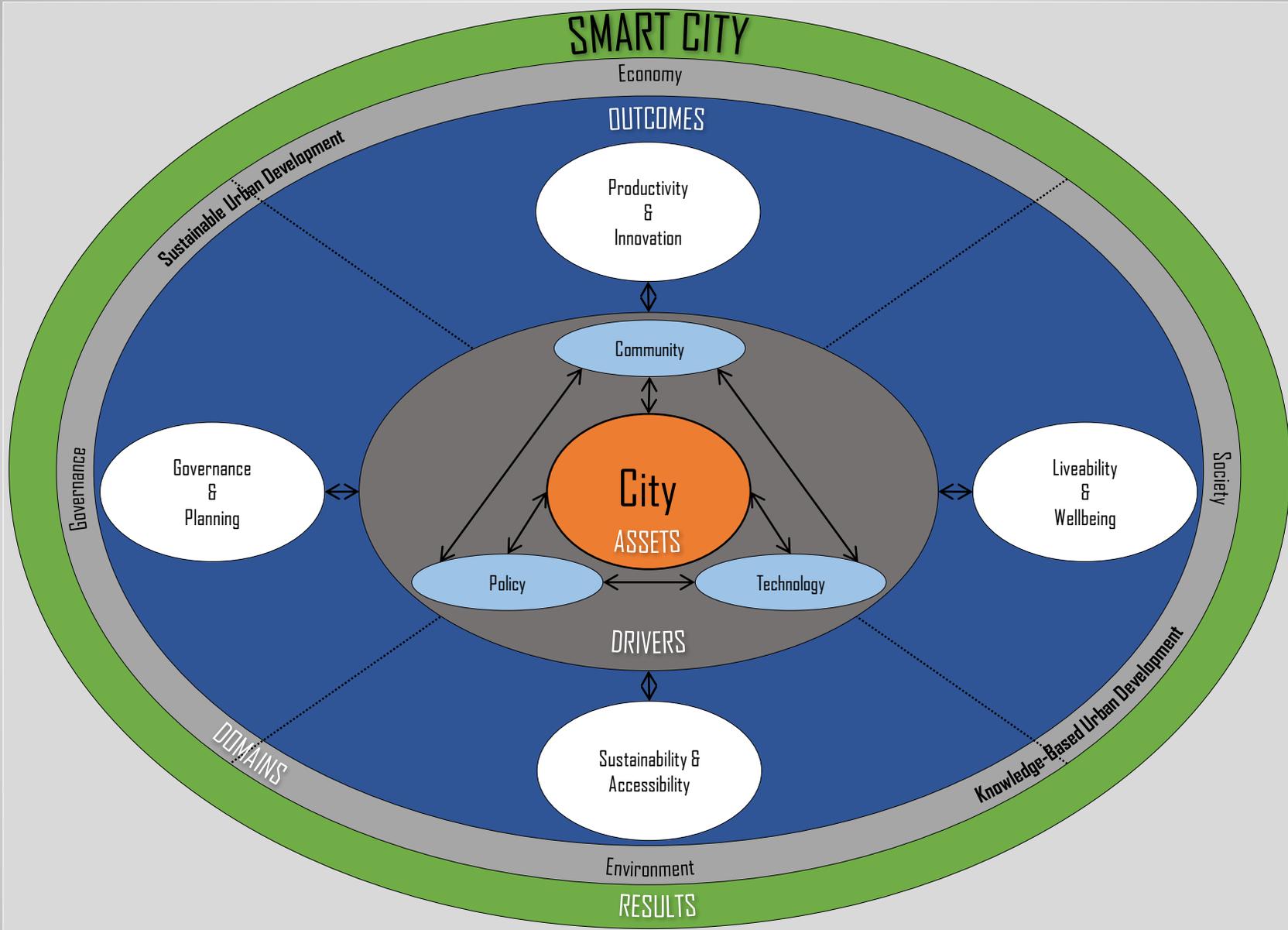
| Reference | Definition |
|-------------------------------|--|
| Yigitcanlar et al. (2018) | An ideal model to build the cities of the 21st century, in the case, its practice involves a system of systems approach and a sustainable and balanced view on the economic, societal, environmental and institutional development domains |
| Lara et al. (2016) | A community that systematically promotes the overall wellbeing for all of its members, and flexible enough to proactively and sustainably become an increasingly better place to live, work and play |
| Yigitcanlar (2016) | An ideal form to build the sustainable cities of the 21st century, in the case that a balanced and sustainable view on economic, societal, environmental and institutional development is realised |
| ITU (2014) | An innovative city that uses ICTs and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects |
| Piro et al. (2014) | A city that intends as an urban environment which, supported by pervasive ICT systems, is able to offer advanced and innovative services to citizens in order to improve the overall quality of their life |
| Alkandari et al. (2012) | A city that uses a smart system characterised by the interaction between infrastructure, capital, behaviours and cultures, achieved through their integration |
| Lazaroiu & Roscia (2012) | A city that represents the future challenge, a city model where the technology is in service to the person and to his economic and social life quality improvement |
| Schaffers et al. (2012) | A safe, secure environmentally green, and efficient urban centre of the future with advanced infrastructures such as sensors, electronics, and networks to stimulate sustainable economic growth and a high quality of life |
| Caragliu et al. (2011) | A city that is smart when investments in human and social capital and traditional transport and modern ICT infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance |
| Gonzalez & Rossi (2011) | A public administration or authority that delivers or aims to a set of new generation services and infrastructure, based on information and communication technologies |
| Hernandez-Munoz et al. (2011) | A city that represents an extraordinary rich ecosystem to promote the generation of massive deployments of city-scale applications and services for a large number of activity sectors |
| Nam & Pardo (2011) | A humane city that has multiple opportunities to exploit its human potential and lead a creative life |
| Zhao (2011) | A city that improves the quality of life, including ecological, cultural, political, institutional, social, and economic components without leaving a burden on future generations |
| Belissent et al. (2010) | A city that uses ICTs to make the critical infrastructure components and services of a city more aware, interactive, and efficient |
| Eger (2009) | A particular idea of local community, one where city governments, enterprises and residents use ICTs to reinvent and reinforce the community's role in the new service economy, create jobs locally and improve the quality of community life |
| Paskaleva (2009) | A city that takes advantages of the opportunities offered by ICT in increasing local prosperity and competitiveness |
| Rios (2008) | A city that gives inspiration, shares culture, knowledge, and life, a city that motivates its inhabitants to create and flourish in their own lives |
| Giffinger et al. (2007) | A city well performing in a forward-looking way in economy, people, governance, mobility, environment, and living built on the smart combination of endowments and activities of self-decisive, independent and aware citizens |
| Partridge (2004) | A city that actively embraces new technologies seeking to be a more open society where technology makes easier for people to have their say, gain access to services and to stay in touch with what is happening around them, simply and cheaply |
| Odendaal (2003) | A city that capitalises on the opportunities presented by ICTs in promoting its prosperity and influence |
| Bowerman et al. (2000) | A city that monitors and integrates conditions of all of its critical infrastructures, better optimise its resources, plan its preventive maintenance activities, and monitor security aspects while maximising services to its citizens |
| Hall et al. (2000) | An urban centre of the future, made safe, secure environmentally green, and efficient because all structures |

Evolution of the Smart City Notion

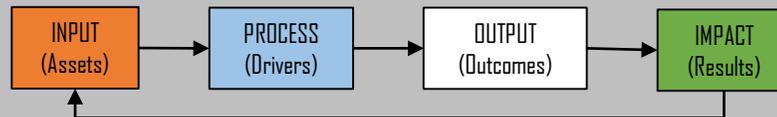
| Version | Emphasis | Target | Focus | Brand | Reference | Period |
|----------------|---|----------------|---|---|---|--------|
| Smart City 1.0 | The need to implement <u>new and innovative technologies</u> to solve problems in urban areas | Private sector | Technology and service | Intelligent City | Michael Batty (1990) UK | ~1990s |
| Smart City 2.0 | A greater degree of <u>involvement of the local authorities</u> regarding the application of technologies | Public sector | Technology, infrastructure and service | Smart City | Rudolf Giffinger (2007) Austria | ~2000s |
| Smart City 3.0 | <u>Citizen active engagement</u> in smart solutions to improve living standards and sustainability | Community | Technology, service and citizens | Responsive City | Stephen Goldsmith (2014) Switzerland | ~2010s |
| Smart City 4.0 | Urban space not being separate from the nature and <u>not to be designed just or primarily for humans</u> | Academia | Knowledge (including technology) and nature | More-Than-Human City (Truly Smart and Sustainable City) | Tan Yigitcanlar (2018) Australia | ~2020s |

Smart City ^(4.0) is an urban locality functioning as a healthy system of systems with sustainable and balanced practices of economic, societal, environmental and governance activities generating desired outcomes for all humans and non-humans (Yigitcanlar et al., 2018).



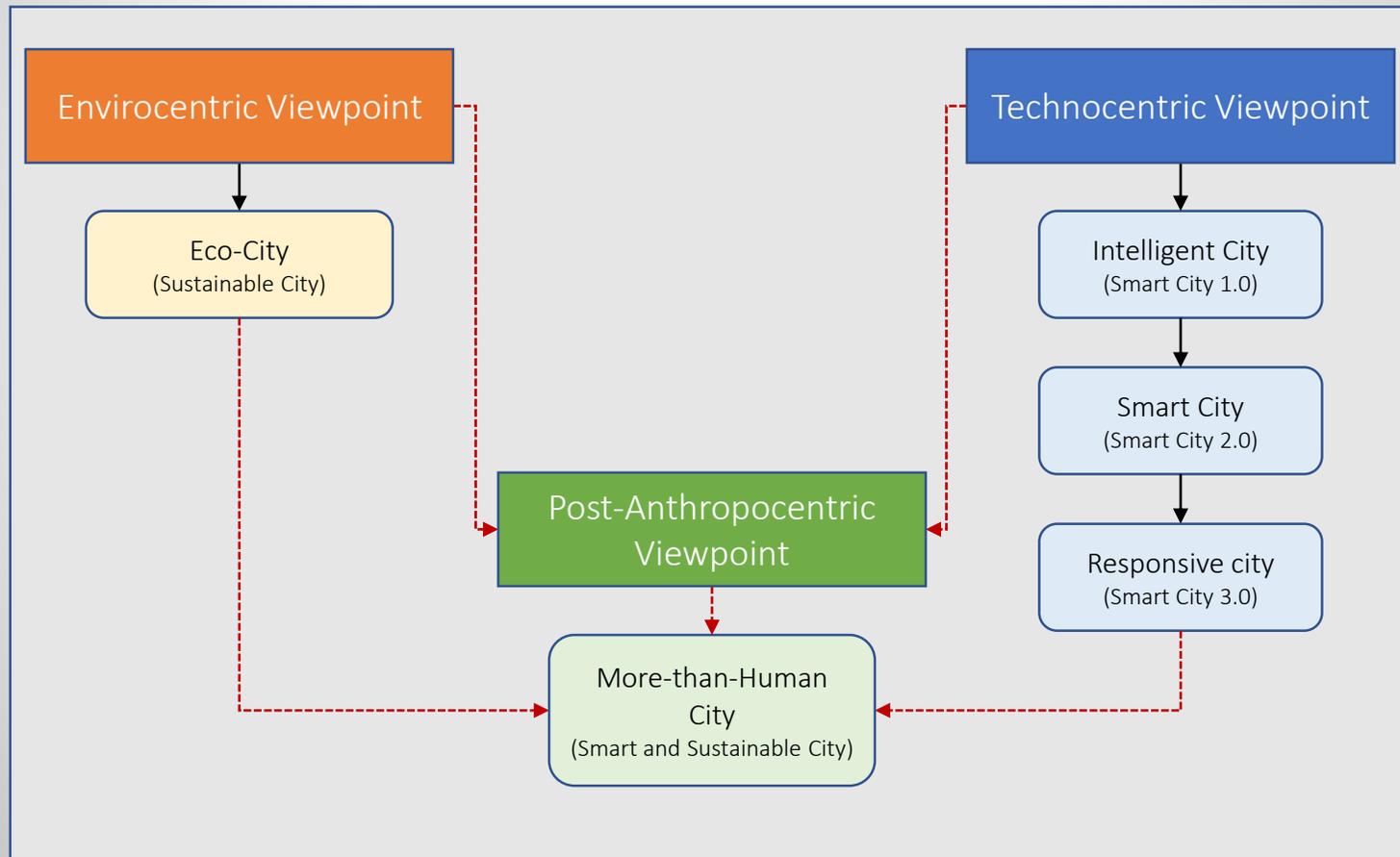


Input-Process-Output-Impact Model:

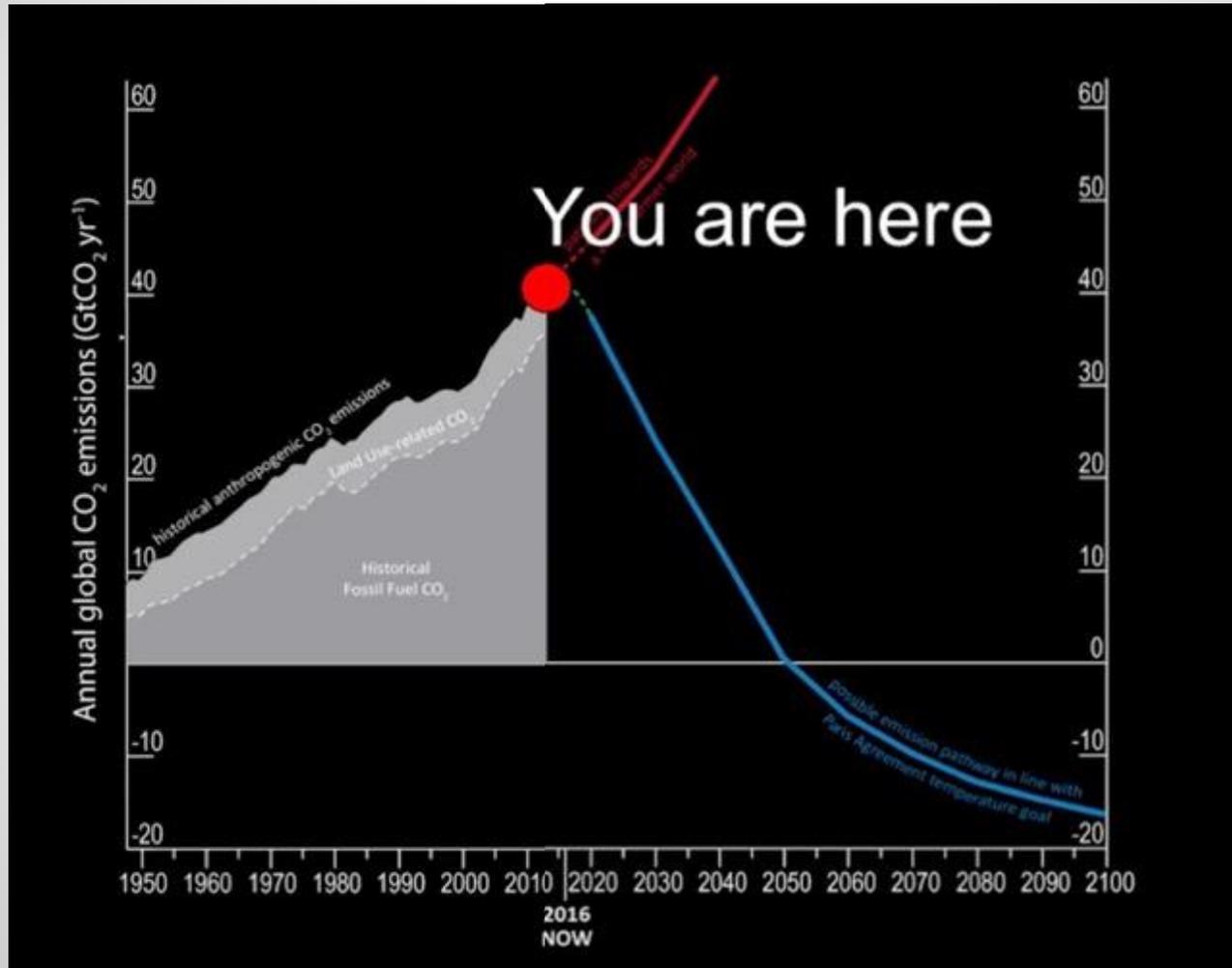


© Yigitcanlar et al. (2018)

Smart City 4.0/More-than-Human City/Smart and Sustainable City/Post-Anthropocentric City



Greenhouse Gas Emissions



Climate Change Warnings

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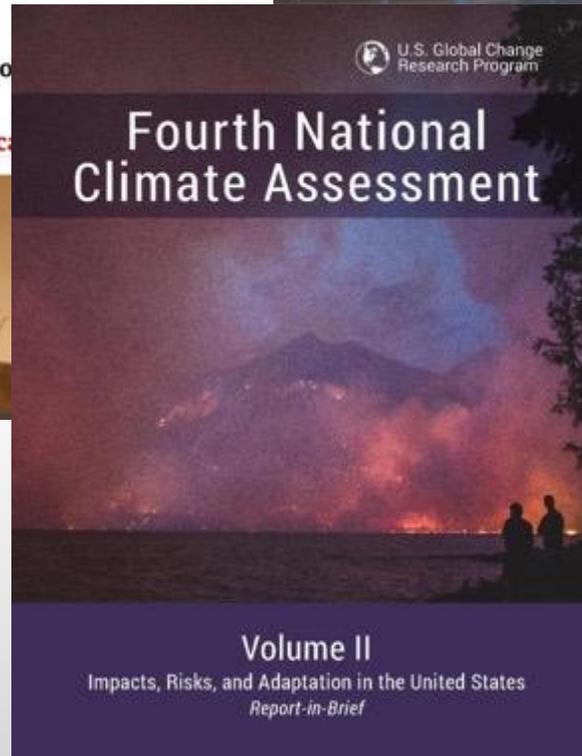
Environment ► Climate change Wildlife Energy Pollution

Climate change

We have 12 years to limit climate change catastrophe, warns UN

Urgent changes needed to cut risk of extreme heat, drought, floods and poverty, says IPCC

Overwhelmed by climate change? Here's what you can do



Protesting Climate Inaction

COP24: Swedish teen activist tells world leaders they are 'behaving like children'



Australian kids walk out of school to protest climate inaction

at Down the World's

3 MIN READ



in my house every week."

ren walked out of school across
ernment inaction on climate change,
said they were setting themselves up



Extinction Rebellion

HOME NEWS



Climate change protesters 'swarm' London bridges at rush hour

'People are sick of being told it's enough to sign a petition when we're faced with extinction,' demonstrator says

Recommendations

- The current smart city practice is generating a **Frankenstein urbanism** by forcing the union of different and incompatible elements in cities—in a disingenuous attempt of addressing quality of life and sustainability.
- There is an urgency to **reconceptualise urban planning, design and development paradigms** and act upon accordingly and immediately.
- In such reconceptualization that **question human exceptionalism**, urban space cannot be seen as an entity separate from nature and thus it cannot be designed just or primarily for humans.
- **Decentring the human in urban design** will help to develop post-anthropocentric cities or more-than-human cities that are truly smart, sustainable and equitable.

Recommendations (cont'd)

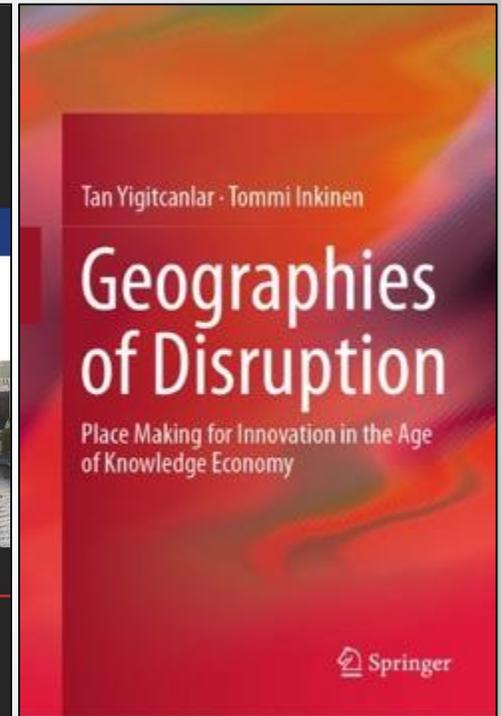
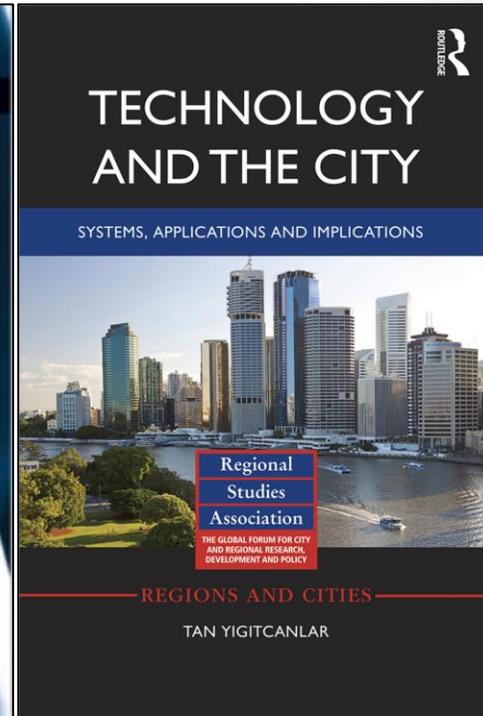
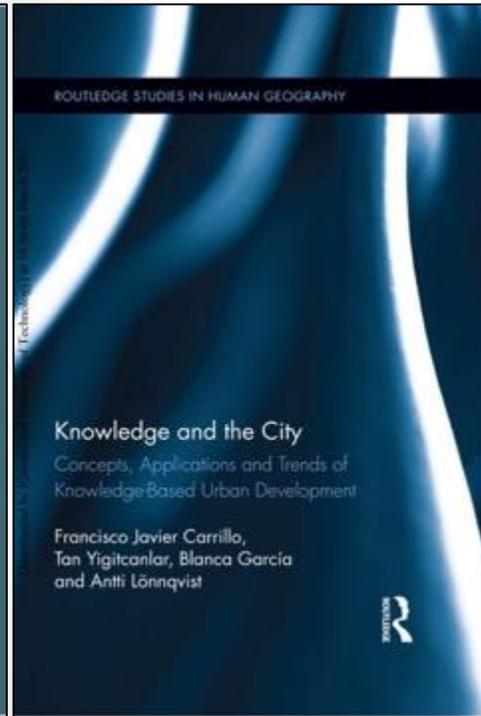
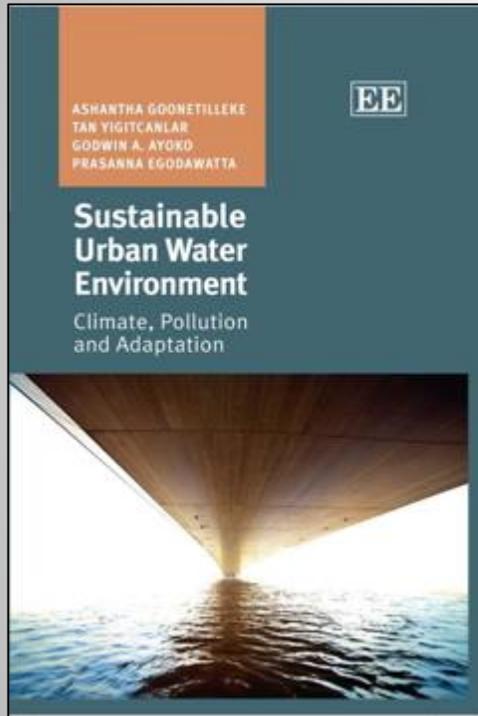
- The current smart city practice, at its best, is a **zero-sum game for sustainability**—environmental gains are cancelled out by the impact of increased technology and energy use.
- The biggest challenge, at this instance, is finding a way to **change our mentality and politics** on how we shape our cities, societies and the environment.
- We need to move forward instantaneously and quickly by focusing on an Ecological Human Settlement Theory that will **create cohabitation spaces to house humans and non-humans in a sustainable and inclusive way** in the post-anthropocentric cities of tomorrow.



Central Park, New York (1857)



Smart, Sustainable and Knowledge-Based Cities



https://eprints.qut.edu.au/view/person/yigitcanlar,_tan.html