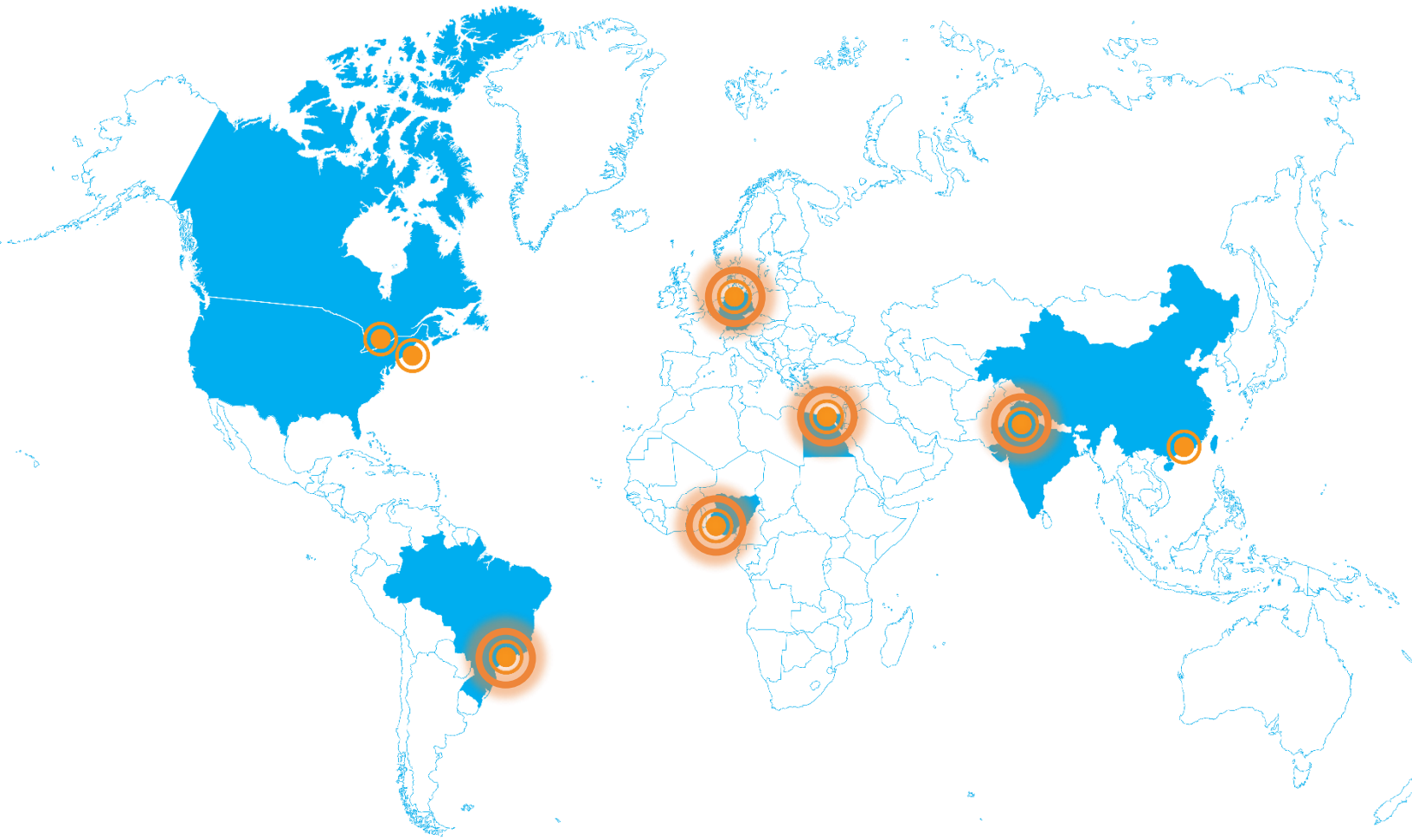
VolkswagenStiftung

HCU HafenCity Universität Hamburg

The Urban Footprints Project

Global Cities on a Low Carbon Path:
Envisioning Systemic Change in Urban Metabolisms

- Kick-Off Workshop Results -



[This page was left blank intentionally.]

I Imprint

Editors:
Lisa Harseim, M. Sc. REAP
Nikita John, M. Sc. REAP
Dr. Cathrin Zengerling

Authors:
Lisa Harseim, M. Sc. REAP
Nikita John, M. Sc. REAP
Maria Alejandra Moleiro Dale
Juliana Braga Webel de Lima
Andréa C. C. A. Lopes
Hossam Tarek Samir Nada
Diego Robles

Please cite as follows:
Harseim, L., John N., Zengerling, C. (Eds.). (2019). *Global Cities on a Low Carbon Path*. UFP Kickoff Workshop Report. Retrieved from: https://www.hcu-hamburg.de/en/master/urban-planning/projektleitungen/dr-cathrin-zengerling-llm/urban-footprints-project/

Cover: Gionatan Vignola/Lisa Harseim

II Disclaimer

The authors declare no conflicts of interest. However, it must be noted that certain, confidential information in this report had to remain undisclosed to protect the informant(s). Moreover, we would like to emphasize that all results in this report represent an intermediate stage of ongoing work.

III Acknowledgements

The Urban Footprints Team would like to express their deep gratitude to all those who made this kickoff workshop possible. We had hoped to create a comfortable and open environment for exchange while taking a step further towards our goal, and we are very glad to have had such knowledgeable and motivated participants for the entirety of this event. For making all this possible we would like to thank the:

Speakers, who gave us a peek into their experiences and work from different disciplinary perspectives,
Panellists, who gave us further valuable insight to deepen our discussions,
Participants, who brought in their knowledge, curiosity and interest,
Volunteers, who stayed on their toes and catered to every unseen need,
Ana Strastil, for holding us all together,
Team of the Hongkong Studio, who created the perfect environment,
and *Caterers*, who fuelled us with delicious and low-foodprint meals.

Thank you!

IV Acronyms

CAP	climate action planning
GHG	greenhouse gas
GIZ	Gesellschaft für Internationale Zusammenarbeit, German Development Agency
GOPP	General Organization for Physical Planning
(I)NDC	(Intended) Nationally Determined Contribution
LAMATA	Lagos Metropolitan Area Transport Authority
UN DESA	United Nations Department of Economic and Social Affairs
SDG	Sustainable Development Goal
SWM	Solid Waste Management

V Executive Summary

Accelerating climate change challenges the effectiveness of traditional, nation-state based mitigation efforts. Growing urban agglomerations turn cities into key actors with a polycentric yet cumulative response to the environmental threat. To explore the status quo of strategic urban (-centred) climate action planning, the kick-off workshop of the Urban Footprints Project focused on five of the project's eight global case study cities.

Together with national, international and local experts, the cities New Delhi, São Paulo, Lagos, Cairo, and Hamburg were analysed through poster debates, presentations, 5R-modelling sessions and a panel discussion.

This report provides an overview of the information that was generated during and for the workshop. It reveals mechanisms of accountability of climate governance that are specific to each city, ranging, for example, from formal to informal, explicit to implicit, and low to high priority.

Embedded into their respective horizontal and vertical governance systems and equipped with varying degrees of local power of their political mandates, it became apparent, that each city's position is unique, calling for tailor-made approaches to urban climate action planning which are firmly rooted in a sensible composition of rules, available material and capacity resources, actors, their relationships, and known system responses to steer the city towards intended and redefined results.

These required elements can be identified through the four-pillar accountability framework as proposed by Zengerling (2018, 2019) to reveal the structural differences of urban climate governance in the studied cities:

- The strength of the *responsibility* pillar is closely linked to the constitutional setting defining the local scope of action as well as political will.
- Overall *transparency* of carbon and material flows seems to depend on the availability of local data in the first place but also democratic conditions as well as the power balance between public and private actors and their form of being intertwined in propelling the country forward.
- *Assessment* frameworks use various methods of accounting and would benefit from streamlining and further development towards complementing production-based with consumption-based accounting.
- The *participation* pillar rests not only on governmental inclusion but also on public pressure and, thereby, can strongly influence appropriate measures and progress on the pathways to a low-carbon future.

Setting the project up for the next step involves in-depth research on the driving factors of the local systems responsible for carbon emissions and unsustainable material consumption patterns.

Section Quick Links: Main Takeaways Panel Discussion The Project

IV Contents

1. Urban Footprints

1.1. The Project: Towards Greater Accountability in the Governance of Cities' Carbon and Material Flows

As climate change becomes more and more apparent and cities host – with a rising tendency – 55% of the world population (UN DESA, 2018), a major task of this century is it to integrate cities as key actors into the global effort of climate change mitigation and adaptation. While states are organized centrally under the Paris Agreement, cities are only indirect participants of this regime. Instead, urban governance acts locally to take up partnerships, and joins city networks in response to the shared challenge.

However, the variety of set targets and strategic urban climate actions are rooted in an "accountability vacuum within an increasingly complex architecture of multi-level governance" (Bache, Bartle, Flinders, & Marsden, 2015) which compromises the reliability of progress.

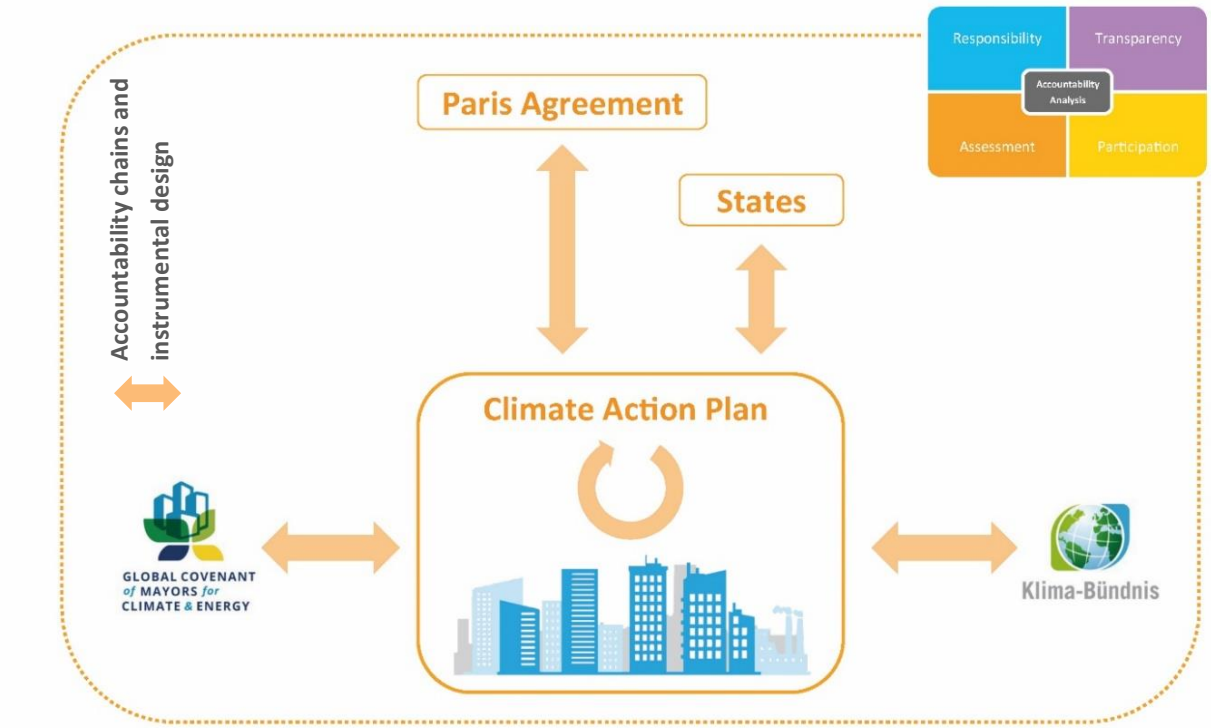


fig. 1: Framework of the accountability analysis in multi-level and polycentric urban climate governance (Zengerling, 2018, 2019)

The research of the urban footprints project ventures into unchartered territory by exploring accountable modes of governance available to cities to activate their transformative forces. Eight global cities (i. e. Cairo, Shenzhen, Lagos, Toronto, Delhi, Hamburg, São Paulo, and New York) and their respective national jurisdictions will be studied under the accountability framework established by Zengerling (2018, see figures 1 and 2). As shown in figure 1, the analysis rests on four key pillars:

1) Responsibility: who is responsible to whom, for what kind of actions, by which means
2) Transparency: who needs to communicate to whom, what kind of information, in which form
3) Assessment: collection of data, measurement (methodologies), verification and evaluation towards an agreed goal
4) Participation: involvement of the principal (e. g. the people) to whom the governing agent is responsible and other stakeholders, considering different forms of participation, ranging from direct to indirect

Cities contribute to global warming due to the GHG emissions of the resources which they consume, process and excrete in order to maintain their activity, causing carbon footprints. Despite efforts to close the loop into a circular economy, throughput of urban metabolisms remains mostly linear. Simultaneously the growth of the metabolism continues to be directly coupled to increasing resource consumption and rising emissions.

Considering this factual and political responsibility of cities to support climate change mitigation, the Urban Footprints Project delves into topics under the umbrella of the following overall research question:

"What is the *status quo* and the *potential* for the *accountable governance* of *cities' carbon and material footprints*?"

(written by Lisa Harseim)

fig. 2: Cities' footprints steered by accountable governance of urban metabolisms. (Zengerling & Vignola, 2018)

1.2. The Kick-Off Workshop: Global Cities on a Low Carbon Path – Envisioning and Planning Systemic Change in Urban Metabolisms

Connecting knowledge from international expert researchers, local stakeholders and young professionals, the workshop focused on five out of the eight case study cities (i. e. New Delhi, São Paulo, Lagos, Cairo, and Hamburg) and was structured around the topics energy demand (e. g. from heating, cooling, electricity and mobility) and material management (e. g. in construction, urban development, solid waste management, & food supply).

Systemic change is required to reshape urban metabolisms from linear to loop and, thereby, reduce cities' resource in- and emission output. Therefore, the first day of the workshop was dedicated to learning about the specific city contexts and developing visions for the improvement of their urban systems. Across disciplines, through lifestyle, infrastructure and planning perspectives, the envisioning was facilitated by:

1) group breakout sessions working with the 5R modelling framework of the USAID to model the local system around one emission relevant infrastructure per city and to envision what we would want the future of this urban system to look like (see chapter 3).

2) inspiring keynotes on urban infrastructures in Hamburg, material flow modelling in data-scarce environments such as Recife in Brazil, life in the megacity of Lagos and infrastructure integrated urban development in the Delhi region (see chapter 2).

3) a poster per case study city, compiled by the UFP team, to inform about key facts and give a first glimpse of the status quo of governance structures as well as respective urban carbon and material flows (see figures 3, 4, 5, 6, 7 on the following pages).

The second day juxtaposed the visionary ideas of the previous day with the reality of climate action and resource planning in the selected global cities in order to lay the foundation for the development of feasible transition pathways.

Keynotes shared the challenges and opportunities along the way of planning for systemic change for reducing carbon emissions in the city of São Paulo, the city of Hamburg – with a special focus on the district Bergedorf, the region of Greater Cairo, New York and Delhi. Finally, a panel discussion allowed debating and reflection on these learnings and expert experiences regarding accountable governance, lifestyle changes and planning perspectives.

The formal agenda of the workshop was rounded off with a carefully composed low-foodprint catering, offers of an external networking dinner and a guided tour through the modern and developing city district of HafenCity to witness climate and material sensitive planning in Hamburg.

We supported the experiment of the workshop food supply with desk research, collaboration with the caterers, and careful documentation of the quantified carbon and water footprints. The evaluation of the experiment results will be shared publicly online.

(written by Lisa Harseim)

Following pages:

HAMBURG, GER

The Growing City

CITY KEY FIGURES

Area: 755 km² (CDP)

Population: 1.8 mio

Density: 2,430 inh/km²

Administrative Structure:

- One of three German City States
- Comprises of seven boroughs and 104 districts

Climate Pressures:

- Climate zone Cfb: warm temperature, fully humid, warm summer [1]
- Heavy rainfall, sea level rise, flooding, urban heat islands [2]

COUNTRY KEY FIGURES

[3] 3.997 tri USD : GDP

[3] 55,800 (2018) : GNI per cap

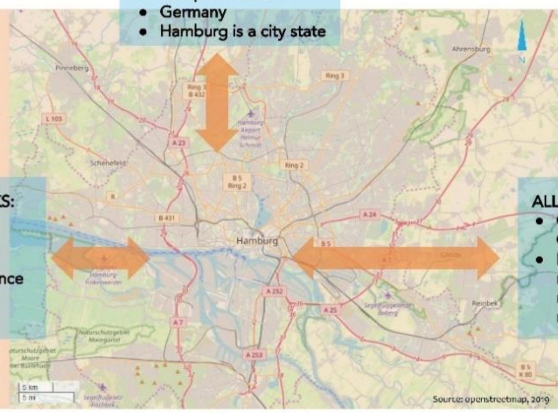
[4] 0.935 (5th, 2018) : HDI

[5] Score 80/100, Rank 11/180 : Corruption Perception Index

Primary: 2 %, secondary: 24%, tertiary 74% : Economic Sectors

VERTICAL Governance:

- **Paris Agreement (NAZCA)**
- **European Union**
- **Germany**
- **Hamburg is a city state**



Source: openstreetmap, 2019

CITY NETWORKS:

- **Covenant of Mayors**
- **ICLEI**
- **Climate Alliance**

ALLIANCES:

- **Chicago Climate Charter**
- **METREX - network of EU metropolitan regions/areas**

STRATEGIC PLANS

Title: Hamburg Climate Plan [2]

Timeframe:

- Adopted in 2015
- Action plan for 2020/2030
- Long-term perspective for 2050

Vision:
En route to a "Climate Smart City" [2]

Targets: [2]

Time axis	Climate change mitigation	Climate adaptation
2050	Climate friendly city At least 80% CO_2 reduction	Resilient to climate change, meaning a city adapted to climate change
2030	50% CO_2 reduction	Integrated action as a matter of course
2020	Hamburg makes a contribution to the national target: 40% CO_2 reduction	Climate adaptation kept constantly in mind (applies to government and civil society)

Responsible Author(ity): Hamburg Coordination Center for Climate Issues (Leitstelle Klima) / State Ministry for Environment and Energy

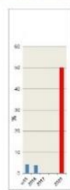
GHG Inventory:

- Bottom-up accounting
- Consumers' balance sheet
- Only CO_2 accounted for so far

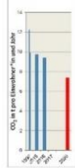
Steering Committee: Hamburg Coordination Center for Climate Issues (Leitstelle Klima)

Noteworthy:

- per capita emission reduction goals
- bottom-up accounting
- consumer emissions
- involved in several transdisciplinary, international research projects (TRANSFORM, CLUE etc.)



[7] fig. 1



[7] fig. 2

KEY HURDLES

Share of renewables in primary energy consumption is still very low (fig. 1) [7]

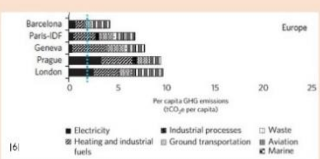
Per capita emissions are declining towards 2020 goal but goal is arguably not sufficient ambitious for the 1.5 degree goal (fig. 2) [7]

New coal-fired power plant in operation since 2015 despite carbon emission reduction goals

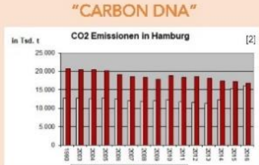
instrumental, institutional and financial capacity/focus does not seem sufficient for drastic changes needed

Time axis	Per capita emissions / year
2050	2 t CO_2
2030	6 t CO_2
2020	9 t CO_2 [2]

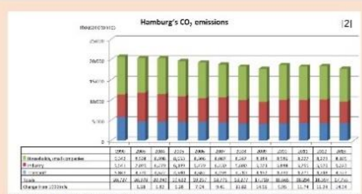
"CARBON DNA"



[6]



[2]



[2]

Fig. 14: Hamburg's CO_2 emissions: consumers' balance sheet (source: Statistikamt Nord, as at November 2015)

HCU HafenCity Universität Hamburg

LAGOS, NG:
A metropolis of Local Governmental Areas in Lagos State

CITY KEY FIGURES

Area (CDP): 3,577 km² [1]
Population: 17 mio est. to 21 mio [14;2]
Density: about 6,871/km² [14]

Climate Pressures:
- Aw - äquitorial winter dry [4]
- Coastal flooding, heat, wildfires, food security [1; 2; 6]

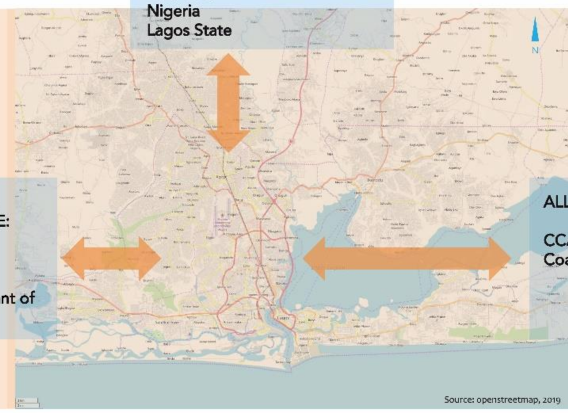
Administrative Structure:
- Comprises 16 of the 20 Local Governmental Areas of Lagos State [3]
- State governor effectively is mayor

COUNTRY KEY FIGURES

[8] 397.27 billion : GDP
[12] 0.532 (2018) : HDI
[7] 5,700 : GNI per capita, PPP
: Corruption Index - NG vs. World 73 vs. 56.9 (2018)
: Economic Sectors
"21.1% (2016 est.) : **agriculture**
22.5% (2016 est.) : **industry**
56.4% (2017 est.) : **services**" [13]

VERTICAL GOVERNANCE:

Paris Agreement (NAZCA) [6, 15]
African Union
ECOWAS
Nigeria
Lagos State



Source: openstreetmap, 2019

HORIZONTAL GOVERNANCE:

C40 Megacity
ICLEI Africa
Global Covenant of Mayors

ALLIANCES:

CCAC - Climate & Clean Air Coalition [5]

STRATEGIC PLANS

Title:
- National Adaptation Strategy and Plan of Action on Climate Change for Nigeria (NASPA-CCN)
- LAS-CCAS - Lagos State Climate Change Adaptation Strategy (2012)
- LSCP - Lagos Climate Change Policy (2012-2014)
- Lagos Plan of Action for the Economic Development of Africa (1980-2000)

Vision:
"[a] prosperous and climate change resilient Lagos" [11]

Targets:
- committed & inventarized but did not set any targets yet [1]
+ city aims to evacuate from threatened lands

Responsible Author(ities):
- State Ministry of Environment [6]
- National Climate Change Commission (NCCC) [6]
- Nigeria Integrated Water Resources Management Commission (NIWRMC) [6]

GHG Inventory:
CDP self-reporting [9]

Steering Committee:
-

Noteworthy in LAS-CCAS:
+ Extensive adaptation recommendations based on climate change impact assessment
- no mention of monitoring or accountability mechanisms

KEY HURDLES

- Absence of strong institutions that could push adaptive capacity [10]
- "Poor Funding,
- Lack of public awareness and support [...]
- Infrastructural decay,
- Unskilled manpower,
- Poor integration (strategies & institutions)
- Poor research framework [...]
- Adaptation progress has proven to halt" [10]
- Informal building activity
- Rural to urban migration

"CARBON DNA"

GHG emissions (CDP):

29,426,266 tCO2e [9]

GHG emissions per sector:

50% buildings
18% transport
33% waste management [2]

REFERENCES

[1] c40.org
[2] https://www.globalcovenantofmayors.org/cities/lagos/
[3] https://de.wikipedia.org/wiki/Lagos#Stadtregierung
[4] http://koeppen-geiger.vu-wien.ac.at/present.htm
[5] http://ccacoalition.org/en/partners/nigeria
[6] World Bank, 2013, available at: http://documents.worldbank.org/curated/en/707851468100141797/pdf/Toward-climate-resilient-development-in-Nigeria.pdf
[7] https://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD?locations=NG
[8] https://data.worldbank.org/country/nigeria
[9] Nangini et al., 2019: "A global dataset of CO2 emissions and ancillary data related to emissions for 343 cities" in Nature/Scientific Data, DOI: 10.1038/sdata.2018.280
[10] Filho et al., 2018: "Strengthening climate change adaptation capacity in Africa- case studies from six major African cities and policy implications" in Environmental Science & Policy
[11] LAS-CCAS, 2012: Towards a Lagos State Climate Change Adaptation Strategy. Lagos State Ministry of Environment.
[12] http://www.hdr.undp.org/en/countries/profiles/NGA
[13] https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html
[14] http://worldpopulationreview.com/world-cities/lagos-population/
[15] https://climateaction.unfccc.int/views/stakeholder-details.html?id=11215

HCU HafenCity Universität Hamburg

NEW DELHI, IN:
At the heart of the third largest urban area in the world

CITY KEY FIGURES

Area:
National Capital Territory (NCT) is an administrative border enclosing 1,483 sq.km.[1]
National Capital Region(NCR), used for development plans includes NCT+ Neighbouring Districts 33,578sq.km [2].

Population:
NCT 16.78 million[1] | NCR 26 million[2]
Density:
NCT 11,320/sq.km[1] | NCR 840/sq.km[2]

Administrative Structure:
NCT is the capital city and a union territory. [3]
Governed like a state and has 11 Districts
Headed by an elected Chief Minister

Climate Pressures:
Water scarcity, Heatwaves, UHI, Air Pollution exacerbated by climate

COUNTRY KEY FIGURES

$2.602 trillion (2017 est.) [4] : GDP

0.640 [5] : HDI

7,680[6] : GNI per capita, PPP

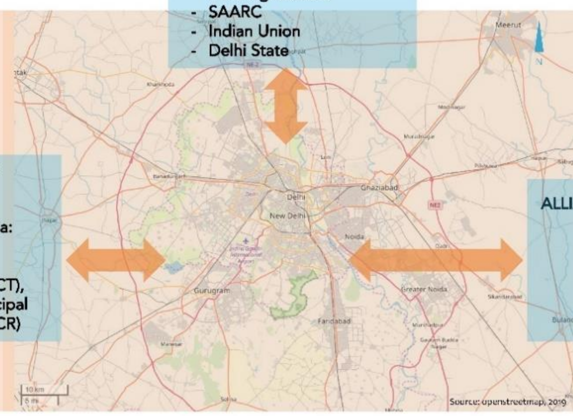
41/100[7] : Corruption Perception Index

Contribution to GDP(%)[8]: Economic Sectors
(2013) **14% Agriculture**
59% Services
27% Industry

VERTICAL GOVERNANCE:
- **Paris Agreement**
- **SAARC**
- **Indian Union**
- **Delhi State**

CITY NETWORKS:
- **C40: NCT**
- **ICLEI South Asia: North Delhi Municipal Corporation(NCT), Gurgaon Municipal Corporation(NCR)**

ALLIANCES:



STRATEGIC PLANS

Title: State Level Action Plan for Climate Change: Climate Change Agenda for Delhi

Timeframe: 2009-2012, Renewed agenda not announced.

Vision: Focus areas of air pollution, water, noise, municipal waste management, green areas and climate change.

Targets:
Climate change related efforts in NCT based on the INDCs include
+ Subsidising use of solar water heating
+ Promoting use of CFL
+ Promoting 'green' building practices
+ Increasing green area 20% to 33%
+ Increase water use efficiency with WW treatment, Yamuna clean-up
+ Identified body (MGICCC) to create strategic knowledge on CC [9]

Responsible Author(ity):
Ministry of Environment, Forest and Climate Change(MoEFCC)
Delhi Pollution Control Committee (DPCC)
Delhi Jal Board (DJB) Public works Department and the respective Municipal Corporations.[9]

GHG Inventory:
2014, Compliant to 2015 Paris Agreement
Estimated using emission activity data[10]
2012, Upstream Emissions for all Kyoto gases [11]

Noteworthy:
-Need more National EF[10]

Steering Committee:
-

KEY HURDLES

Income disparity and informality owing to urban migration

The idea of prosperity is linked with an urban lifestyle. So traditional/sustainable practices are either impractical(ex: cycling) or considered less desirable(ex: shopping at local vegetable markets) by a large section of the urban working-age population.

A large part of India's low emission are due to the lack of centralised infrastructure provision in rural areas. In light of achieving it's development goals, especially in developing areas around Delhi, the potential increase in per capita emissions might not hold priority.

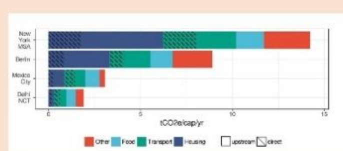
Institutional capacity is repeatedly recognised as an area requiring improvement.

"CARBON DNA"

CO_2 Emissions from Direct Energy Use of Urban Households in Delhi,2010 Emissions (kg CO2 equiv. per capita per month) [12]

Electricity	66
Cooking Fuels	7.87
Private Vehicles	5.44
Total Standardised	61.83

Per capita urban GHG footprints of the four cities and their sectoral composition. The shares of direct emissions in the footprint are indicated by criss-cross lines.[11]



REFERENCES:
[1]GoI. (2011) 'Census of India 2011', Retrieved on July 3rd, 2019 from www.censusindia.gov.in/2011-Common/Archive[illegible].html
[2]GoI. (2011) 'The Constitution(Sixty ninth Amendment) Act, 1991', Retrieved on July 3rd, 2019 from indiacode.nic.in/coiweb/amend/amend69.htm
[3]DDA (2006) 'Master Plan of Delhi', Retrieved on July 3rd, 2019 from https://dda.org.in/planning/mpd-2021.htm
[4]Central Intelligence Agency. (n.d.). The World Factbook. Brazil. Retrieved on July 3rd 2019 from: https://www.cia.gov/library/publications/the-world-factbook/geos/br.html
[5]UNDP (n.d.). Brazil. Human Development Indicators. Retrieved on July 3rd, 2019 from: http://hdr.undp.org/en/countries/profiles/BRA
[6]The World Bank Data. (n.d.). GNI per Capita, PPP. Retrieved on July 3rd 2019 from: https://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD?locations=NG-BR
[7] Transparency International. (2018). Corruption Perception Index 2018. Retrieved on July 3rd, 2019 from: https://www.transparency.org/cpi2018
[8]GoI (2014) Employment across various sectors, NSSO 66th Nationwide Survey, Planning Commission, Government of India (3 June 2014), pp 116
[9]Mehra, R. (2009) Climate Change Agenda for Delhi 2009-2012. Delhi Retrieved on July 3rd, 2019 from [illegible]
[10]Nagar, P.K. et al. (2019) 'A framework for developing and projecting GHG emission inventory and preparing mitigation plan: A case study of Delhi City, India', Urban Climate, 28, p. 100462. doi: 10.1016/j.uclim.2019.100462
[11]Pichler, P.-P. et al. (2017) 'Reducing Urban Greenhouse Gas Footprints', Scientific Reports, 7(1), p. 14659. doi: 10.1038/s41598-017-15303-x
[12]Ahmad, S., Baiocchi, G. and Creutzig, F. (2015) 'CO2 Emissions from Direct Energy Use of Urban Households in India', Environmental Science & Technology, 49(19), pp. 11312–11320. doi: 10.1021/es505814g

HCU HafenCity Universität Hamburg

São Paulo, BR:

Governed by Informality

CITY KEY FIGURES

Area [1]:
- 1,521.11 km² (São Paulo Municipality)
- 7,946.96 km² (Metropolitan Region)

Population [1]:
- 12,176,866 inh. (São Paulo Municipality)
- 21,571,281 inh. (Metropolitan Region)

Density [1]:
- 8,005.25 inh./km² (São Paulo Municipality)
- 2,714.41 inh./km² (Metropolitan Region)

Administrative Structure: the Metropolitan Region has a Development Council with representatives of its comprising 39 Municipalities and the State Government [2]

Climate Pressures: extreme temperatures and drought / rainfall events.

COUNTRY KEY FIGURES

3.248 trillion (2017 est.) [3] : GDP

0.759 [4] : HDI

15,820 [5] : GNI per capita, PPP

35/100 [6]: Corruption Perception Index

: Economic Sectors [3]
6.6% (2017 est.) : agriculture
20.7% (2017 est.) : industry
72.7% (2017 est.) : services

STRATEGIC PLANS

Title:
- National Plan on Climate Change (2008)
- Policy for Climate Change in the Municipality of Sao Paulo (2009)
- State Policy for Climate Change (2009)
- National Policy on Climate Change
- Guidelines for the Action Plan of the City of Sao Paulo for Mitigation and Adaptation to Climate Change (2011)
- National Adaptation Plan for Climate Change

Timeframe: 2025 and 2030 (iNDC)

Vision: the Municipality aims to collaborate with minimizing GHG emissions, leading to sustainable development [7]

(National) Targets [8]:
+ 2025: 37% lower GHG than 2005
+ 2030: 43% lower GHG than 2005

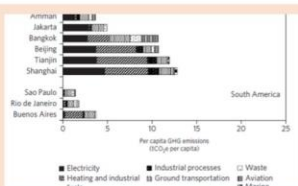
Responsible Author(ity):
- Ministry of Environment (National)
- Secretariat of Infrastructure and Environment (State)
- Secretariat of Green and Environment (Municipality)

GHG Inventory:
- National and State Inventories: methodology based on IPCC guidelines from 1996 (with revisions from 1997) - some estimations consider the IPCC guidelines from 2006. The inventory includes the GHG not controlled by the Montreal Protocol[9,10].
- Municipality Inventory: methodology based on IPCC guidelines from 2006. The inventory includes the GHG not controlled by the Montreal Protocol[11].

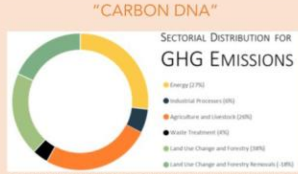
KEY HURDLES

- Political / mandate changes may lead to difficulties in the continuity of environmental and climate policies and/or actions (for mitigation and adaptation)
- From the perspective of the population in general, there are more urgent matters compared to climate change (e.g.: education, health, poverty, etc.)
- Imbalance between policies and actions towards climate change mitigation and adaptation

"CARBON DNA"



Per capita GHG emissions for cities, by continent. Image adapted from "Low-carbon infrastructure strategies for cities", by C. A. Kennedy, N. Ibrahim and D. Hoornweg, (2014).



Sectorial distribution of GHG Emissions in Brazil for 2015. Data retrieved from "Estimativas Anuais de Emissões de Gases de Efeito Estufa no Brasil", by MCTIC, 2017, p. 11.

GHG Emissions in Brazil categorized by sector, with lines representatives of net and gross total emissions (respectively with and without GHG removal due to vegetation growth). Data retrieved from "Estimativas Anuais de Emissões de Gases de Efeito Estufa no Brasil", by MCTIC, 2017, p. 11.

HCU HafenCity Universität Hamburg

CAIRO, EG:
the capital leader under central government

CITY KEY FIGURES

Area : 1,709 km² [16]

Population:

23.7 mio (sum Greater Cairo, Census 2017) of about 90 mio (total Egypt) [12]

Density: > 350/ha, ⅔ within 15km [17]

Administrative Structure:

- Greater Cairo Metropolitan Region (GCMR) covers area in 3 Governorates: Cairo, Giza & Qalyubia
- Governorates, Provinces/(economic) Regions [18, 14]
- Local Popular Councils independent budgets federally allocated [18]

Climate Pressures:

- Bwh in Köppen-Geiger Classification - arid, winter dry, hot [5]
- Sea level rise [11], drought, storms, flooding

COUNTRY KEY FIGURES

[7] 250.895 billion, +5.314% (2018) : GDP, growth

[10] 0.696 (2017) : HDI

: Big Mac Index - EG vs. US

[6] 40 EGP vs. 5.58US$ (Jan. 2019)

: Corruption Index - NG vs. World

[9] 35 vs. 56.9 (2018)

: Economic Sectors

"11.7% (2017 est.) : agriculture
34.3% (2017 est.) : industry
54% (2017 est.) : services" [8]

VERTICAL GOVERNANCE:

Paris Agreement (~~NAZCA~~) [1]
Arab League & African Union
Egypt

HORIZONTAL GOVERNANCE:

~~**C40**~~
~~**ICLEI Africa**~~
~~**Global Covenant of Mayors**~~
Sister cities (e.g. NY)

ALLIANCES:

~~**CCAC - Climate & Clean Air Coalition**~~

STRATEGIC PLANS

Title:

- (Climate Action Plan of WB for MENA)
- INDC
- National Adaptation Plan (NAP)
- National Development Plan
- National Strategy for Adaptation to Climate Change & Disaster Risk Reduction (2011)
- Climate Change Risk Management Programme (2013)
- Greater Cairo Master Scheme = "Cairo 2050"
- "Cairo 2030" [+...]

Vision INDC & NAP:
"The Egyptian INDC will focus on national needs of adaptation. Mitigation will be third priority [...] without any negative impact on the future Egyptian sustainable development ambitions." [11]

Responsible Author(ities):

- Ministry of Housing, Utilities and Urban Communities (MHUC)
- General Organization for Physical Planning (GOPP) [15]

Important Urban Authorities:

- General Authority for Cleaning and Beautification of Cairo (CCBA) [14]
- Public Transport Authority [14]

Targets, GHG Inventory & Steering Committee:
none

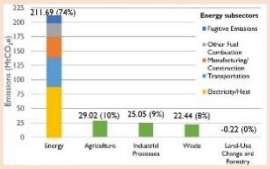
Noteworthy in NAP & INDC :

- Focus on mega projects, e.g. new capital
+ Development metro, "planting 3 mio acres", 1 mio housing units

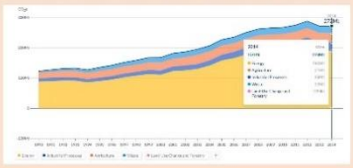
KEY HURDLES

- Export profits (natural gas resources)
- Climbing the social ladder is associated with foreign & expensive among youths [13]
- Great Housing demand [11]
- Congestion & air pollution
- Import dependence (Food, Water)
- Informal building activity
- Rural to urban migration
- "Excessive centralization,
- Lack of transparency,
- [...] communication failures between administrative apparatus and citizens" [15]
- Corruption & patronage [15]
- Gap between (urban) plans & actions [15]

GHG emissions (EGYPT, 2012) [2]:



GHG emission history per sector (EGYPT) [3]:



CO2 emissions of Egyptian Cities [4]:

Urban Cluster	Footprint/cap (t CO2)	Population	Footprint (t CO2)
Asyut	1,9	3,479,160	6,745,646
Benha	2,5	3,558,360	7,240,580
Sohag	2,0	6,173,586	12,072,600

REFERENCES

HCU HafenCity Universität Hamburg

2. "I Have A Dream... - The 2°C Goal": Keynotes

2.1. My Vision for Urban Infrastructures in 2050 Hamburg by Christian Maaß

Conclusions (excerpt from presentation):

- A climate neutral city is possible by 2050.
- The electricity sector is generally on a good way for decarbonisation, but the federal regulatory framework needs improvement
- Electrification of the mobility sector is very important for low carbon mobility.
- Hamburg has a long history of low carbon city planning – but is not yet far enough to reallocate enough public space from cars to low carbon transport (cycling, public transport)
- The heat sector is the most challenging part of the low carbon energy transition of cities in Germany.
- Efficiency retrofitting of buildings is needed but will not be able to solve the problem alone.
- Hamburg should focus on building up a smart distribution system for the heat that enables the integration of large low carbon heat sources.
- Hamburg is currently a pioneer in Germany and develops a strategy to integrate renewables into the local DH system.

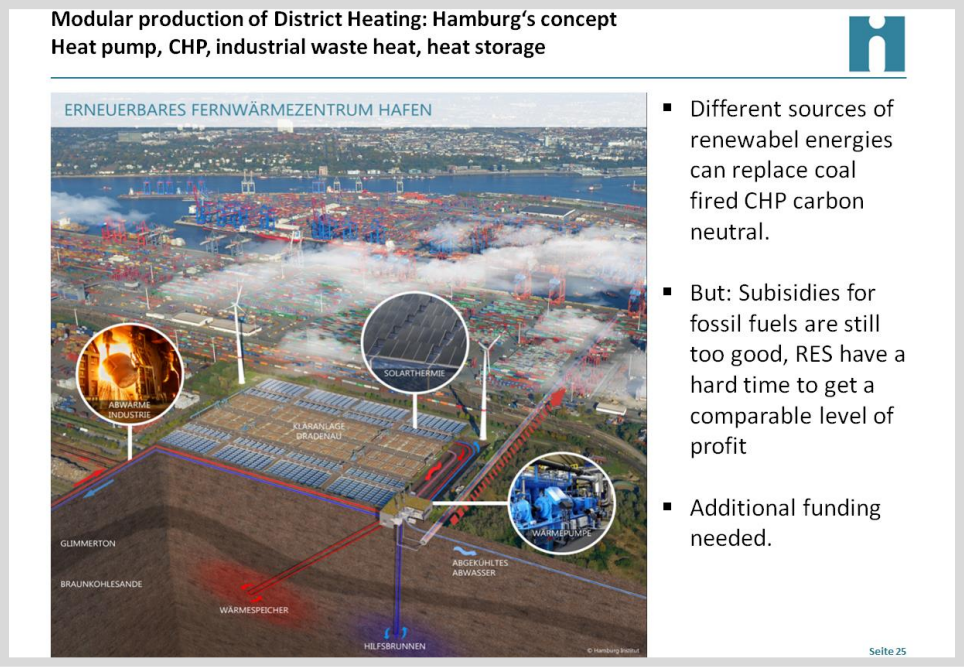


fig. 8: Vision for Hamburg to power it's heating grid with renewable energy. (Maaß, 2019)

2.2. My 2 tonne Day in 2050 Recife by Dr. Esteban Muñoz

The presentation focused on the development of a model of urban flows to assess GHG emissions at a micro-level and has been applied to Recife within the UN Environment Cities Unit, Economy Division. Conclusions (excerpt from presentation):

- The model requires minimal input data: (a) projected aggregated drivers values, (b) aggregated consumption values (from input-output tables), and (c) micro-level consumption model, defined as a table-model.
- It allows for a modular implementation and the library provides functions for the projection of aggregated values, but these values can be imputed from external sources, e.g. projections from statistical agencies. External consumption models can also be implemented within the model.
- The simulation at a micro-level allows the user to perform an assessment at a micro-level.
- The model can be expanded into a spatial model by simulating individual neighbourhoods.

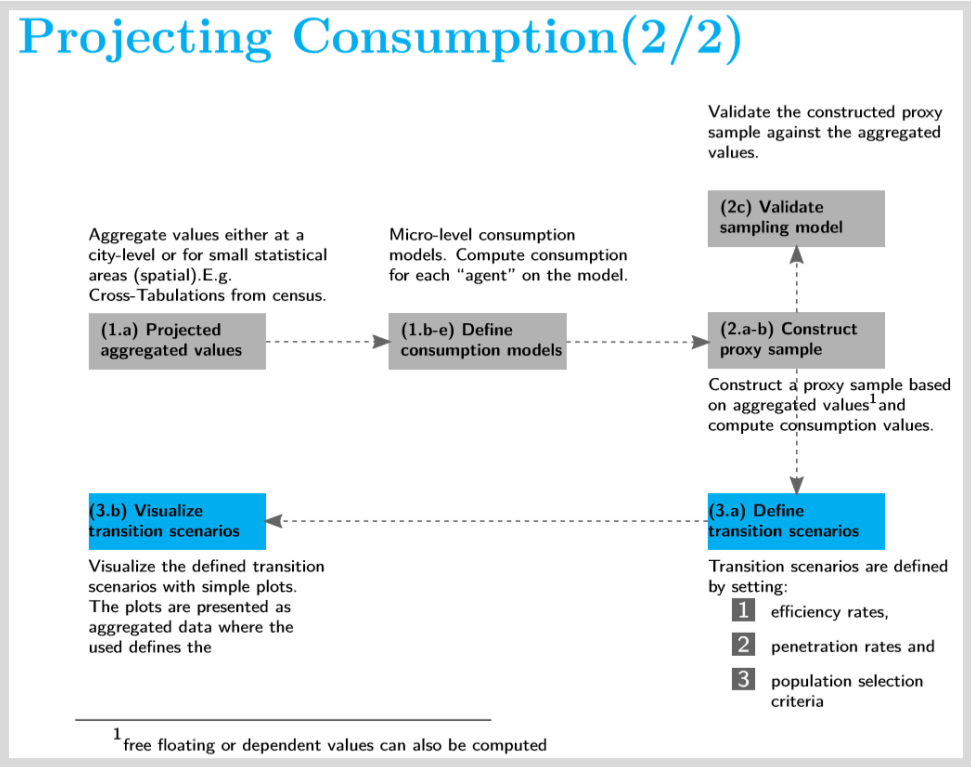


fig. 9: Using standard practices of data gathering, a model of Recife's water and electricity consumption had been constructed. (Muñoz, 2019)

2.3. This is Lagos: Sustainable Development in the Age of the Megacity by Chima Akukwe, Charles Nnanna, Maria Moleiro Dale and Jonathan Young

Conclusions (derived from presentation):

- To overcome key hurdles (economic) investment needs to be improved in the short term
- In the mid- to long-term, work needs to focus on urban development and social welfare
- Confidence in political action has to be build up from short to long term
- Welfare needs to be achieved in the 3 scopes:
    - social (e. g. through participation, implementation, regulation, and awareness & education);
    - economic (e. g. through network expansion, incentive setting for investors),
    - environmental (e.g. by slowing down urban migration, NMT systems and bicycles, and Waste-to-Energy)

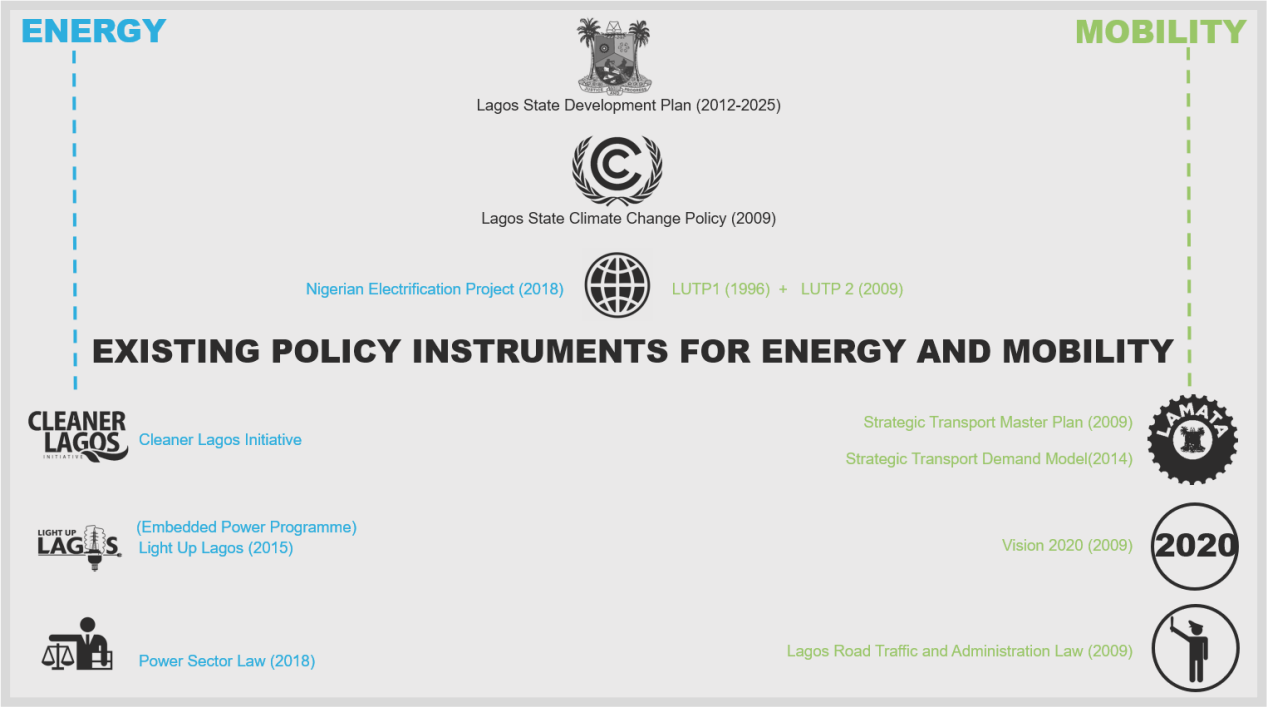


fig. 10: Lagos current energy and mobility plans must plan for service provision under massive urban growth until 2050. (Akukwe, Moleiro, Nnanna, & Young; 2019)

2.4. My Vision for Infrastructure Integrated Development in the Delhi Region by Dr. Manisha Jain

Main Points (derived from presentation):

- Urbanisation and climate change are linked intricately through contribution and risk
- Outward expansion happens on the cost of natural resources & increases costs for service provision
- Indian growth mostly unplanned and in the periphery, outside of municipal boundaries
- City growth is determined by non-agriculture employment opportunities, distance from medium to large cities, dry weather, availability of open space
- Planning initiatives focusing on Delhi exist from national to rural/urban scale (URDPFI Guidelines 1996, 2014; National Action Plan on Climate Change, 2008 down to master (land use) plan; Climate Change Agenda for Delhi, 2009-2012)
- National plan formulates the national missions on sustainable habitat (e.g. promotion of urban public transport) and the national mission for green India (e.g. increasing the forest cover)
- Expansion of Delhi public transport to and integration into surrounding regions stopped in 2010 at border
- Planned, protected Delhi greenbelt area decreased by 37% from 1999 to 2010

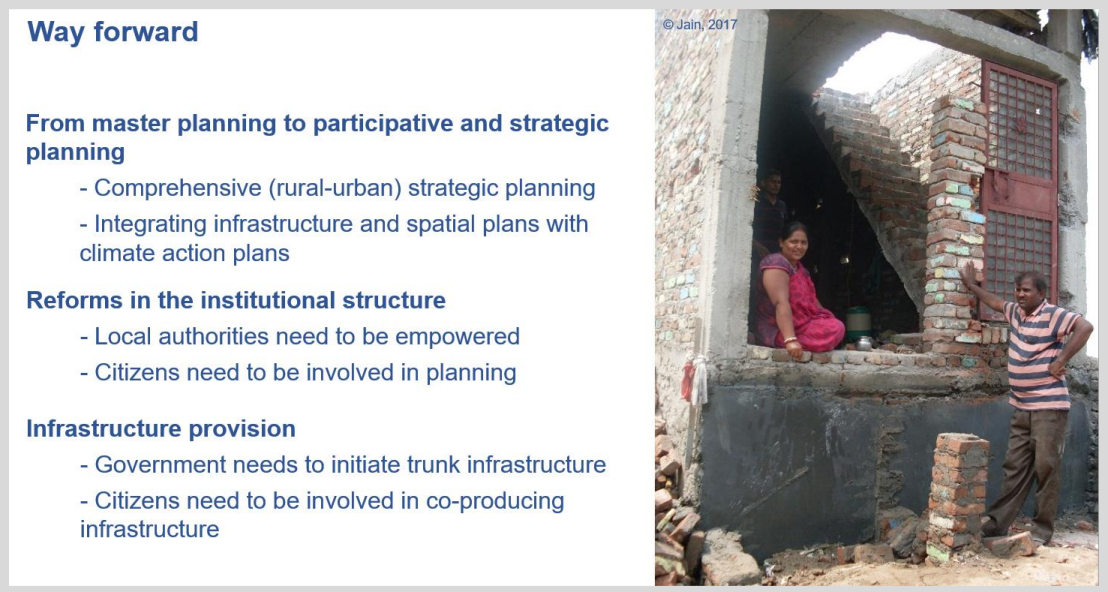


fig. 11: Delhi's planning procedures need to improve to cope with a future of urban growth. (Jain; 2019)

3. 5R Modelling

Accepting the complexity of the urban level, cities involve multiple interactions between varying actors that keep changing. While addressing factors affecting development issues that plague an entire city or locality, addressing a singular actor or a singular interaction might not be sufficient, and this is where systems thinking comes in. Applying systems tools, provides the first steps towards creating a clearer picture into the operating environment, the cities of New Delhi, São Paulo, Lagos, Cairo, and Hamburg.

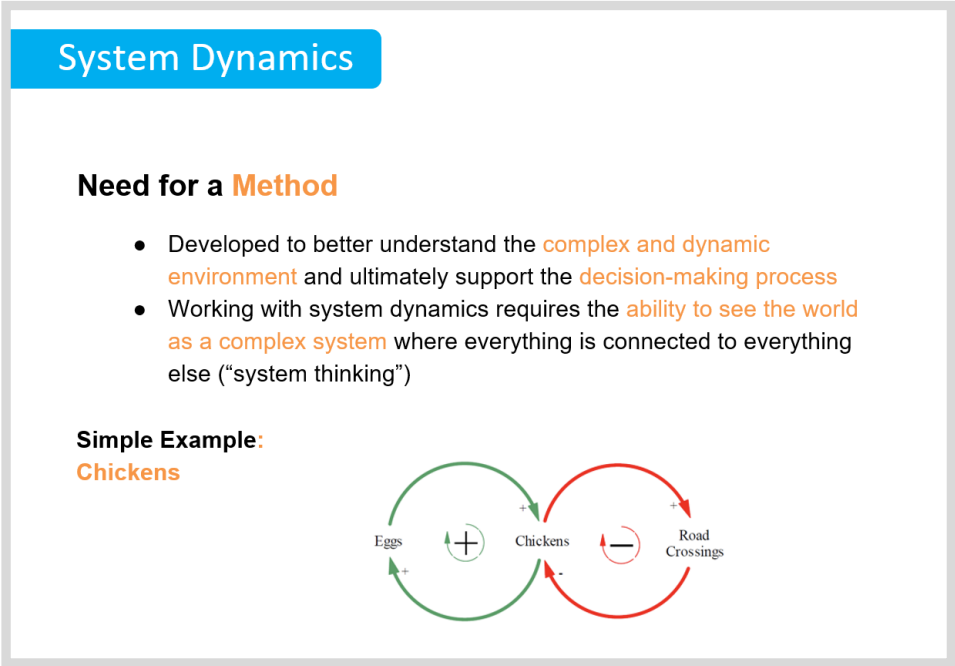


fig. 12: The 5R model helps to detangle complex system dynamics. (Joseph; 2019)

At the workshop, we had the opportunity to combine the knowledge of thematic experts and local perspectives from these cities towards modelling the 'status quo' of the local system.

"The local system refers to those interconnected sets of actors—governments, civil society, the private sector, universities, individual citizens and others—that jointly produce a particular development outcome" (USAID, 2014, p.4).

The 'local' in this case was defined by the actors functioning within the boundaries of the specific city or urban region. We chose to use the 5R method, one of the approaches at modelling a local system, to understand the dynamics of the provision of specific services and infrastructure within our choice of cities (see figure 13).

Parallel Workshop Session					
Urban System	**Solid Waste Management**	**Electricity Supply**	**Mobility Infrastructure**	**Heat Supply +Housing**	**Food Supply**
Context	São Paulo	Lagos	Delhi	Hamburg	Cairo
Moderators	Andreas Obersteg Camila Camara	Phillip Preuner Maria Moleiro	Nikita John Diego Robles	Kathja Lamisch Cathrin Zengerling	Kirya Heinemann Lisa Harseim

fig. 13: Overview of the pairings of cities x topics of the conducted 5R modelling sessions. (John, 2019)

What is the 5R Model?

This model breaks down a local system into the following elements (further illustrated in fig. 13):

> "**Resources:** Local systems transform resources—such as budgetary allocations or raw materials or inputs—into outputs.
> **Roles**: Most local systems involve several actors who take on various defined roles: producer, consumer, funder and advocate.
> **Relationships**: The interactions between the actors in a local system establish various types of relationships. Some may be commercial; others more administrative and hierarchical.
> **Rules**: All local systems have a set of rules that govern them. These rules could even be cultural, anything that defines or assigns roles determines the nature of relationships between actors and establishes the terms of access to the resources on which the system depends.
> **Results**: The concept of "results" is expanded to include measures of the overall strength of the local system as well as traditional outputs and outcomes." (USAID, 2014, p.8)

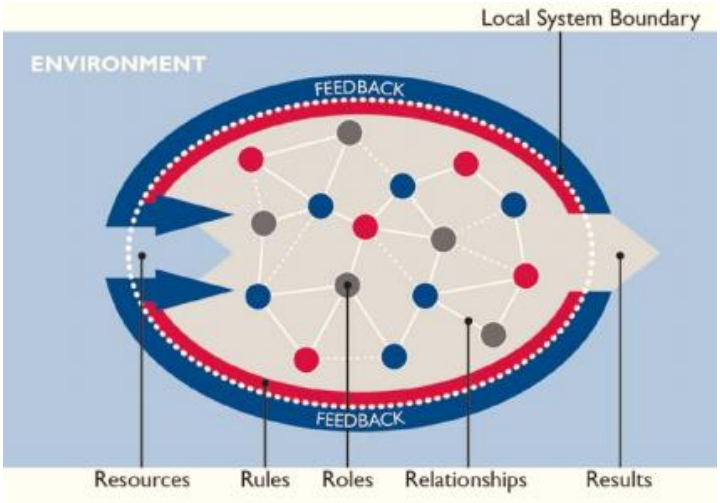


fig. 14: The 5Rs: Key elements of a local system. (USAID; 2016, p.3)

Why 5R?

With the level of detail that can be added to create a status quo 'model', there is a possibility to understand what needs to change in the future. In our case, the future needed to allow for a reduction in GHG emissions and an increase in accessibility of the specific services/infrastructure.

On having created the model that mirrors the status quo and the desired future, it is then possible to identify causal agents or a large-scale shift in interactions that can, in turn, support the systemic change required. The main advantage is that of having an overview of the local system at the desired level of detail and with realistic boundaries.

So, as opposed to focussing on solutions, the process looks to possibilities of transitioning that includes all relevant actors and simultaneously ensuring that the ability of the system to adapt and respond to drastic changes is not left to chance. The level of detail and accuracy produced in these models are dictated by the knowledge of the local and thematic experts present, highlighting yet another advantage of this model, which is that it can be improved with increasing participation of expert.

This method is favoured with its potential to replace traditional forms of support for decision making that relies on a few hand-picked experts that function in a rigid environment, which might not be prepared for the system's 'feedback' in the short or long term. This modelling process aims to give a deep and nuanced understanding of a system, especially its strength and weaknesses. By including varying perspectives, the actual contours of a system and the boundaries can be recognised, promoting better project design, but more importantly promoting a more holistic approach of systems thinking (Sternman, 2013; USAID, 2014).

(written by Nikita John)

3.1. Breakout Session: Heat Supply and Housing in Hamburg

At the beginning of the session, the resources related to the heating supply and housing in Hamburg were listed with inputs from all participants in the discussion table. The list displays resources such as money; infrastructure; coal, oil; gas; water; pellets; sun; waste, etc.

The next step was organizing the roles, i. e. the stakeholders involved in the heating supply and housing in the city of Hamburg. The private sector was represented by the companies involved in the provision of infrastructure and heating services, as well as maintenance, investment, planning and construction of the facilities. The government at different levels (i. e. national, state, and district) was also considered as a stakeholder. Other players such as traders, homeowners, tenants, buyers, universities, citizens and local initiatives were listed.

Moving forward, the relationships between roles were established. With arrows indicating the dynamics between parts, the participants made the connections to understand the co-dependencies and in which ways stakeholders influenced one another.

Once the relationships were defined, the discussion moved on to explore the rules in the given context. District- and state-level, national and international regulations and policies were taken into account. These steps provided an overview of Hamburg's heating supply and housing. Based on the applied analysis, participants were able to list the results perceived. Some results pointed to a positive perception of the current situation and status quo, although some issues and flaws were also identified, which indicates room for improvements.

As a final activity, participants were asked to envision a scenario for 2050, where the problems were tackled, and fundamental changes had been implemented. With a green marker, the group started by excluding fossil fuels from the resource list. Some stakeholders and their interdependencies were modified seeking new forms of businesses, and the necessity of change in lifestyles of the population was highlighted.

Aiming to facilitate others' comprehension about the concepts and propositions displayed in the resultant poster, the group used five orange stickers remarking the most relevant aspects to be considered in the 2050 vision: For example, the coal and gas power plants phase-out, cooperative and decentralized heat production, new technologies and innovation, shifted lifestyles and re-municipalization.

(written by Juliana Braga Webel de Lima)

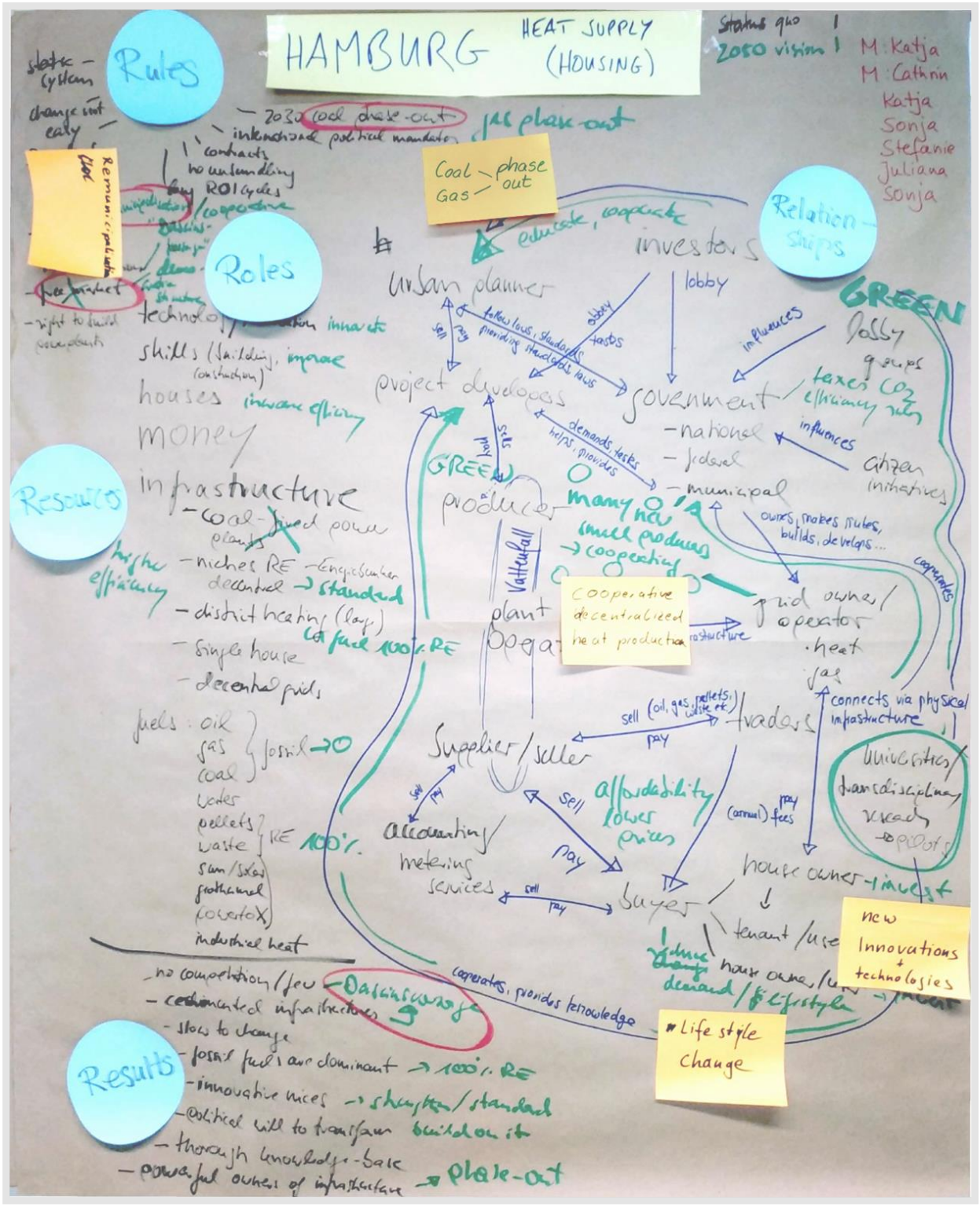


fig. 15: 5R model result of Hamburg's heat supply in 2019 (black/blue) and optimized in 2050 (green). (Lamich, Schlipf, Webel de Lima, Wodrig, Wolframm, & Zengerling; 2019)

3.2. Breakout Session: Solid Waste Management in São Paulo

The aim was to make use of the "5 R Modelling" methodology to reflect and analyse the solid waste management (SWM) system in São Paulo and envision a future with lower carbon emissions and increased accessibility.

Initially, the workshop followed the given instructions in which the participants were guided to reflect on their own about each of the "5 R Modelling" topics, draft their thoughts on paper, and have an open discussion to display the common points of each topic on the common board. However, after going through the first topic self-reflection and discussion, the participants preferred to reflect on the other topics together to complement each other and input their common thoughts directly on the common board. This allowed for more fluid interactions between the participants. The discussion about the SWM system in Sao Paulo started from a narrow understanding of waste (the streams coming from households) to a broadened view (construction and electronic waste streams). At the end of the workshop session, the participants were invited to reflect on the key findings after their discussion on the SWM system in Sao Paulo and potential solutions towards a system with lower carbon emission practices.

Regarding the resources that feed the SWM system in Sao Paulo, one point to be highlighted was the agreement between the participants that waste streams are the main resource for this specific system to work.

Concerning the roles that are involved in the system, it was agreed that the general user (user/waste producer) had to be considered also as a producer, as the consumption and use of goods results in waste production.

When discussing the relations between the roles which make the system flow, the particular case of how taxation works within this system should be mentioned: Once it involves the users paying taxes to the municipality (the finance sector). The municipality pays the managers, who are the ones responsible for paying and controlling the operators. Operators take care of the collection, transportation and processing of the waste streams. In the background, policymakers are the ones responsible for regulating all these municipal sectors involved. In the end, the system relies on the user and NGOs to influence the policymakers and, thereby, the system at a broader range.

Regarding the rules, it is important to mention that sustainability-related practices are already present and influencing the SWM system in Sao Paulo. However, such practices and awareness are not distributed homogenously throughout neighbourhoods and social classes. Although richer neighbourhoods are "cleaner", waste avoidance and separation are not significant when compared to

poorer neighbourhoods. These may be "dirtier", but its dwellers avoid, reuse and recycle a significant share of their products and goods due to scarcity.

For reducing the carbon footprint of this SWM system, one must include an additional stakeholder:

The sector of the industry responsible for the provision of products must provide products and goods with less packaging and longer lifetime. For that, the user needs to employ a conscious demand so that the paradigm shift can take place in this sector.

Finally, regarding the results emerging from the system of SWM in Sao Paulo, one should highlight that:

The current SWM system in Sao Paulo is of fairly good quality, capable of providing its services in a "universal" manner, even though it was agreed that there is space for improvement.

Signs of inequality were identified in different parts of the system regarding, for instance: 1) accessibility to waste collection, which may be related to the incorrect disposal due to inconvenience; and 2) awareness about the waste matter, which may be related to the persistent consumerism culture influenced by the industry.

In the case of SWM in Sao Paulo, there is a potential for increasing organic waste composting practices for the generation of biogas, energy and organic compost. Moreover, the city already presents a series of best practices related to this topic.

(written by Andrea C. C. A. Lopes)

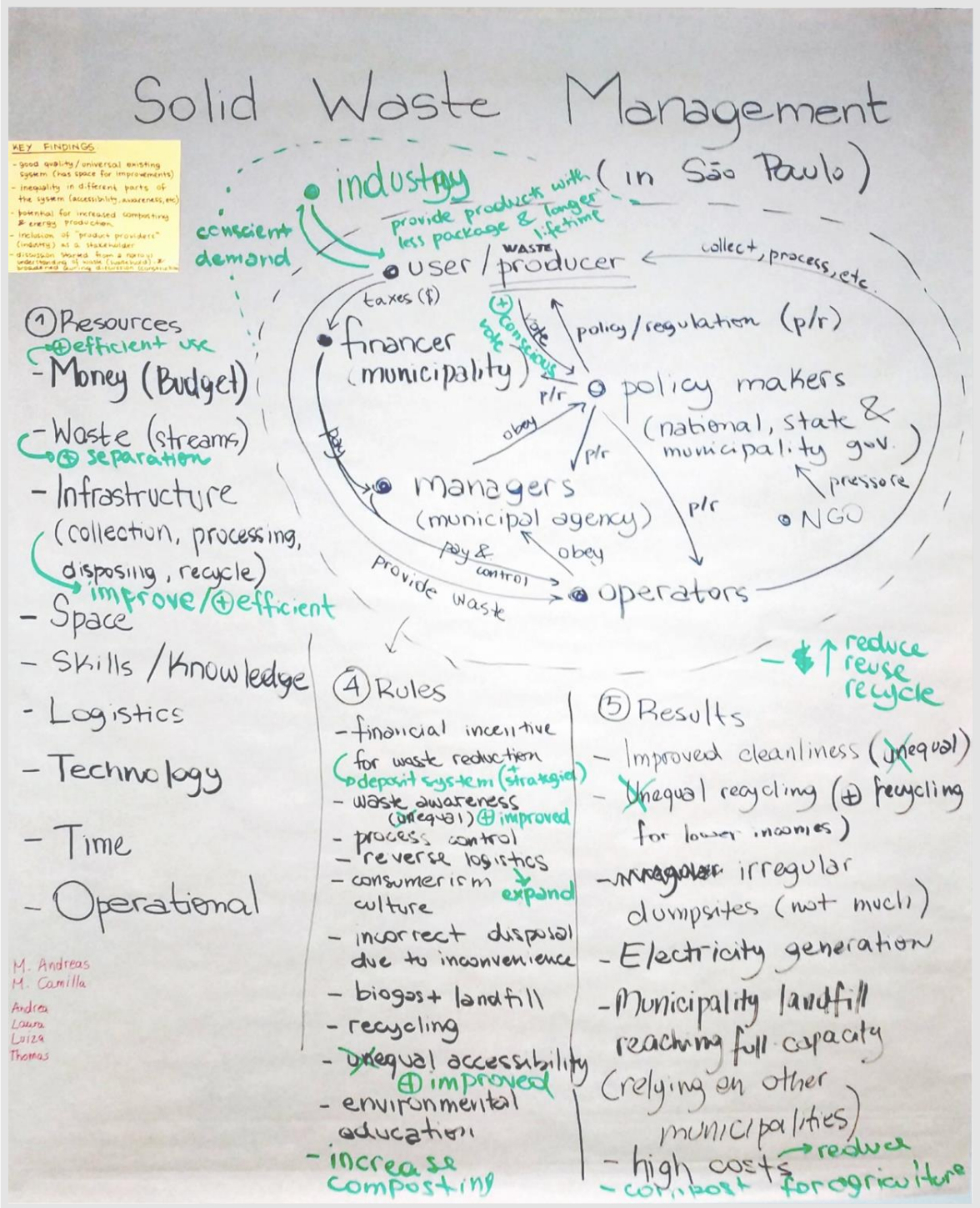


fig. 16: 5R model result of São Paulo's solid waste management in 2019 (black) and optimized in 2050 (green) (Aringueri, Camara, Ceneviva, Hagedorn, Lopes, & Obersteg; 2019)

3.3. Breakout Session: Integrated Infrastructure in Delhi

The 5R modelling session focused in the city of Delhi, in India, intended to depict the current situation (status quo) of the city regarding the mobility infrastructure, as well as projecting how the participants of the workshop visualize Delhi by 2050.

Mobility infrastructure in Delhi is characterized by a mixture of infrastructure, vehicular fleet, and technologies. Considering that the city extends its territory through several kilometres, the use of the available land for infrastructure is crucial. Main actors are the government, service providers (public and private), landowners, urban planners, and users (direct or indirect). They interrelate and account for different, yet sometimes hierarchical, connections between them. It became apparent how the mobility structure displays or reflects the government (or authorities) in a position of demanding and enforcing, while the lower levels interact either by having a monetary interest or obeying.

The framework of mobility infrastructure in Delhi operates under the umbrella of unreliability, lack of inclusiveness and loopholes in the existing regulations. As a result, mobility in the city is perceived as unpleasant, does not integrate, pollutes the environment (air, noise), and runs over its capacity due to delays and high population.

With the goal of reaching lower levels of GHG emissions by the mobility sector in Delhi, several improvements can be implemented:

The transition from fossil fuels to renewables as a source of energy is the cornerstone of the objective, as well as new technology resources that facilitate the commuters' experience of using public or private transport.

Interactions among stakeholders should experience a change in this vision, as citizen participation in decisions and urban planning needs to be considered in a society improving its mobility infrastructure, as well as institutions engaged with the compliance of the (new) official regulations regarding transportation. By doing this, an improved and stronger legal framework should be implemented and enforced.

As a result of this new strategy, the city of Delhi will account for an inclusive, affordable, clean and intelligent mobility infrastructure while alleviating a once overpopulated city with more open spaces for pedestrians and bicycles, green areas and available land for other purposes.

To reach this, it is important to note that the socio-political conjuncture is one of the major obstacles to overcome, even more than the existing technological limitations.

(written by Diego Robles)

fig. 17: 5R model result of Delhi's mobility infrastructure in 2019 and optimized in 2050. Each category of R collected on one colour of notes. Yellow dots indicate elements to be tackled in future. (Behera, Bose, Jain, John, Pichler, & Robles; 2019)

3.4. Breakout Session: Accessibility of Electricity Supply in Lagos

Lagos can be considered rich in many resources when it comes to the topic of energy supply: It is a city strong in natural sources of energy, such as gas, oil, coal, solar and hydropower which defines its potential for energy production. Nevertheless, the current supply of electricity to its population is hindered by weak management of other resources such as poor infrastructure, slow technological advances and a constant battle among those who control money and politics in the city and the state.
The critical situation of the energy supply in the city revolves around the influence of government over others of the main role players: The central government regulates producers and controls the supply chain of this commodity over its distributors. Although measures of privatization have been taken over the years, the hurdle remains because of mismanagement. At the end of this supply chain, the consumers have very low influence over government in terms of what they can demand.

The rule that arises as a consequence of the current situation is that energy production continues to be controlled by the government. Therefore, consumers cannot freely choose their electricity distributor because there is no variety of options in the market, and producers cannot bypass the transmitters in order to skip corruption hurdles along the extended chain of supply.

As a result, the overburdened and unattended infrastructure has ceased to meet the increasing demand of the ever-growing megacity. The current distribution system leads to energy waste in its transmission. From the social point of view, the feeling of abandonment on behalf of the population has led to an outburst of vandalism due to evident unequal accessibility to the system.

As a vision for the megacity in 2050, a shift in its valuable resources should aim towards a higher education level for the majority of its population, increase in the use of renewable resources for production of energy (such as solar or water) and, especially, strengthening of the appreciation of its local knowledge: A society should thrive in development according to the recognition of its values and skills, instead of constantly importing foreign systems.

This new approach of recognition of values as resources should balance the weight of each of the role players in matters of electricity supply. The role of government should be to keep a closer and equal relation towards producers, transmitters and distributors while, at the same time, allow the existence of private producers with a regulated course of action. Investors should also play a determinant role in between national and private production. The outcome should be a consumer who could also feel like a participant in the decision-making process, and actively affect the decisions of distributors, based on the variable demand of electricity (consumer/prosumer).
The new rules in Lagos Megacity could head towards a more open market with better communication among its actors and a democratization of the supply. From the government and citizen perspective,

the implementation of economic incentives to save electricity can be a positive way of giving a sense of control to the final consumer.

When these measures are taken into account in a sustained way, the long-term result could be a more decentralized and balanced system, focusing on bottom-up management of electricity. It assures that the small scale can diminish the gap between production, transmitter and distributor. Cities with desolate infrastructure in developing countries like Nigeria have a significant advantage: The possibility to attempt a leap-frog effect and jump ahead into the type of energy source and supply correspondent to the city that it shall become in the near future.

(written by Maria Moleiro Dale)

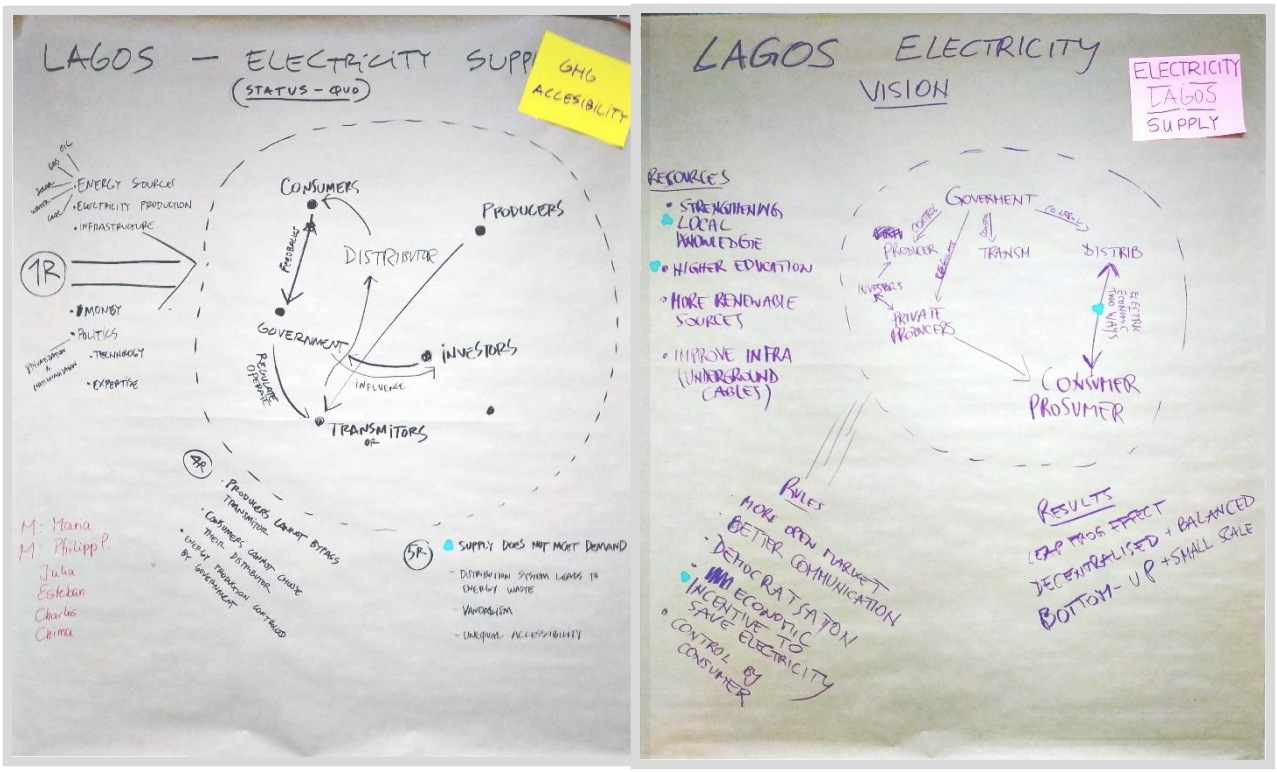


fig. 18 & 19: 5R model result of Lagos' electricity access in 2019 (left) and optimized in 2050 (right). (Akukwe, Moleiro Dale, Muñoz, Nnanna, Preuner, & Sievert; 2019)

3.5. Breakout Session: Cairo Food Supply

Concerning Food Supply, Cairo "Governorate" (akin to "State"), despite being the capital of Egypt, it is not sufficient to be examined all by itself. Owing to Cairo's completely urban nature, it is, first and foremost, a food "consumer" and not, in any significant way, a food supplier. Therefore, it was necessary to, instead, examine the Greater Cairo "Economic Province" (a higher administrative division level comprising a collection of nearby, economically dependent governorates), adding Giza and Qalyubia (two governorates of a significant agricultural make-up, accounting for Cairo's Food Supply).

A brief, preliminary look at the topic highlighted three main Climate-Change-related problems, namely:
1) Individualistic long-distance transportation of agricultural produce on a daily basis.
2) Weak local governance and a lack of a clear, effective, locally tailored policy.
3) Citizen's negative behaviour patterns and habits, that range from farmers illegally expanding their built-up area over their own agricultural or arable lands to keep family members close (culture of close family ties) up to consumers' poor and unhealthy dietary choices, inevitably influence the food market as a whole.

To counter the identified three main problems, three main solutions were proposed, accordingly:
1) Empowering local governance structures and institutional bodies, for example, with decision-making authority, instruments as well as resources for implementation.
2) Development and implementation of a clear, effective, locally tailored policy for Greater Cairo's food supply chain, food cycle, and food-related processes.
3) Education and increasing awareness of citizens in their various roles (e. g. farmers, retailers, consumers) by explaining the critical significance of and how they can have either a negative or a positive influence on food supply, the food market, and, ultimately, Climate Change.

A final, conclusive note suggests an unbiased perspective on informality, which is a strong player as well as characteristic of the food supply chain. It is primarily important to see informality as a result of a "failure of formality". That means, it exists to solve a problem while it creates another: Informality is irregular, difficult to control or systemize, and rigid because it strongly resists change for fear of a loss of gains and compromised interests. The developed policy should not involve the extermination of informality. However, the challenge lies in how to positively incorporate this informality into a good governance structure for Greater Cairo's food supply chain.

(written by Hossam Tarek Samir Nada)

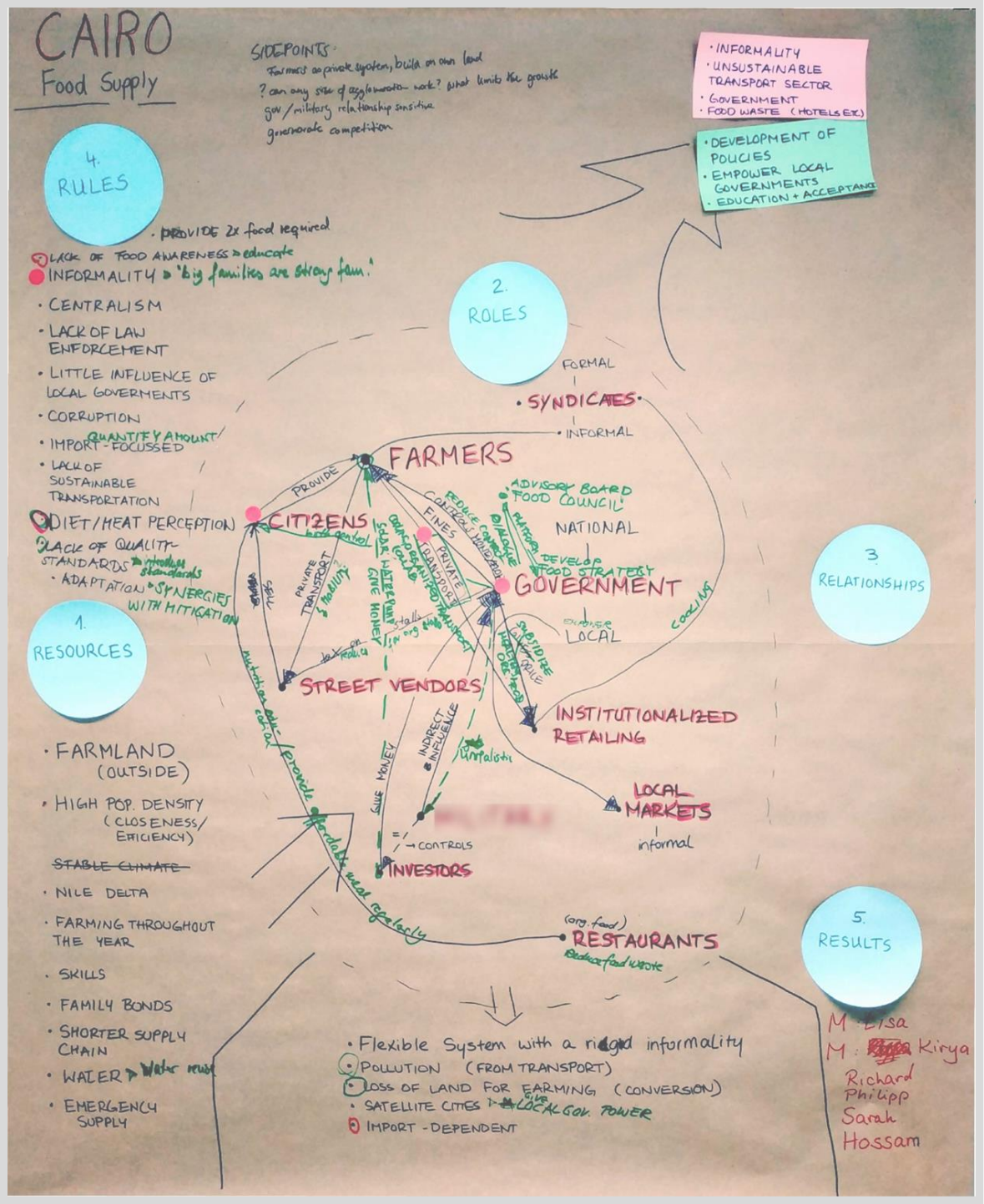


fig. 20: 5R model result of Cairo's food supply system in 2019 (black) and optimized in 2050 (green). (Alvarés, Harseim, Heinemann, Joseph, Nada, & Schuck; 2019)

4. "The Plans We Have for the 2°C Goal": Keynotes

4.1. Climate Planning in São Paulo by Laura Ceneviva

Considerations of Climate Action Planning (excerpted from the presentation, addition from author notes):

- Sao Paulo is actively involved in climate planning since 2003, the timeline shows a rich list of strategic and sectoral planning initiatives up until today
- However, a critical perspective reveals: Actions disregard climate change subject, they still follow only traditional sectorial practices; Stakeholders maintain old points of view; Anthropocentrism
- Sao Paulo always counted with the support of international organizations, such as e.g. Cepal, GEF, ICLEI, C40
- Transnational companies play an important role for local emissions but there is hardly any way of influencing them at the scale of local (and even national) governments
- Change needs reasoning transformation AND emotional attachment (what means moral and cultural values) – science, as well as traditional planning, is not enough, urban planners should consider organizing urban interventions which contribute to value changes (several examples for Sao Paulo, e.g. bike lane on Avenida Paulista, carnival in the streets)

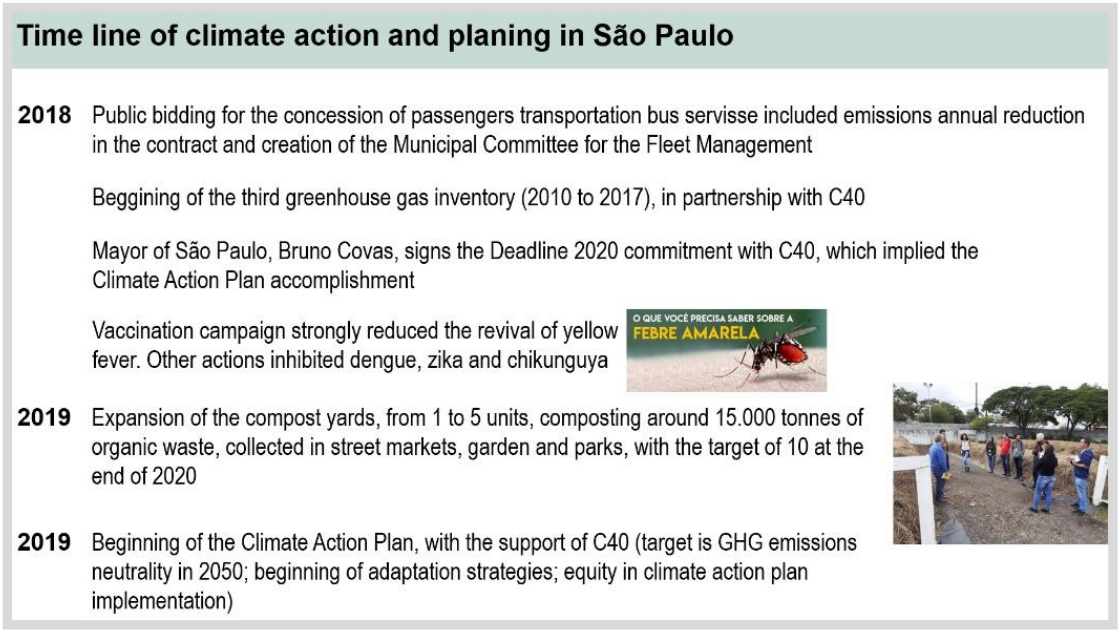


fig. 21: Climate change awareness is not the main driver of local climate action planning in São Paulo. (Ceneviva; 2019)

4.2. Climate Action Planning and Implementation in Hamburg by Solveig Schröder

Main points (derived from presentation):

- Tasks of a Hamburg climate action manager: implementing actions following a concept, communication & awareness building, initiating and coordinating projects, horizontal and vertical linking of projects & topics, applying for & administrating funding)
- What works well are the implementation of actions in urban planning, public administration as example, connecting existing projects & actors, creating awareness through personal experience & identity creation, connecting climate change with other topics, e. g. SDGs
- Financing: 65% per cent state funding of the position, small internal budgets for actions
- Status Quo problems: Climate change is one of many topics - management is often located in low hierarchical position; „Silo mentality" within public administration hampers cross-sectoral working; Complexity of climate change; Success of actions is very person dependent; awareness still low
- Improvements: High positioning of climate management & role of internal communication; establishing more agile and iterative working structures; piloting; allowing space (and funds) for experimenting; allowing for top-down and bottom-up development of climate protection management

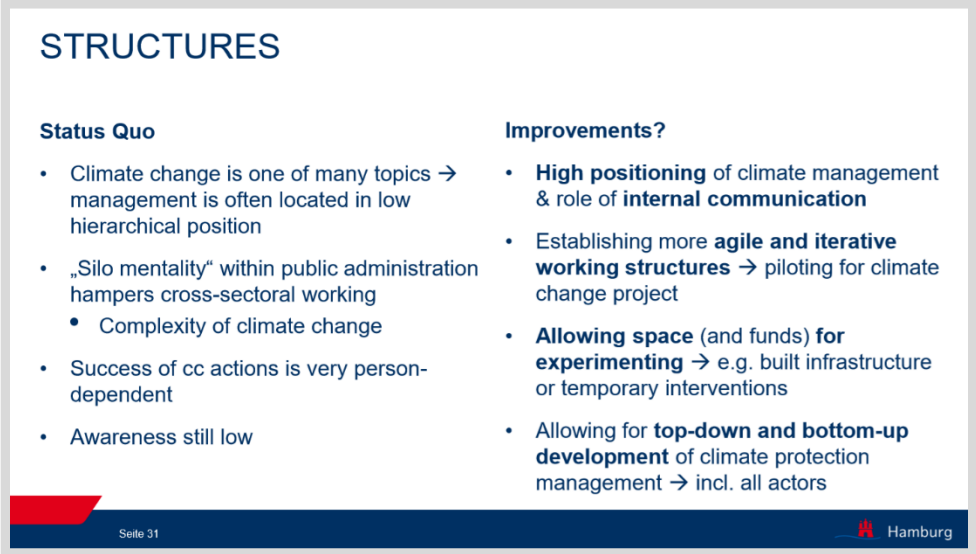


fig. 22: Suggested improvements in Hamburg's urban climate protection governance. (Schröder; 2019)

4.3. Climate Action Planning in Cairo by Prof. Dr. Heba Khalil

Points (excerpted from presentation):

- governmental efforts focus on adaptation to sea-level rise & threats to agriculture instead of mitigation (INDC)
- development strategies remain stuck at the national level, lacking implementation on the local level in CAP or by allocating funds
- improving QoL in informal settlement areas through research projects:
  - Urbinsight Projects, Cairo: using Urban Metabolism as a tool for better resource efficiency in Imbaba (informal) and Zamalek (mostly formal)
  - Project Improving Informal Areas and environmental Performance while reducing Urban Heat Island Phenomenon: measures suggested are, for example, wind corridors, façade, and rooftop greenery; pilot project proposals of shading and street vegetation; awareness-raising outcome: a toolkit
- Giza Climate Change Strategy (GCCS):
  - Recently developed by Cairo University & GIZ's Participatory Development Program
  - 7 focus areas: tourism, agriculture, health, industry, water resources and irrigation, water and sewage services, urban sector and infrastructure
  - Themed projects are in line with vulnerable sectors identified by the National Strategy for Climate Change Adaptation and Disaster Risk Reduction (2011)

fig. 23: Egyptian climate adaptation planning does not reach the urban level. (Khalil; 2019)

4.4. Reducing Urban GHG Footprints in New York and New Delhi by Dr. Peter-Paul Pichler

Conclusions (excerpted from presentation):

- Production and consumption-based emission accounting is complementary (see figure 23)
- For effective, integrated climate strategies, accounting for upstream emissions are:
  - Relevant: about the same amount as direct emissions
  - Doable: globally consistent (with caveats)
  - Useful: Many co-benefits and potential for local policies with global impact
- Cities can mitigate climate change mitigation beyond their limits
- Aside from New York and Delhi, Berlin and Mexico City were accounted for
  - Biggest emission causing sectors across all cities are housing, mobility, and food - all of which can be addressed through urban climate action planning
  - Consumption based emission total is larger than production based in the Global North cities and vice versa for the Global South cities
  - GHG footprint indicator combines direct household emissions (thermal, mobility) and indirect emissions from private consumption

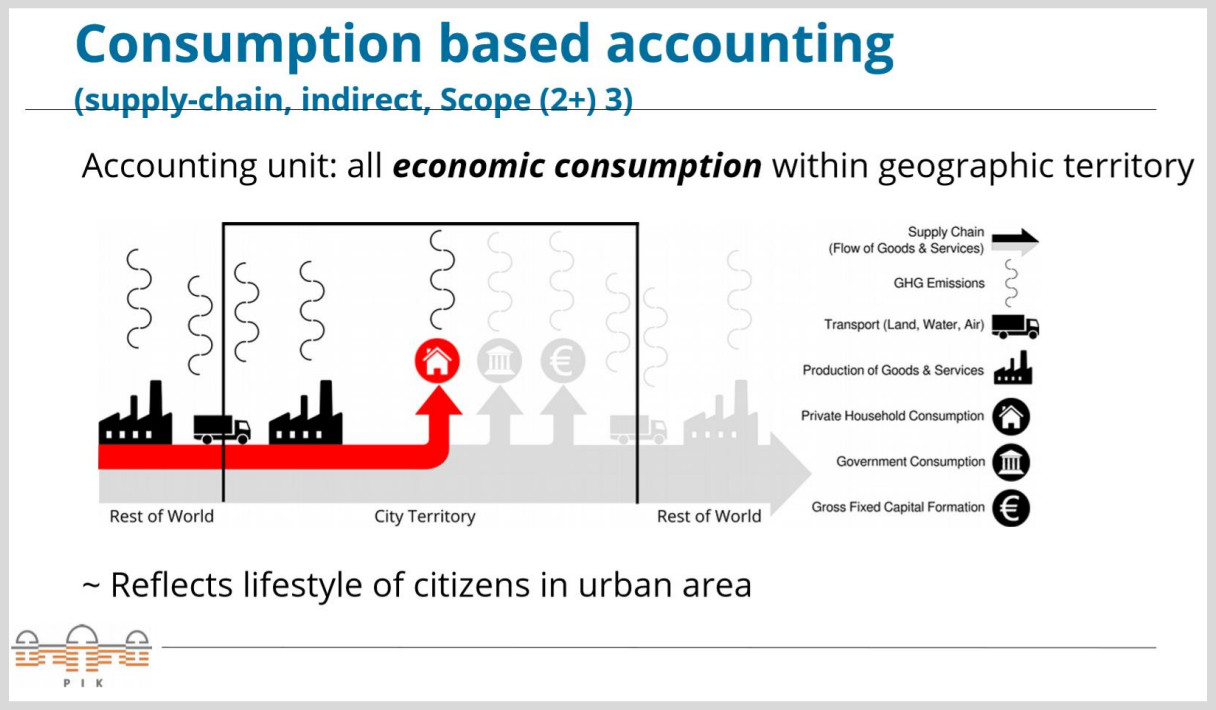


fig. 24: For a realistic impression of the GHG emissions caused by a city, both production- and consumption-based accounting should be applied. (Pichler; 2019)

5. Panel Discussion: "Can We Plan for Systemic Change?"

The esteemed panel consisted of **Prof. Dr. Anita Engels** | University of Hamburg, **Prof. Kristine Kern** | Leibniz Institute for Research on Society and Space, **Laura Ceneviva** | Head of Climate Commission São Paulo, **Carl Philipp Schuck** | GIZ, and **Dr.-Ing. Michael Bose** | em. HafenCity University. The panel moderated by **Dr. Cathrin Zengerling** discussed topics that furthered the learnings from the workshop and gave everyone the opportunity to not only reflect on them but also combine it with the experience of the panellists.

Can we actually plan for systemic changes? What is the role of strategic planning in reaching a transformative change in line with our current visions for 2050?

Regarding existing plans, cities already have various strategies and missions addressing both climate change issues and development, the important point would be the integration of these plans. There is also a need for interim goals in these strategic plans, so as to break them down and make them more realistic. The core importance in the process of planning was recognised in the communication process/dialogue, and in channelling the needs of those involved and understanding reality. However, since planning doesn't necessarily mean action, the focus was also laid on the need to create plans that can be implemented and support the process of implementation.
Some prerequisites that would help in ensuring better planning, should look to see whether the city in question has the mandate, capacity and the resources to implement what is planned.
While some cities might be more equipped than others, the need for political will to support change is a key component.

Challenges that have been faced up until now in promoting sustainable urban development led to the consideration of city-regions as the boundary of studies and action as opposed to just cities itself. The need for cooperation while deemed necessary is a challenge because cooperation amongst local/governmental bodies requires sharing, which leads to a loss of power that is far from what the traditionally centralised administrations are used to. There is also the disruption caused by the lack of planning that leaves cities unequipped to handle changes, causing them to react as opposed to taking proactive action. Disruption can also be used as a tool taking the example of global movement on Fridays for change and the critical mass pushing for bringing focus on making Hamburg a more bike-friendly city. With the need for change usually there is a reallocation of resources which leads to conflict but this conflict allows for supporting implementation processes, public protest activities that invoke political action. This point was highlighted by the comment stating that integrated planning didn't have to mean

harmonious planning. The need for planning to also cater for the unexpected while dealing with the realistic issue of planning for the average considering economic gaps in cities has also got to be taken into consideration.

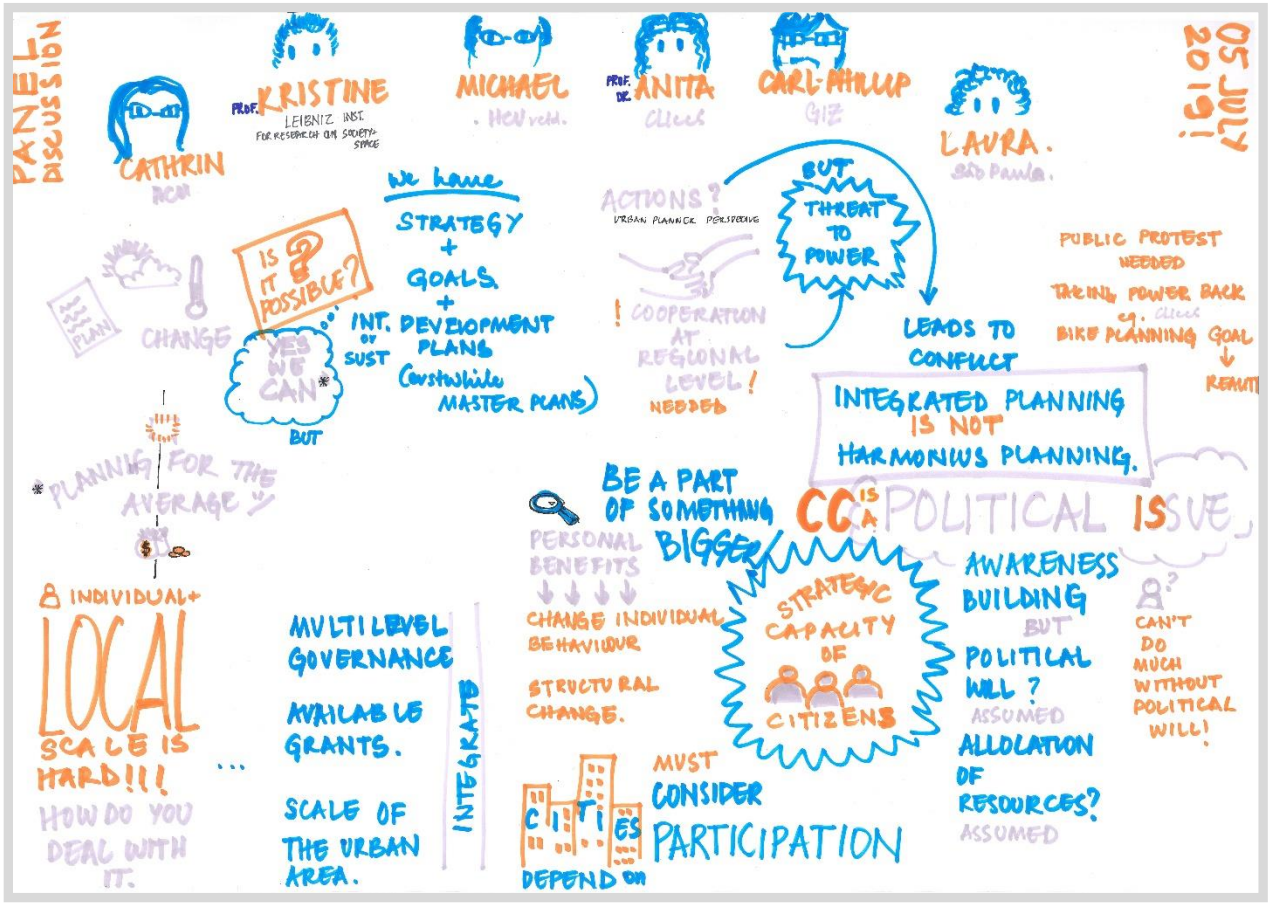


fig. 25: The graphic recording of the panel discussion (part 1) carves out key points of requirements for integrated systemic change on the urban level: regional cooperation, citizen participation and political will. (John; 2019)

What is your experience with the extent up to which you can integrate the individual's lifestyle (behavioural) with the planning infrastructure and services of a city (structural)?

Increased integration between departments and citizen perspective into the planning process would be vital to alleviate conflicts in administration and better inform the individual of the available resources respectively. The focus needs to be on structural change that can trigger a change in individual behaviour. Without the structural changes, depending on lifestyle change alone would be a risk to the

success of strategic plans. Participative planning is the best tool at the disposal of local authorities, supported by transparency and better communication, which helps in increasing the strategic capacity of the citizen, beyond protesting. Another key tool would be to run experiments on measures that would motivate behaviour change, ideally understand what the individual stands to benefit, which would further propagate change in lifestyle.

The realistic aspect of the symbolism behind citizens' movements and the emotions behind it were discussed as forms of motivation that need to be considered more during the planning process. Studying cities from the past that managed to combat issues, irrespective of whether it's in regard to reducing emissions or even more social or holistic aspects could help reflect on realistic approaches too. All of which further highlights the importance of the combined role of political will on the structural end and from the aware individual, their role in building political pressure.

Where do you see the role of private and multinational actors in the sustainable urban development of cities in the global north and south, and what could be the respective challenges?

While the private investor and their funds are deemed necessary, the need for a balance in power between them and the public authorities is even more so. The vulnerability of a governing body in the case that this balance is not maintained, is evident in the form of many traditionally administered cities. Also, the increasing role of private investors in laying the rules for what is considered sustainable, with them creating indices and carrying out assessments is something to be wary of, and that needs careful consideration.

While there are some existing tools in place to safeguard the interests of the people, there is the reality behind, the capability of private investment to come shrouded with their own agendas. It should also be easy to distinguish between investments that were politically motivated as opposed to those that aren't, both of which would make for urban footprints that should be interesting to study and create a potential for future consideration of investments. In conclusion, foreign or private capital does not need to be dismissed, but carefully considered for its pros and cons, especially with relatively vulnerable governance settings.

(written by Nikita John)

fig. 26: The graphic recording of the panel discussion (part 2) highlights the role of individuals in building political will and the importance of private stakeholder collaboration & control. (John; 2019)

6. Outlook: Main Takeaways of the Workshop

The cases of New Delhi, São Paulo, Lagos, Cairo, and Hamburg demonstrated vividly that accountability is very context-specific and takes on many forms. Principal and agent can be tied together in power relationships ranging from strong local scope of action (e. g. Hamburg, São Paulo) to completely centralized steering under national government (e.g. Delhi, Cairo).

Assessment and transparency are paid tribute through monitoring frameworks using different methodologies, often supported through or initiated by (one-time interventions of) external, non-municipal players. Private and informal data is notoriously difficult to obtain and incorporate in transparent accounting. Transparency appears to reflect the strength of the current state of democracy in each country.

Moreover, if a GHG inventory exists at all (e.g. in São Paulo, New York) it has been created using production-based calculation factors and, thereby, disregards upstream material associated emissions outside the urban boundaries. Consumption-based accounting should complement urban inventories. It is practised by Hamburg and aspired by New York, as stated in the OneNYC 2050 plan.

These accounting methods are primarily based on available statistical data (e.g. household expenditure surveys and input-output tables). One is fairly straightforward and based on an existing input-output model (e. g. method presented by Peter-Paul Pichler), another uses the statistical data to parametrize a more complex microsimulation model (e.g. method presented by Esteban Muñoz for UN Environment) - both can be realized globally but do require an investment of municipal capacity and funds.

However, this dedication depends on a significant amount of political will which is created by pressure put on them by the interested, informed, motivated, and engaged public. Since awareness levels inside the governmental apparatus and in the general public are relatively low across all studied cities, it is difficult to build momentum for systemic change.

The essential role of the citizens lies not only in the cumulative impact of lifestyle or behaviour changes but also in their contribution via the participation pillar. Via both tracks they need to support and claim the change of existing urban infrastructure and systems of service provision.

Cooperation of public government with actors of the private and informal sector can significantly spur feasible climate action planning. However, the influence of foreign or private investment needs to be carefully considered for its pros and cons, especially with relatively vulnerable governance settings. Additionally, history of the country, the governmental system and special local

conditions need to be well understood (e.g. centralization in Egypt, engagement in memberships of São Paulo, young democracy of Nigeria) when identifying the potentials for increased climate action.

The Urban Footprints Project was set on track for further research in New Delhi, São Paulo, Lagos, Cairo, and Hamburg. It will expand its efforts to the remaining case studies of the cities of New York, Toronto, and Shenzhen and dedicate itself to comprehensive disclosure and understanding of the various forms of the existing and potential accountable governance mechanisms. Based on the findings, it will suggest enhanced accountability mechanisms using the full range of modes of governance available to the respective cities.

Sensitized to the difficulties and intricacies of climate governance, the Urban Footprints Project will proceed with legal analysis and a social science approach to explore the interrelations of people, politics and urban systems within the particular legal frameworks. This will be combined with accounting methods and flow modelling in order to contrast the need for climate action with the city's progress on a development pathway compatible with the < 2° goal to limit global warming and the safe space of planetary boundaries.

(written by Lisa Harseim)

VI Appendix

Agenda:

July 4th:	Envisioning Systemic Change in Cities	
09:00	Arrival	
09:30	Welcome & Introduction	Cathrin Zengerling, Lisa Harseim & Nikita John
	"I Have A Dream… - The 2°C Goal"	Keynotes on Lifestyle & Planning Perspectives
10:00	My Vision for Urban Infrastructures in 2050 Hamburg	**Christian Maaß** | former State Secretary for Urban Development and Environment in Hamburg, co-founder Hamburg Institute
10:20	My 2 tonne Day in 2050 Recife	**Dr. Esteban Muñoz** | UN Environment, Cities Unit
10:40	Tea and Coffee Break	
11:00	This is Lagos. Sustainable Development in the Age of the Megacity	**Chima Akukwe, Charles Nnanna, Maria Moleiro Dale, Jonathan Young** | REAP HafenCity University Hamburg
11:20	My Vision for Infrastructure Integrated Development in the Delhi Region	**Dr. Manisha Jain** | Leibniz Institute of Ecological Urban and Regional Development
12:00	Lunch	
13:00	Introduction to Workshop Sessions	Cathrin Zengerling & Team
	"5 R Modelling"	Parallel Workshop Sessions
13:30		Sessions on Hamburg, São Paulo, Delhi, Lagos and Cairo
15:45	Tea and Coffee Break	
16:15		Sharing Results of the Workshop Sessions
17:15	Closing	
17:30	Meet the Participants	

July 5th:	Transition Processes in Cities	
09:00	Introduction & Recapitulation	Cathrin Zengerling & Team
	"The Plans We Have for the 2°C Goal"	**Keynotes on Current Climate Action Planning in Cities**
09:30	Climate Planning in São Paulo	**Laura Ceneviva** | Head of Climate Commission São Paulo
10:00	Climate Action Planning and Implementation in Hamburg - The Case of Hamburg Bergedorf	**Solveig Schröder** | Climate Manager, District Hamburg Bergedorf
10:30	Tea and Coffee Break	
10:45	Climate Action Planning in Cairo	**Prof. Heba Khalil** | Cairo University
11:15	Reducing Urban GHG Footprints in New York and Delhi NCT	**Dr. Peter-Paul Pichler** | Potsdam-Institute for Climate Impact Research
11:45	Tea and Coffee Break	
	"Can We Plan for Systemic Change?"	**Panel Discussion**
12:00	Challenges & Opportunities in Urban Lifestyles and Infrastructures	Panellists: **Prof. Dr. Anita Engels** | University of Hamburg, **Prof. Kristine Kern** | Leibniz Institute for Research on Society and Space, **Laura Ceneviva** | Head of Climate Commission São Paulo, **Carl Philipp Schuck** | GIZ, **Dr. Ing. Michael Bose** | em. HafenCity University
13:00	Closing	
13:30	Lunch and Networking	
16:00	HafenCity Tour	HafenCity GmbH | Climate and Material Sensitive Planning at HafenCity Hamburg

List of Participants:

#	Title	First Name	Last Name	Role	Organization
1		Ana	Strastil	Participant	HafenCity University
2		Andréa	Lopes	Volunteer	HafenCity University, REPAiR Program
3		Andreas	Obersteg	Participant	HafenCity University, REPAiR Program
4		Animesh	Behera	Participant	HafenCity University, REAP
5	Prof. Dr.	Anita	Engels	Panelist	Hamburg University, Prof. for Sociology, esp. Globalization, Environment and Society
6		Bhoomika	Bais	Participant	HafenCity University, REAP
7		Camila	Camara	Organiser	HafenCity University, REAP
8		Carl Phillip	Schuck	Panelist	GIZ (German Corporation for International Cooperation)
9	Dr.	Cathrin	Zengerling	Organiser	HafenCity University, Urban Footprints Project
10		Charles	Nnanna	Speaker	HafenCity University, REAP
11		Chima	Akukwe	Speaker	HafenCity University, REAP
12		Christian	Maaß	Speaker	Hamburg Institute
13		Diego	Robles	Volunteer	HafenCity University, REAP
14	Dr.	Esteban	Muñoz	Speaker	UN Environment, Cities Unit
15	Prof. Dr.	Heba Allah	Khalil	Speaker (virt.)	Cairo University
16		Hossam	Nada	Participant	HafenCity University, REAP
17		Jochen	Menzel	Participant	Zukunftsrat Hamburg
18		Jonas	Fischer	Participant	HafenCity University, Phd. Cand.
19		Jonathan	Young	Speaker	HafenCity University, REAP
20		Julia	Sievert	Participant	HafenCity University, City Science Lab
21		Juliana Braga	Webel de Lima	Volunteer	HafenCity University, REAP
22		Katja	Lamich	Participant	Climate Service Center Germany, GERICS
23	Dr.	Katja	Wolframm	Participant	The Green Party, Hamburg Kreativ Gesellschaft
24		Kirya	Heinemann	Organiser	HafenCity University, REAP
25	Prof. Dr.	Kristine	Kern	Panelist	IRS Leibniz Institute for Research on Society and Space, Institutional Change and Regional Public Goods
26		Laura	Ceneviva	Speaker/Panelist	Executive Secretary, Municipal Climate Change Committee, São Paulo
27		Lisa	Harseim	Organiser	HafenCity University, Urban Footprints Project, Phd. Cand.
28		Luiza	Aringueri	Volunteer	HafenCity University, REAP
29	Dr.	Manisha	Jain	Speaker	Leibniz Institute of Ecological Urban and Regional Development
30		Maria Alejandra	Moleiro Dale	Speaker	HafenCity University, REAP
31		Marina	Brink	Participant	HafenCity University, Media department
32	Prof. Dr.	Martin	Wickel	Participant	HafenCity University
33	Dr.-Ing.	Michael	Bose	Participant	em. HafenCity University, head of the department of Regional Development and Regional Planning

34	Dr.	Nico	Caltabiano	Participant	Max Planck Institute for Meteorology
35		Nikita	John	Organiser	HafenCity University, Urban Footprints Project, Phd. Cand.
36	Dr.	Peter-Paul	Pichler	Speaker	PIK (Potsdam Institute for Climate Impact Research)
37		Philipp	Preuner	Participant	HafenCity GmbH
38		Richard	Alves	Volunteer	HafenCity University, REAP
39		Sarah	Joseph	Speaker	Kühne Logistics University
40		Shittu	Othniel	Participant	HafenCity University, REAP
41		Solveig	Schröder	Speaker	Climate Manager, District Hamburg Bergedorf
42		Sonja	Ewald	Participant	Zukunftsrat Hamburg
43		Sonja	Schlipf	Participant	HafenCity University, Phd. Cand.
44	Dr.	Stefanie	Wodrig	Participant	Senate Chancellery of the City of Hamburg
45		Thomas	Fraser	Participant	Siemens Gamesa Renewable Energy
46		Thomas	Hagedorn	Participant	HafenCity University, Research Associate

VII Works Cited

Bache, I., Bartle, I., Flinders, M., & Marsden, G. (2015). *Blame games and climate change: Accountability, multi-level governance and carbon management*. The British Journal of Politics & International Relations. (17 (1), 64-88. Https://doi.org/10.1111/1467-856X.12040.

Akukwe, C., Nnanna, C., Moleiro Dale, M. A., & Young, J. (2019, July 4th). *This is Lagos: Sustainable Development in the Age of the Megacity*. Presented at the UFP kick-off workshop in Hongkong Studios, Hamburg [pdf, on file with the author]

Ceneviva, L. (2019, July 4th). *Climate Planning in São Paulo*. Presented at the UFP kick-off workshop in Hongkong Studios, Hamburg [pptx, on file with the author]

Presentation Khalil, H. (2019, July 4th). *Climate Action Planning in Cairo*. Presented at the UFP kick-off workshop in Hongkong Studios, Hamburg [pdf, on file with the author]

Presentation Maaß, C. (2019, July 4th). *My Vision for Urban Infrastructures in 2050 Hamburg*. Presented at the UFP kick-off workshop in Hongkong Studios, Hamburg [pdf, on file with the author]

Presentation Muñoz, E. (2019, July 4th). *My 2 tonne Day in 2050 Recife*. Presented at the UFP kick-off workshop in Hongkong Studios, Hamburg [pdf, on file with the author]

Presentation Pichler, P.-P. (2019, July 4th). *Reducing Urban GHG Footprints in New York and Delhi NCT*. Presented at the UFP kick-off workshop in Hongkong Studios, Hamburg [pdf, on file with the author]

Presentation Schröder, S. (2019, July 4th). *Climate Action Planning and Implementation in Hamburg: The Case of Hamburg Bergedorf*. [pdf, on file with the author]

Sternman, J. (2013). *Introduction to System Dynamics*. Available at: https://ocw.mit.edu/courses/sloan-school-of-management/15-871-introduction-to-system-dynamics-fall-2013/instructor-insights/

UN DESA (2018). *World urbanization prospects: The 2014 revision*. Available at: https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf

USAID (2014). *Local Systems: A Framework for Supporting Sustained Development*. Washington. Washington DC. Available at:

https://www.usaid.gov/sites/default/files/documents/1870/LocalSystemsFramework.pdf

USAID (2016). *The 5Rs Framework in the Program Cycle*. Washington DC, pp.1-20. Available at: https://usaidlearninglab.org/sites/default/files/resource/files/5rs_techncial_note_ver_2_1_final.pdf

Zengerling, C. (2018). *Action on climate change mitigation in German and Chinese cities: A search for emerging patterns of accountability*. Habitat International. 75, 147-153. https://doi.org/10.1016/j.habitantint.2018.03.008

C. Zengerling (2019). Governing the City of Flows – A Plea for Greater Accountability in Strategic Planning and Implementation. Urban Planning, 4/1, 187-199. Open access: https://www.cogitatiopress.com/urbanplanning/article/view/1750