

Energy [R]evolution – Advancing to Megacities

Sonja Simon,

Department Systems Analysis and Technology Assessment

Institute of Engineering Thermodynamics

German Aerospace Center (DLR)



Knowledge for Tomorrow



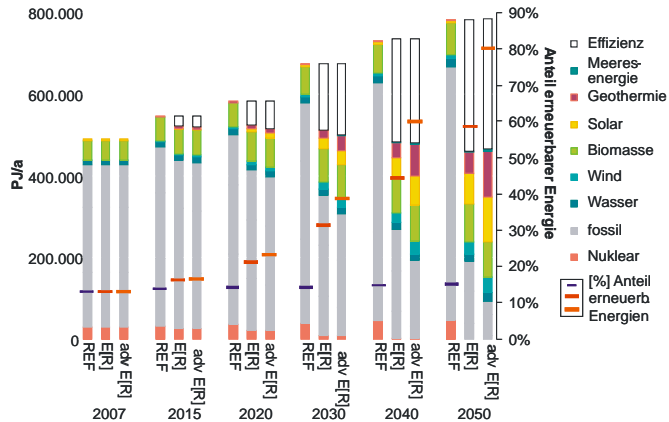
Overview

- **Introduction of DLR energy research**
- **Background and experience: DLR in the Energy [R]evolution project series**
- **Workshop questions:**
 - How fast are cities changing and what are the drivers?
 - What are the main barriers that prevent megacities from being sustainable from the energy perspective?

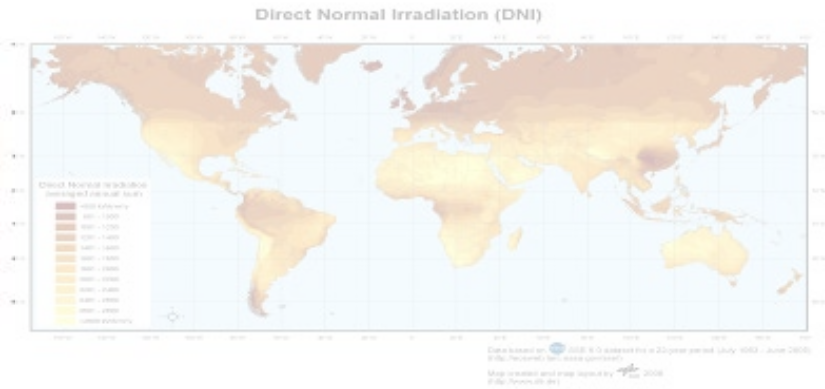


Department of Systems Analysis and Technology assessment of the German Aerospace Center

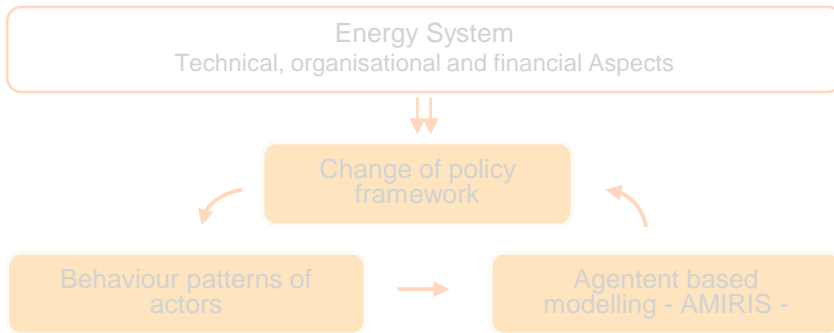
Energy System Modelling and Scenarios



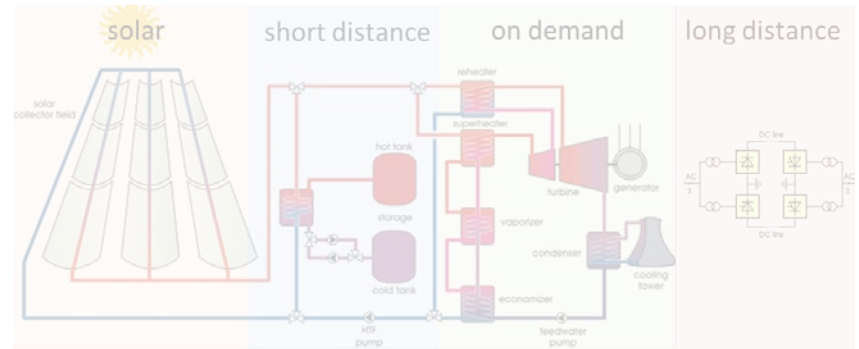
Resources and Potentials



Funding Instruments and Energy Economics



Market Strategies for CSP



27 Scientists including 5 PhD Students

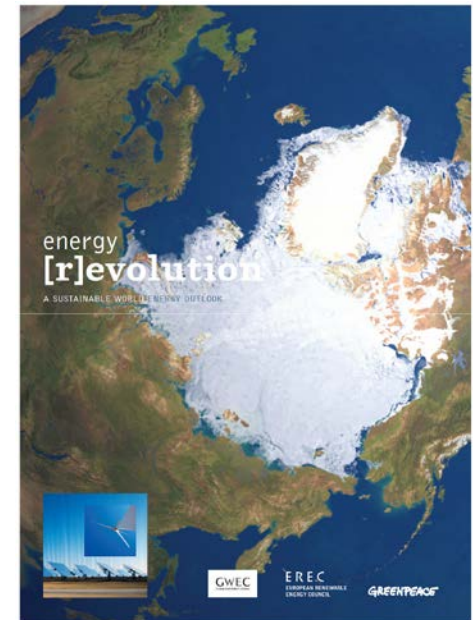


Background and experience

Projects

- **On global level:** Greenpeace **Energy [R]evolution – a sustainable world energy outlook** (long lasting project series since 2006)
- **On national level:** Greenpeace **Energy [R]evolution** series: a sustainable Chile Energy outlook (2009), a sustainable Brazil Energy outlook (2013), and multiple comparable projects (>40 countries) (see <http://www.energyblueprint.info/>)
- **On regional level:** for the Metropolitan Region of Santiago de Chile: **Risk Habitat Megacity** (- 2010)

GREENPEACE

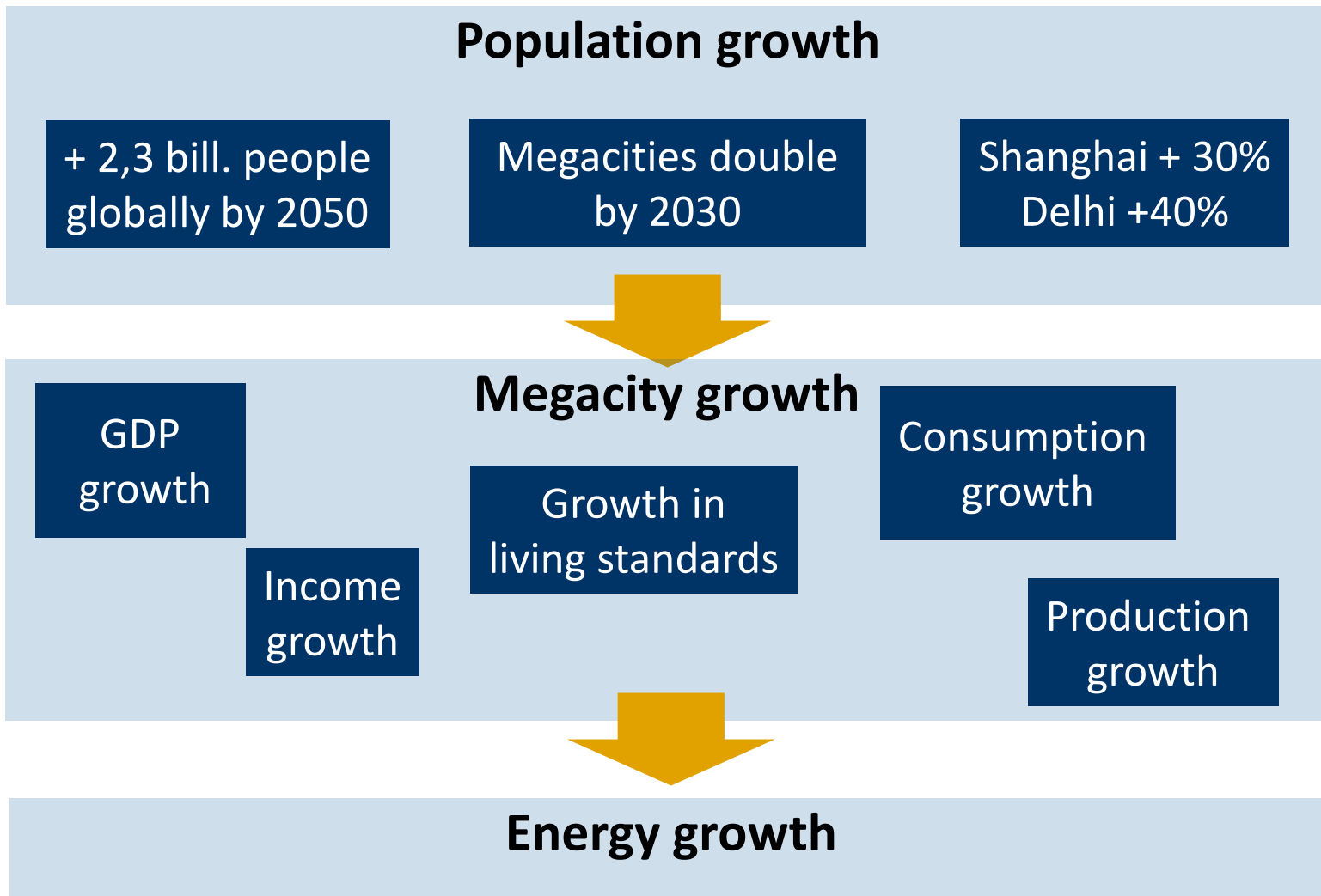


Questions addressed by the workshop

- How fast are cities changing and what are the drivers?
- What are the main barriers that prevent megacities from being sustainable from the energy perspective?

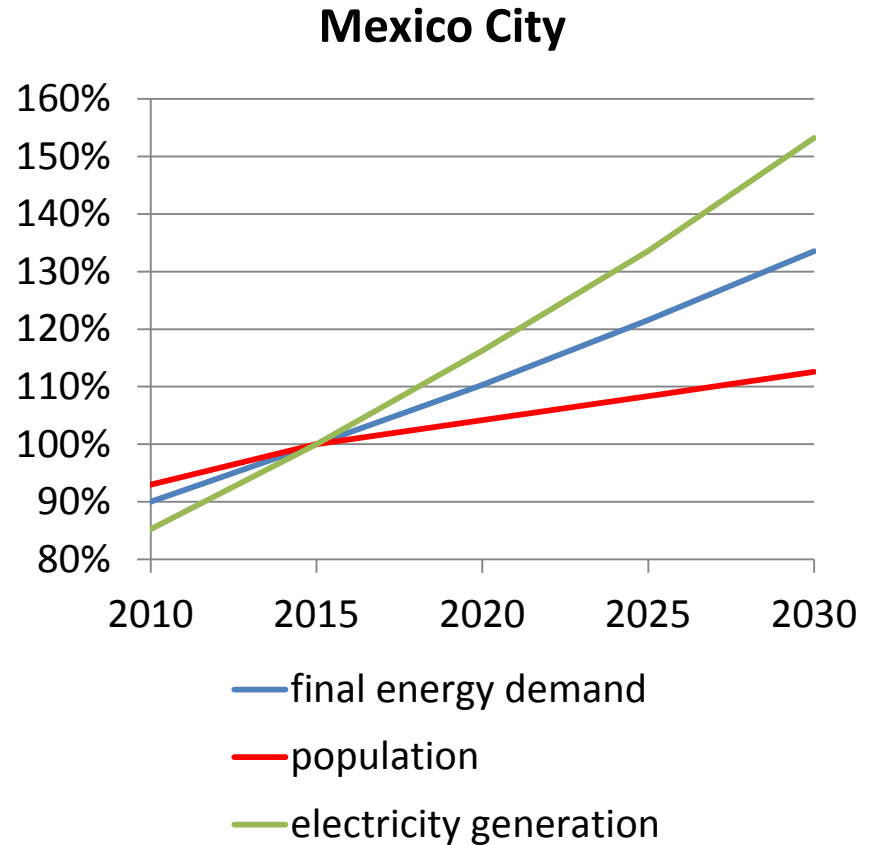


How fast are cities changing and what are the drivers?



Example of Mexico City: Projection of energy demand

- 12% population growth by 2030
- BAU scenario , according to WEO (IEA 2012)



Which are the main barriers regarding a sustainable energy development in the megacity?

Sustainability deficits

- urban areas are responsible for roughly 67% of the world's energy demand, increasing to 73% by 2030
- Cities are responsible for 80% of the world's greenhouse gases

In Mexico City today:

- energy use in building accounts for 45% of the carbon footprint
- 85% of the electricity comes from fossil fuels and 90% is delivered from outside the city
- And the transport sector with its large share of privately owned cars is responsible for 35% of the carbon footprint



Megacities as spaces of risks but also opportunities

Risks

- growth in energy consumption outpaces the capacity of the energy supply system in place with effects on energy security
- due to their rapid growth, large cities often fail to satisfy the basic needs of the poor population;
however equal access to energy services will also result in an even faster increasing energy demand
- Without transition towards a more sustainable energy pathway, progress towards more equal society will increase the sustainability deficits regarding energy and CO₂ emissions



Megacities as spaces of risks but also opportunities

Opportunities: key role in emission mitigation due to high energy density

- New housing development provides chances for buildings with higher energy efficiency (insulation and efficient cooling) and integrated RE
- Opportunities for efficient combined heat and power production
- Smaller grid losses
- Highly efficient public transport systems (e.g. BRT)
- Megacities can provide the financial power to trigger investment in renewable energy sources



Megacities as spaces of risks but also opportunities

But these opportunities are also challenges:

- Surveys of carbon foot prints show, that these opportunities are not yet available for many megacities:
- Example: although per capita income in Mexico City is just on fourth of London, London's carbon footprint is 40% lower than in Mexico City.



Main barriers for megacities for a more sustainable energy system

- New settlements develop fast and cheap, before new efficiency measures can be implemented
- cost barriers: efficiency measures and renewable energies require higher investments and are profitable only in the long run
- renewable energy sources require stable political conditions, but administrative responsibility is often not clearly assigned or commitment is not clear
- Conditions and opportunities of a renewable energy supply system are not yet common knowledge
 - demand side management for the integration of fluctuating renewables
 - feasibility of flexible, on-demand power options via concentrated solar power



Main barriers for megacities for a more sustainable energy system

- Renewable sources in the hinterland are not in the immediate focus of local administration or local consumer (and decision is not in their hands as well)
- for emission free traffic: Electric vehicles, which would be a perfect match for megacities are still too expensive and have a too small market share to develop at faster learning rates on their own.



Renewable energies and efficiency are „up-front“ expensive but rewarding in the long run; therefore they need a stable longterm political framework



Renewable energies and efficiency are „up-front“ expensive but rewarding in the long run

Encouraging example of PV in Germany

- EEG triggered around 20GW PV in Germany during the last 4 years
- Currently every German consumer is paying 6 ct/kWh due to feed-in-tariffs
- But this triggered a 50% drop in investment cost from 2.6 k€ in 2010 to 1.3 k€ in 2013 → all over the world



Thank you for your attention!

