

ADDRESSING RISING ENERGY NEEDS OF MEGACITIES – CASE STUDY OF GREATER CAIRO –

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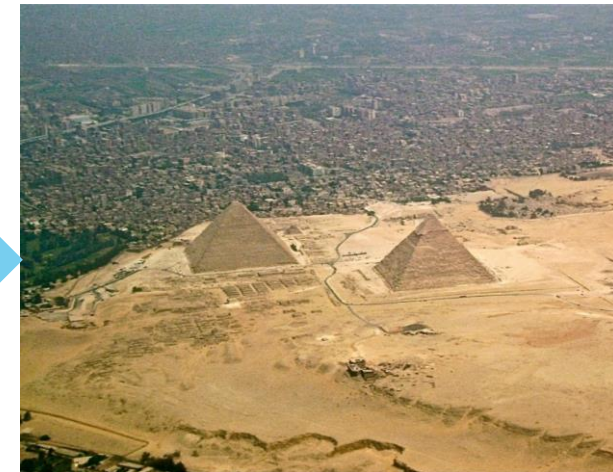
Megacities and energy consumption

- cities consume up to **75% of global primary energy**
=> substantial challenges for decarbonization
- literature does not address the **role of megacities** for global energy transition
(urban agglomerations > 10 million inhabitants)
- megacities mainly in developing countries need to **ensure modern & clean energy** to citizens while coping with lifestyle changes

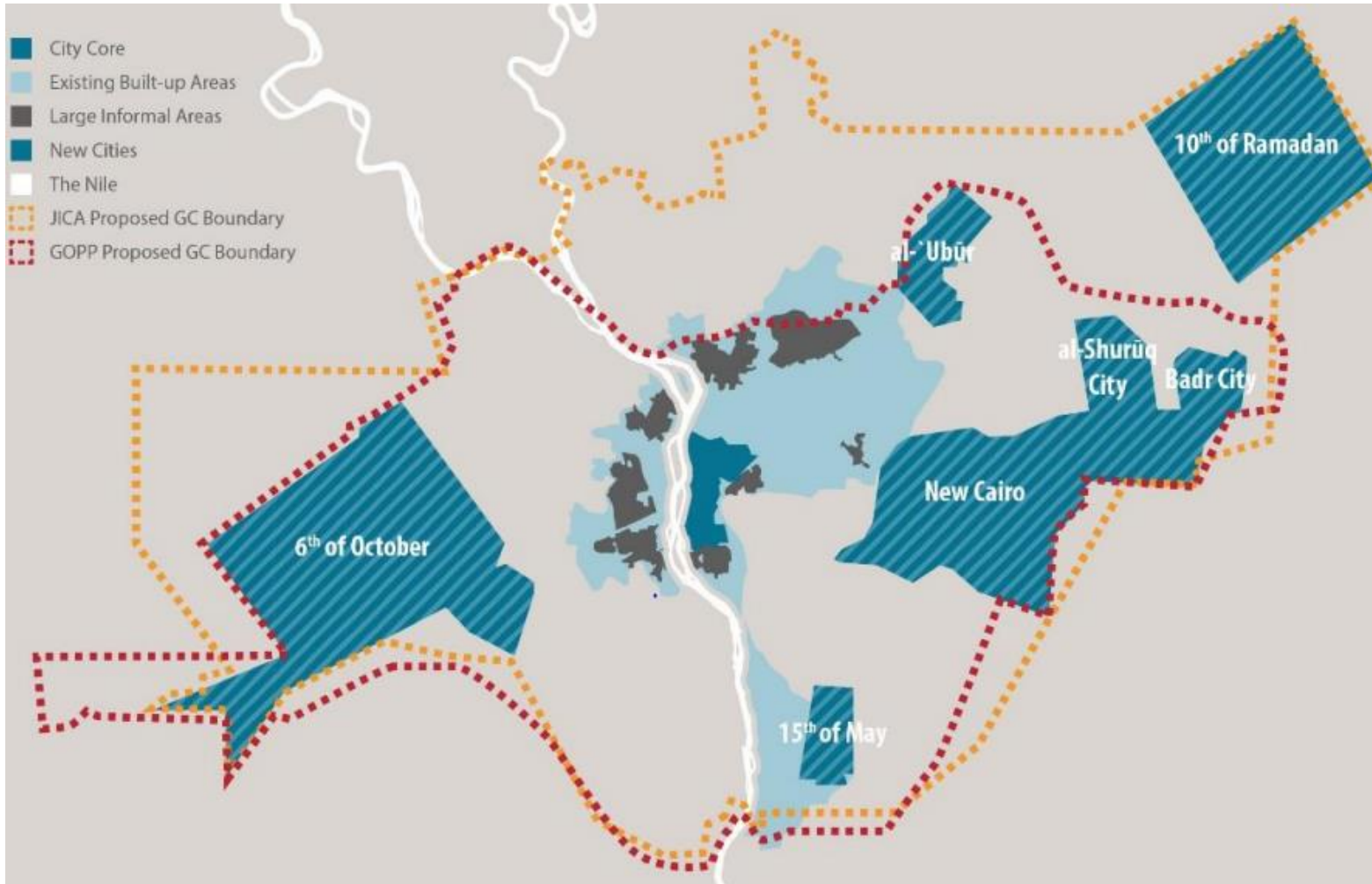


Greater Cairo megacity as case study

- assess different pathways for energy transition of megacities
- impacts of lowering % inhabitants in informal settlements

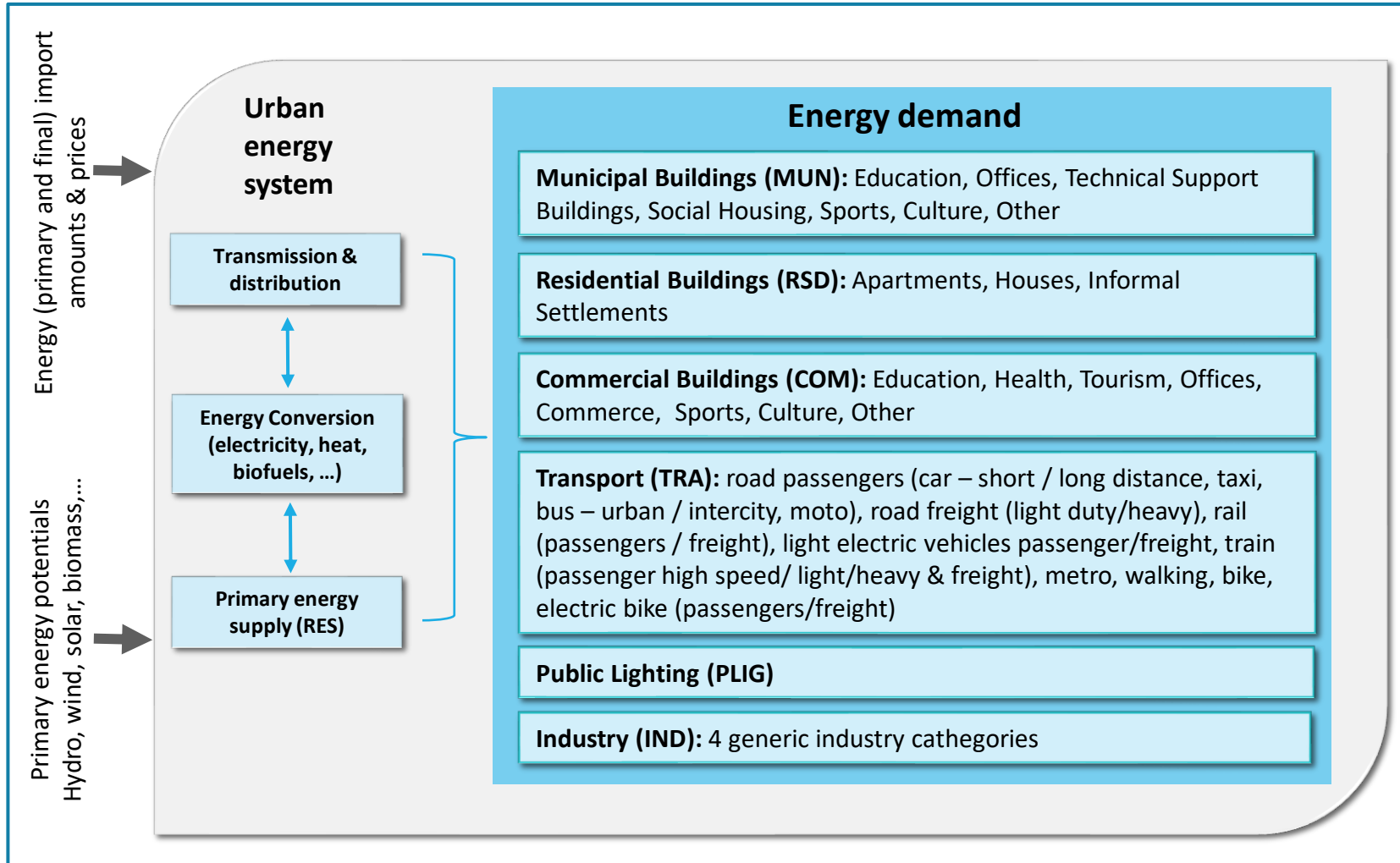


Greater Cairo Megacity

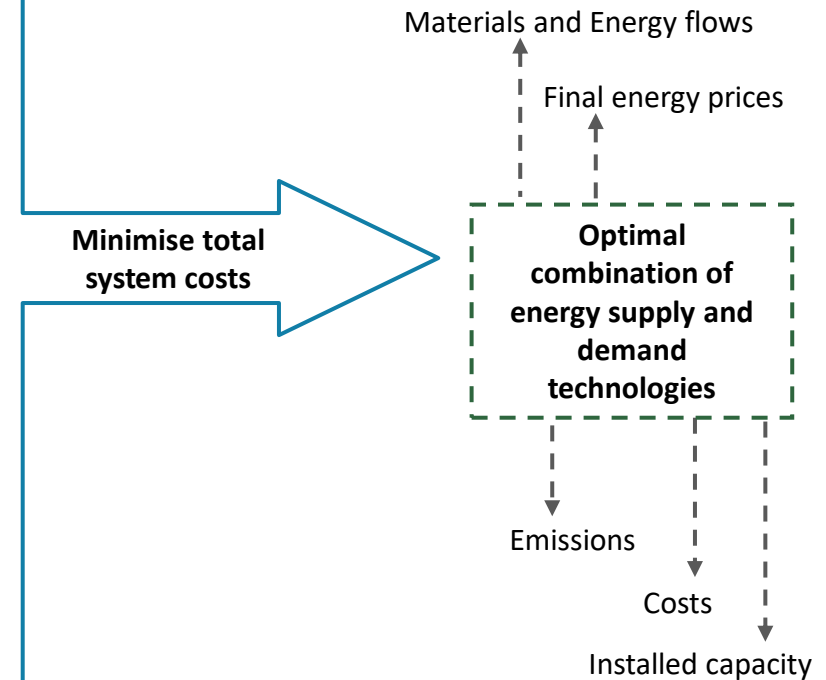


- 12th biggest megacity, **21 million inhabitants**, ongoing expansion to several satellite cities; **54% inhabitants in informal settlements**
- 3 governorates Cairo, Giza and Qalyubeya; **22% of Egypt population & 43% urban population**
- informal settlements' inhabitants are being relocated to outskirts with **improved access to energy and a higher transport demand**

Times Greater Cairo Structure



3 governorates
Cairo, Giza and Qalyubeya
 modelled separately per
 different **sectors** and
technologies



Overview of the TIMES-GC model structure (adapted from <https://doi.org/https://doi.org/10.1016/j.enpol.2008.06.004>)

Data Collection

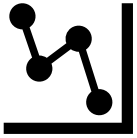


CAPMAS

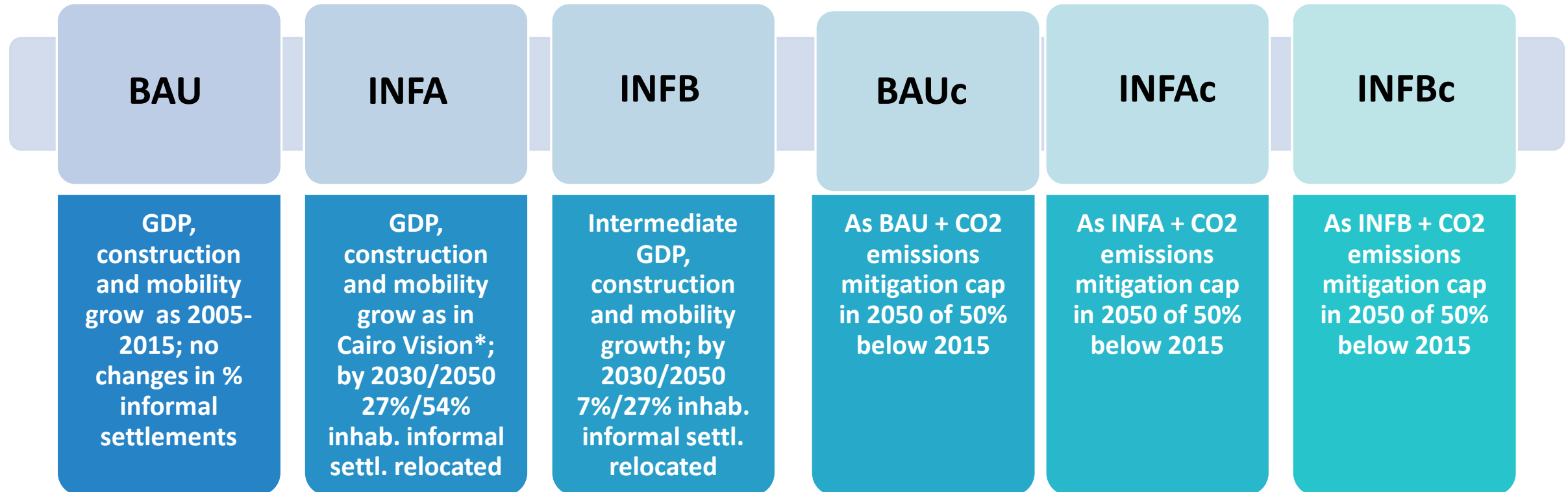


**STATISTICS
YEARBOOK2015
CENSUS 2006**

**INTERNATIONAL
ENERGY AGENCY**

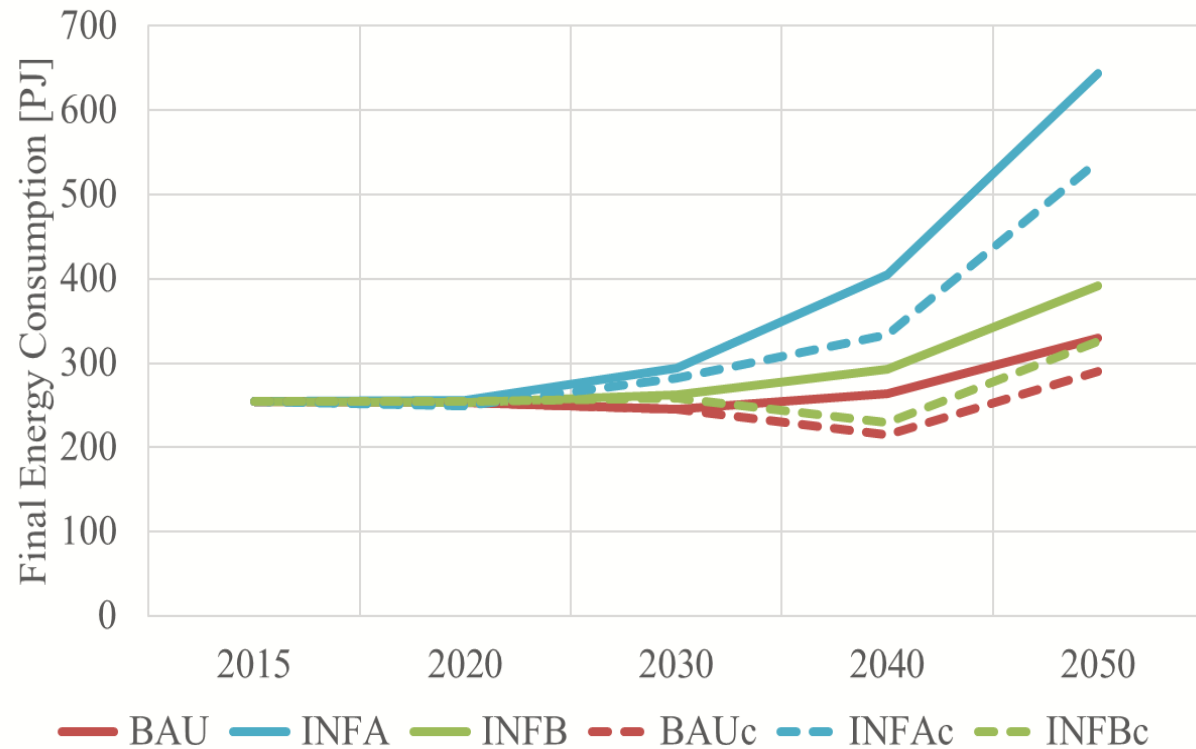


Six modelled socio-economic & CO₂ mitigation scenarios



* General Organization of Physical Planning, *Cairo future vision 2050: within a national vision of Egypt*, vol. 18. 2010. Available at: http://mirror.unhabitat.org/downloads/docs/8635_42944_AymanEl-hefnawi.pdf

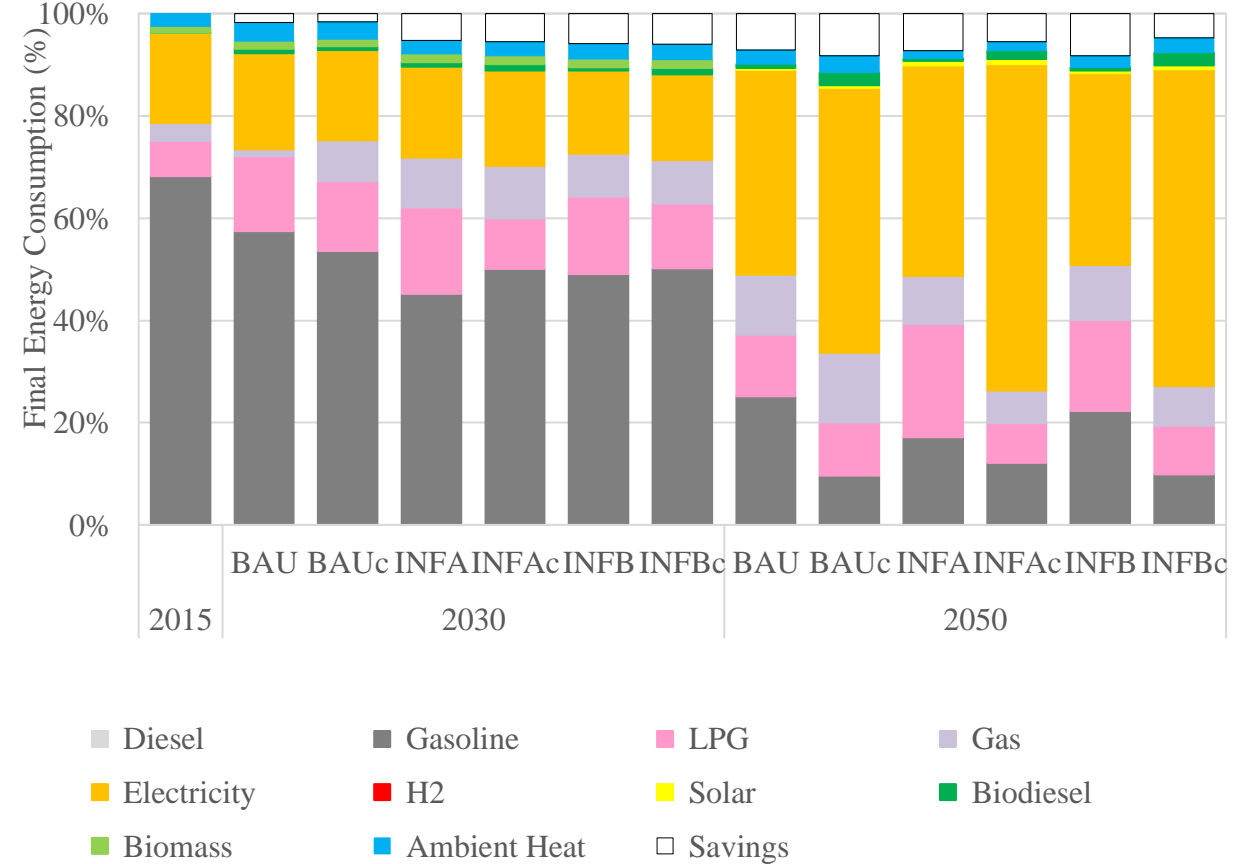
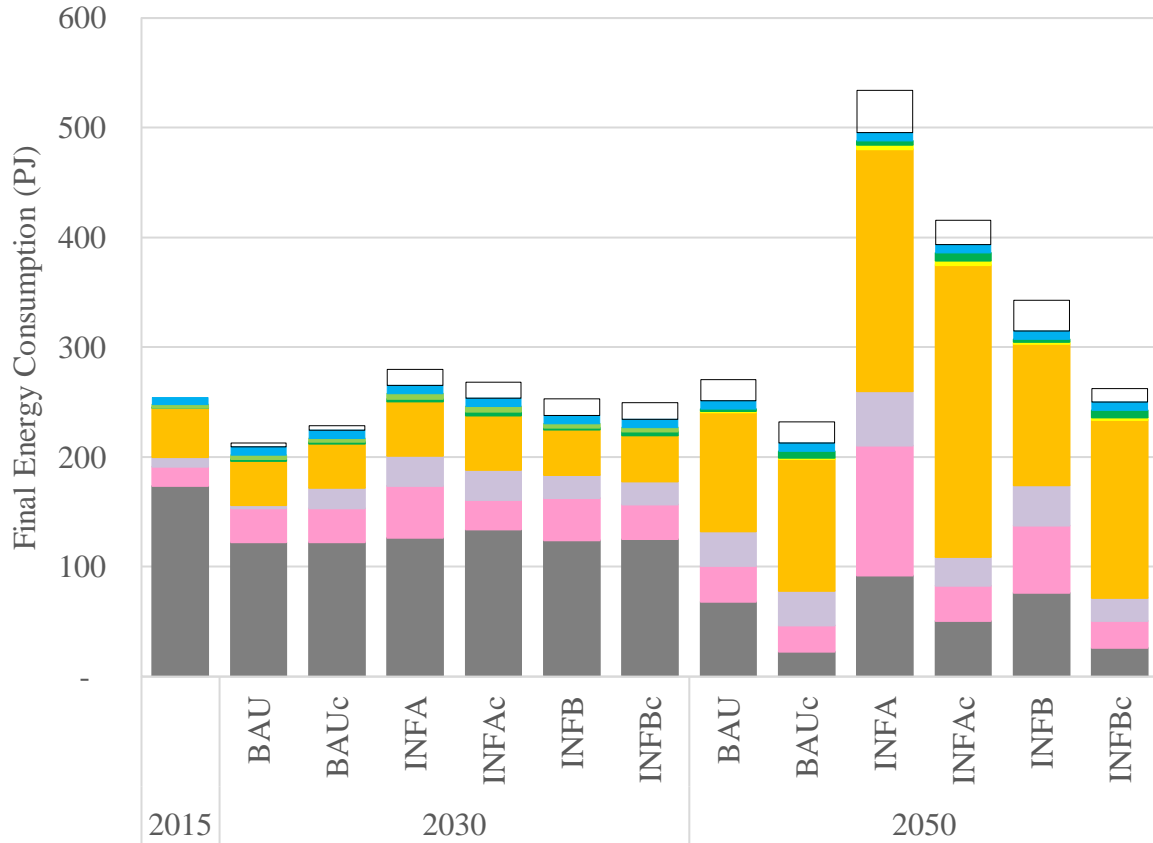
Final Energy Consumption



Scenarios	Energy per capita (GJ/inhabitants)			% difference from 2015	
	2015	2030	2050	2030	2050
BAU	11.57	8.32	7.52	-28%	-35%
BAUc		8.20	6.64	-29%	-43%
INFA		9.96	14.68	-14%	27%
INFAc		9.55	12.31	-17%	6%
INFB		8.87	8.94	-23%	-22%
INFBc		8.75	7.43	-24%	-36%

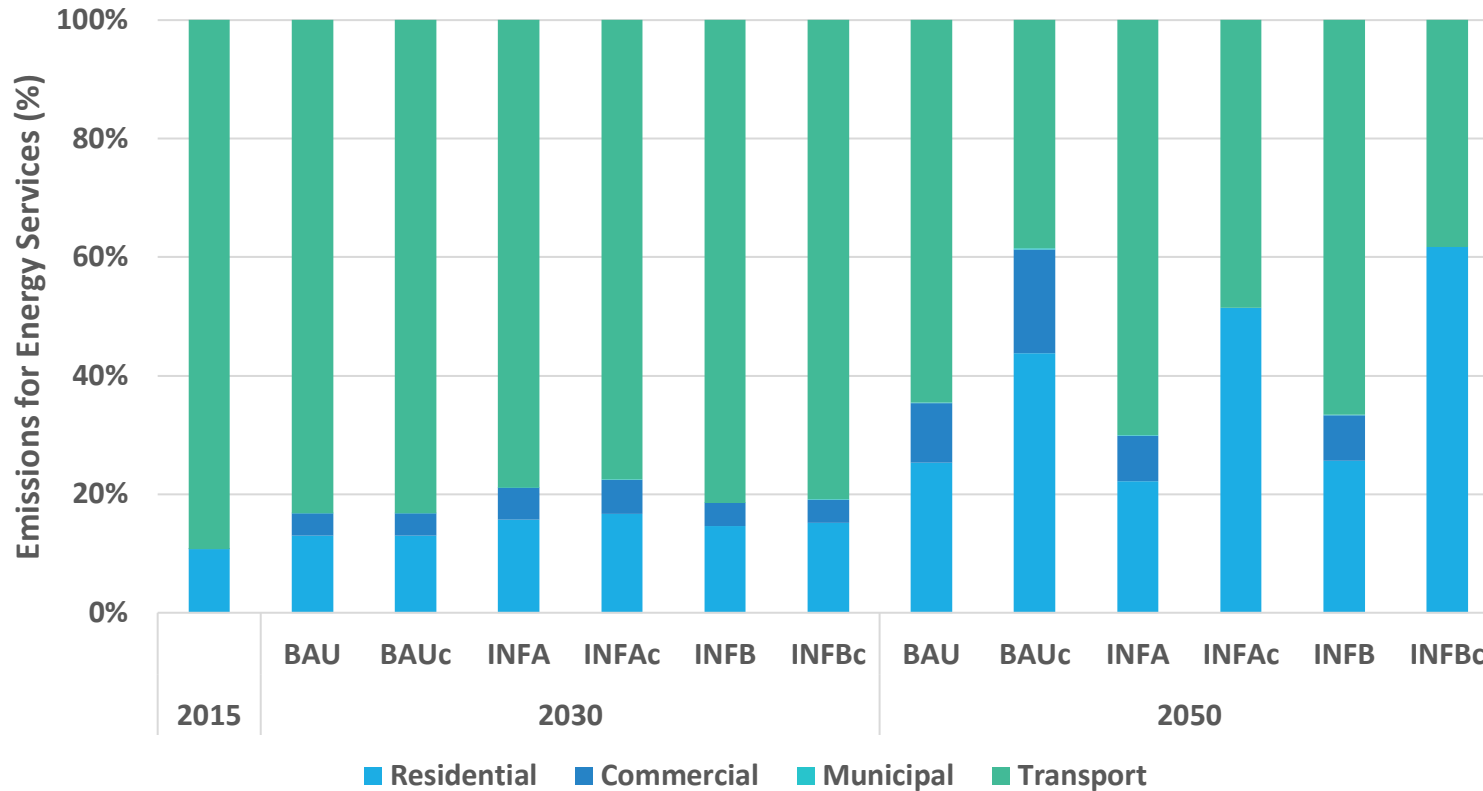
Source: Addressing rising energy needs of megacities – case study of Greater Cairo, submitted to Applied Energy

Final Energy Consumption



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CO₂ Emissions



CO ₂ emissions per capita (kg CO ₂ /inhabitant)	2015	2030	2050
BAU	1.04	0.55	0.34
INFA		0.65	0.66
INFB		0.59	0.43
BAUc/ INFAC/ INFBC		0.38	0.26

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Key Takeaways

- Improving quality of life leads to a necessary increase in energy consumption
=> 2 x CO₂ emissions per capita (INFA) without RES
- Renewable energy systems can provide energy for the summer shortages, reduce the imports, solve the on-going energy crisis, and thus improve the Egyptian energy security;
- Improve energy efficiency => substitute all the outdated devices in residential, transportation, municipal and commercial sectors. Energy efficiency is a viable strategy to achieve a carbon emission reduction also without mitigation policies (BAUc).
- Energy data on demand and supply should be made available for energy modeling and forecasting analysis.

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Thank You for Your Attention!

All questions are welcome!

**Here is mine: Can we model
developing countries megacities on
TIMES?**

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