

# Human Settlements and Climate Change Mitigation:

*Key findings from the latest IPCC WG3 report*

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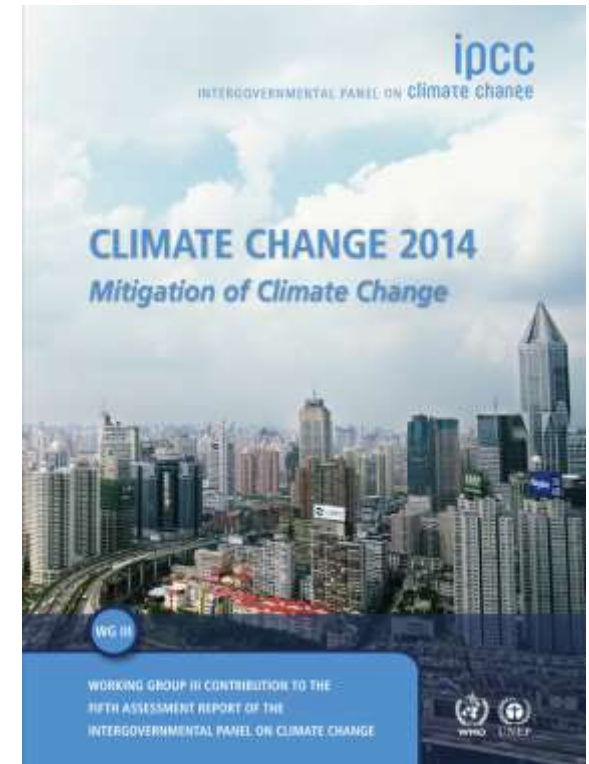
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*IPCC Fifth Assessment Report Outreach Event*

*17-18 August 2015, United Nations Conference Centre, Bangkok, Thailand*

Working Group III contribution to the  
IPCC Fifth Assessment Report



# Key messages

- Our ability to deep-cut global GHG depends, to a large extent, on what kind of cities and towns we will build and how urban dwellers embrace carbon mitigation
- Cities affect GHG emission 'within' as well as 'outside' its physical boundaries; consumption and infrastructure choice in cities are critical for global carbon mitigation
- Existing low carbon city initiatives are mostly focused on sectoral, end-of-pipe and short-term technical solutions; their level of implementation, achievements and collective impacts are yet not clear
- Next 2-3 decade is critical- A large window of mitigation opportunities lie in guiding new urbanization in next 2-3 decades
- Large opportunities lie in systemic and integrated mitigation solutions- beyond sectoral considerations
- Considerations to co-benefits and best practices smoothens the entry points to city climate change mitigation agenda

# Urbanization is associated with increases in income and higher urban incomes correlated with higher energy and GHG emissions

- 71-76% of energy-related global CO<sub>2</sub> emissions are from energy use in cities
- City consumption driven upstream emissions makes cities even more important
- Emissions and contribution of sources vary greatly across cities – direct comparison often does not tell us much - cities are different from nation states

# No single factor explains the large variations in city per-capita city emissions within and across countries

- Influenced by physical, economic and social drivers specific to each city - **No clear answer yet on what cluster of drivers provides a specific carbon outcome of cities**
- Individual technology drivers and activities are relatively better understood- **but systemic factors and integrated effects of drivers are less understood**
- Spatial drivers are important- especially the **collective influence of different density, land-use mix, connectivity and accessibility**

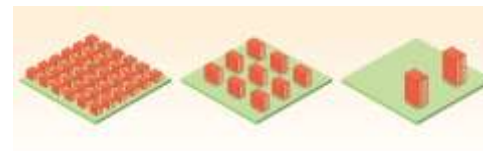


Higher density

Mixed land-use

Better connectivity

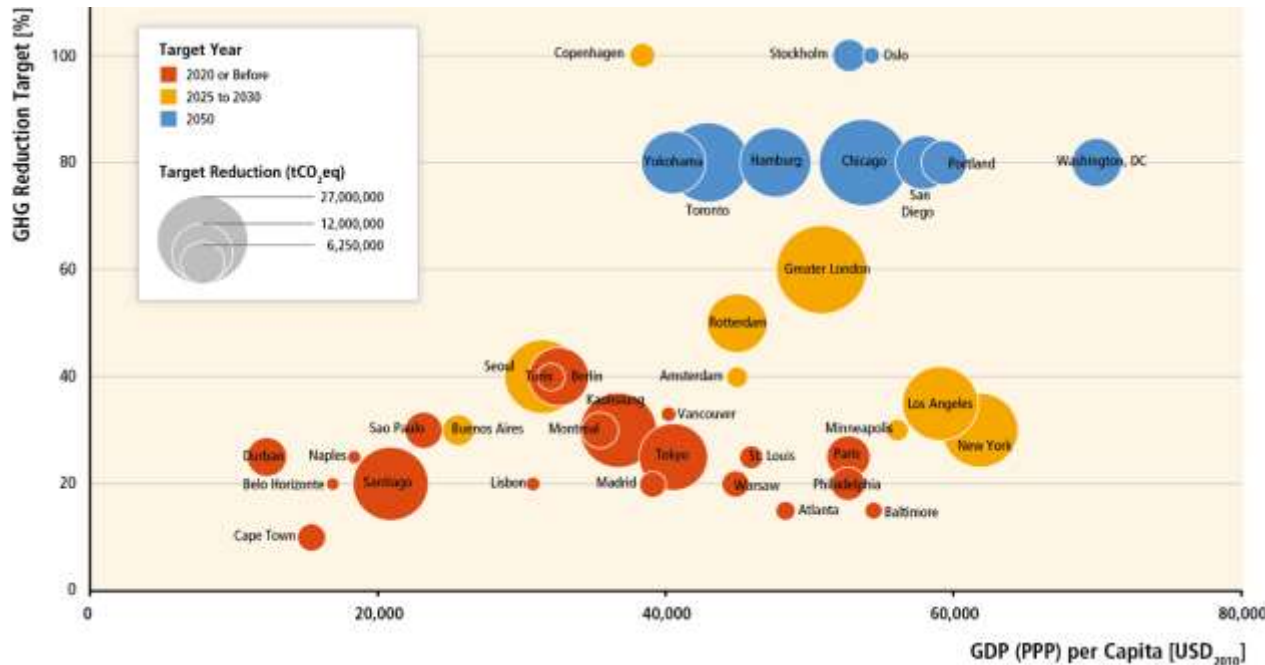
Better Accessibility to people and places



Density is necessary but not sufficient condition for lowering urban emissions

# Thousands of cities are undertaking Climate Action Plans and mitigation commitments

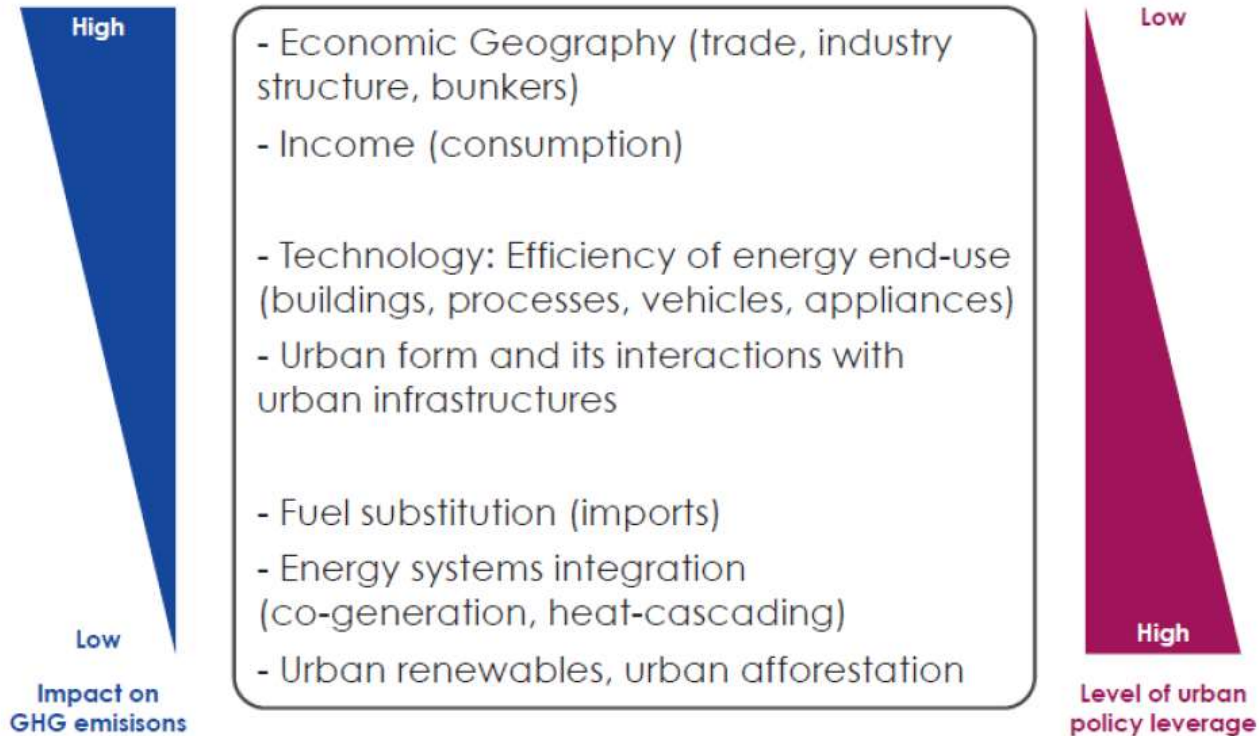
- Little systematic assessment on their level of implementation & the extent to which reduction targets are being achieved
- Focused largely on energy efficiency
- Limited consideration to land-use planning strategies and other cross-sectoral, cross boundary measures



Yet, their aggregate impact on urban emissions is uncertain

# In urban decisions making, policy leverages do not often match with largest mitigation opportunities in cities

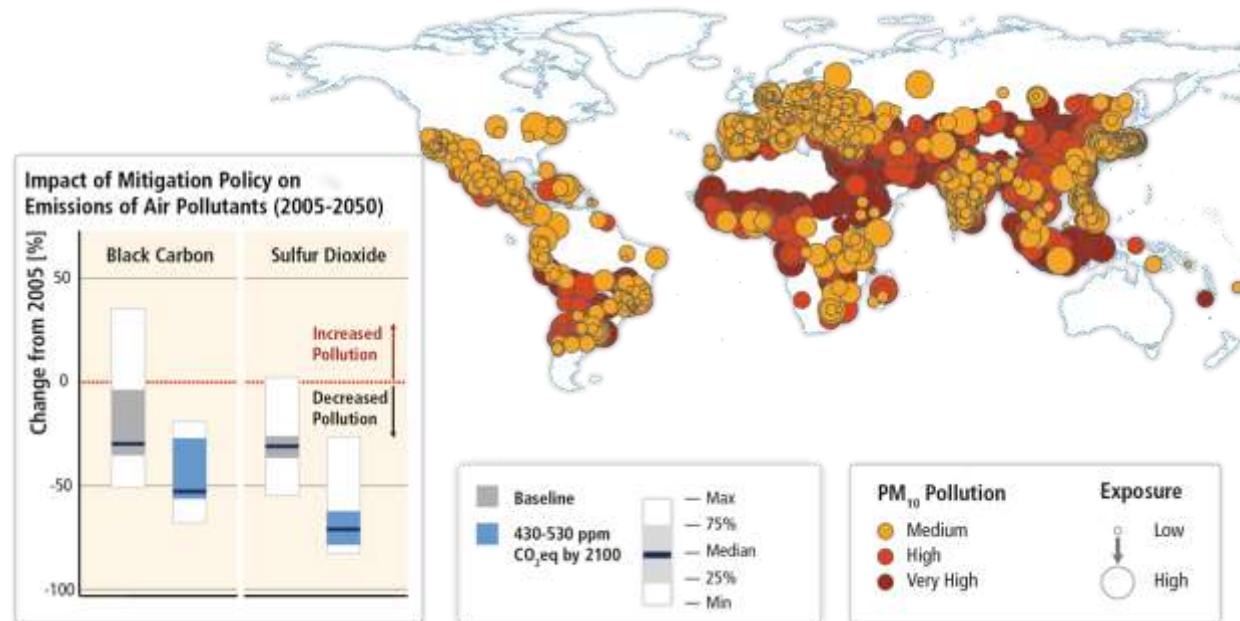
Stylized Hierarchy of Urban Energy/GHG Drivers and Policy Leverages



**Systemic changes have more mitigation opportunities but hindered by policy fragmentation**

# Successful implementation of urban-scale climate change mitigation strategies can provide health, economic and air quality co-benefits

- Action on urban-scale mitigation often depends on the ability to relate climate change mitigation efforts to local co-benefits

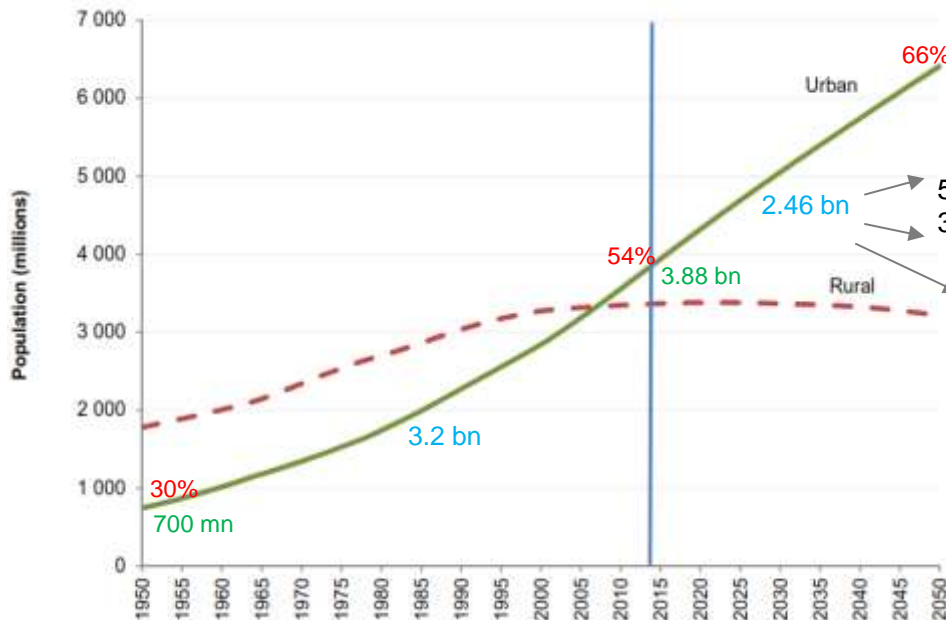


Mitigation measures	Effect on additional objectives/concerns		
	Economic	Social (including health)	Environmental
Compact development and infrastructure	↑ Innovation and productivity <sup>1</sup> ↑↑ Higher rents & residential property values <sup>2</sup> ↑ Efficient resource use and delivery <sup>5</sup>	↑ Health from physical activity <sup>3</sup>	↑ Preservation of open space <sup>4</sup>
Increased accessibility	↑ Commute savings <sup>6</sup>	↑ Health from increased physical activity <sup>3</sup> ↑ Social interaction & mental health <sup>7</sup>	↑ Air quality and reduced ecosystem/health impacts <sup>8</sup>
Mixed land use	↑ Commute savings <sup>6</sup> ↑↑ Higher rents & residential property values <sup>2</sup>	↑ Health from increased physical activity <sup>3</sup> ↑ Social interaction and mental health <sup>7</sup>	↑ Air quality and reduced ecosystem/health impacts <sup>8</sup>

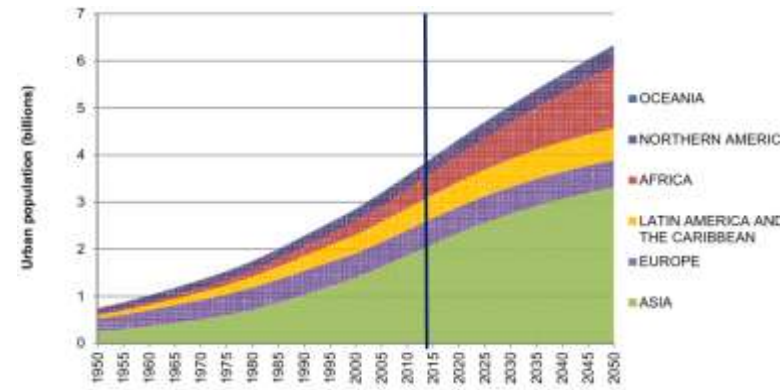
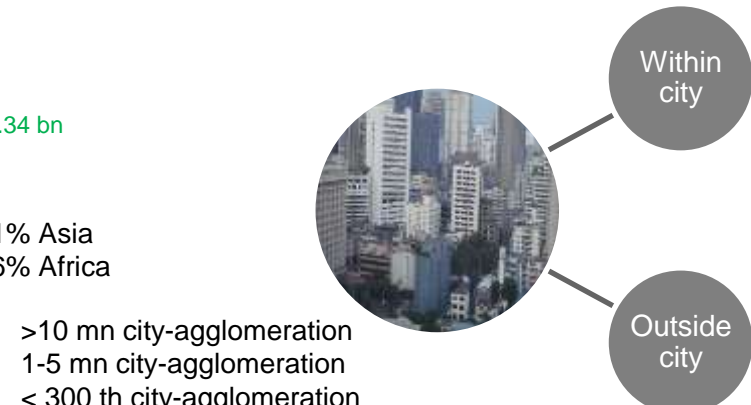
# Global urbanization trends

Urban land could expand up-to 3 time in 2000-30

55% of global land in 2030 is expected to be developed in 2000-30



Source: UN DESA World Urbanization Prospects 2014  
Schneider et al., 2009; Angel et al., 2011; Seto et al., 2011, 2012

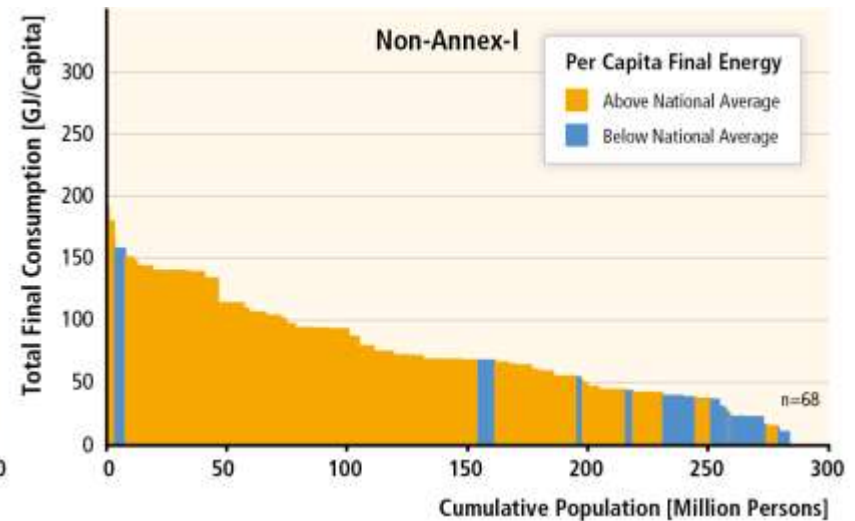
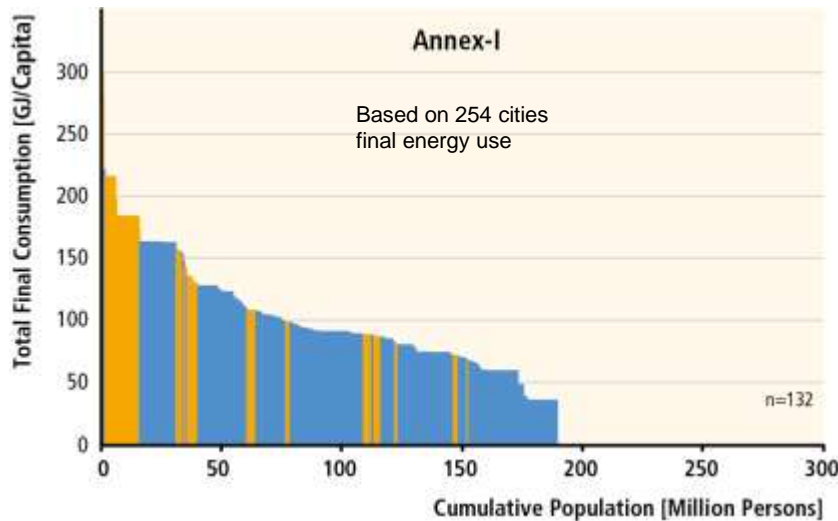


- Two sources of emissions: Due to materials needs (stock); usage of infrastructure (flow)
- Problem of “Lock-in”: Long life of infrastructure and built environment locks energy and emissions pathways

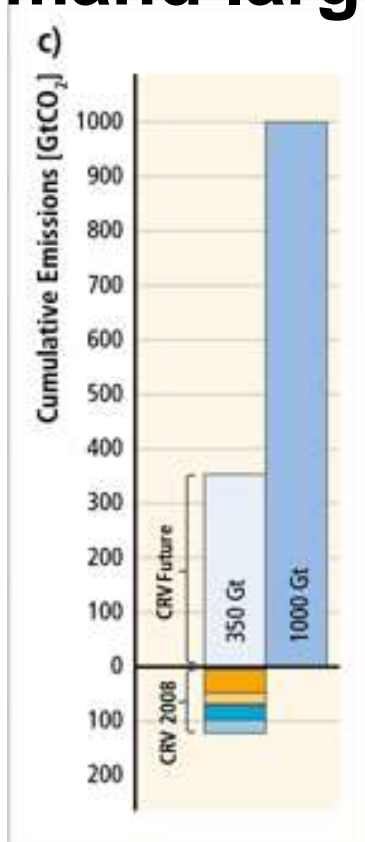


# Implications of urbanization

- Urbanization-income nexus → higher urban incomes correlated with higher energy and GHG emissions
- Bottom up analyses show that Cities in non-Annex I countries have, generally, higher per capita final energy use and CO<sub>2</sub> emissions than respective national averages – majority of new urbanization will be in non-Annex



# Future infrastructure is rapidly urbanizing regions demand large emissions

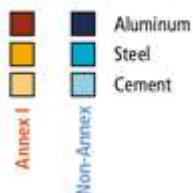


## Future Emissions

- CRV<sub>2008</sub> Future Stocks if Convergence to Annex I Level
- Emissions Budget 2000-2050 for 2°C Target

- The existing infrastructure stock of the average Annex I resident (2008) is
  - @ 3 times that of the world average
  - @ 5 times higher than that of the average non-Annex I resident
- If non-Annex I countries catch up with Annex I for per capita infrastructure stock → will result in significant future emissions
- Amount to 1/3<sup>rd</sup> of total emission budget that we have left in 2000-2050 to stay under 2°C

## CRV<sub>2008</sub> of 2008 Stocks



# ‘Governance paradox’ and need for a comprehensive approach

- ‘Systemic changes’ have large mitigation opportunities but hindered by current patterns of urban governance, policy leverages and persisting policy fragmentation
- Governance and institutional capacity are scale and income dependent, i.e., tend to be weaker in smaller scale cities and in low income/revenue settings
  - However, the bulk of urban growth momentum is expected to unfold in small- to medium-size cities in non-Annex-I countries
  - The largest opportunities for GHG emission reduction might be precisely in urban areas where governance and institutional capacities to address them are weakest
- The feasibility of spatial planning instruments for climate change mitigation is highly dependent on a city’s financial and governance capability
- For designing and implementing climate policies effectively, institutional arrangements, governance mechanisms, and financial resources all should be aligned with the goals of reducing urban GHG emissions

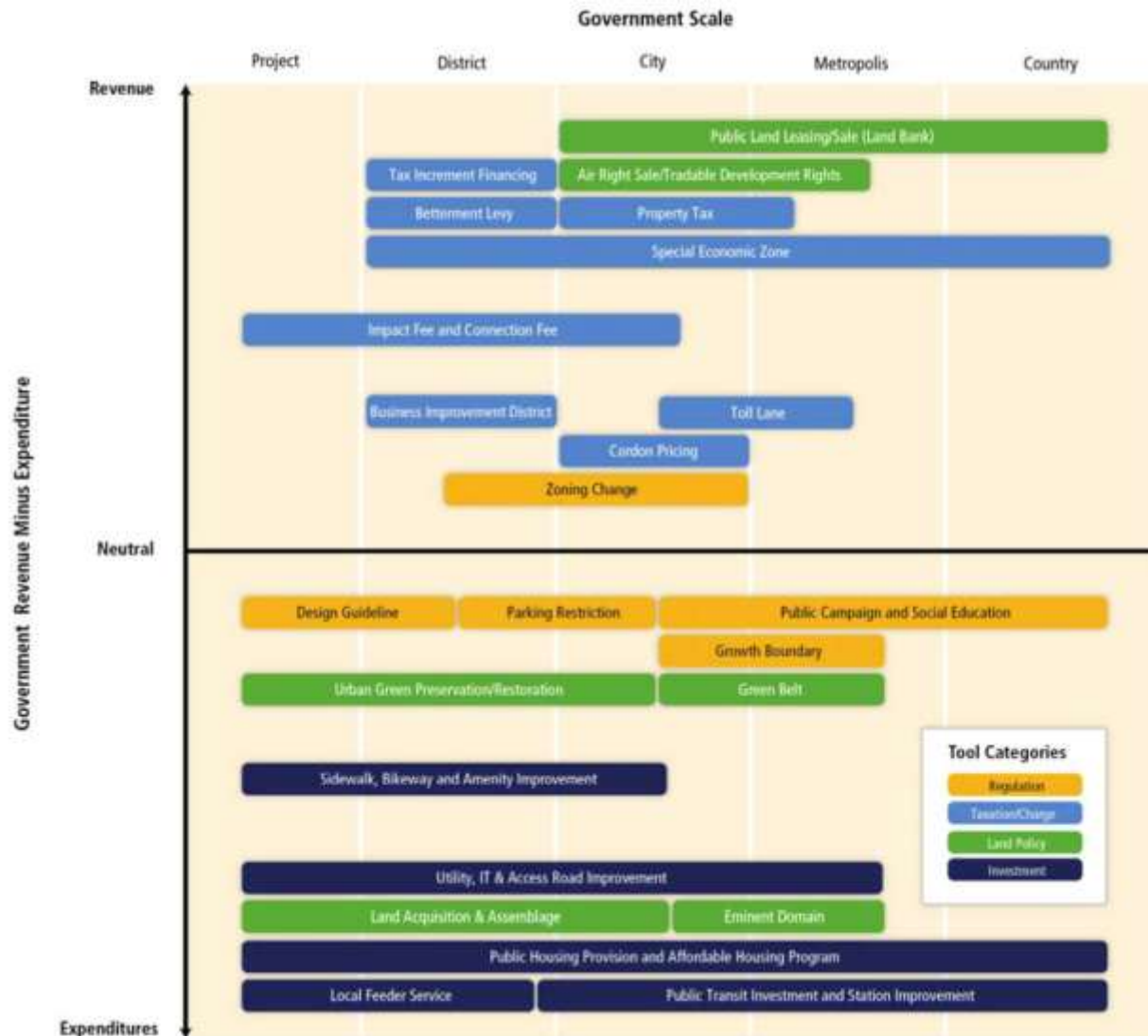
# Key opportunities

- Guiding new urbanization in next 2-3 decades → large opportunity but fast closing too
- Going beyond Incremental change → to transformative change
  - Better climate change action plans and implementations
  - Deploying far-reaching market-based solutions coupled with planning, such as pricing
  - Systemic and integrated solutions
- Overcoming the governance limitations and policy fragmentations
- Smoothing the entry points to climate agenda: Demonstrating the best practice technologies and local co-benefits of urban-scale mitigation actions
- Overcoming the size, governance and income dependency of mitigation solutions, possibly through capacity building

For further information

[www.mitigation2014.org](http://www.mitigation2014.org)

# The feasibility of spatial planning instruments for climate change mitigation is highly dependent on a city's financial and governance capability



Sources: Bahl and Linn (1998); Bhatt (2011); Cervero (2004); Deng (2005); Fekade (2000); Rogers (1999); Hong and Needham (2007); Peterson (2009); Peyroux (2012); Sandroni (2010); Suzuki et al. (2013); Urban LandMark (2012); U.S. EPA (2013); Weitz (2003).

# Mitigation solutions are often scale, governance and income dependent

- The largest mitigation opportunities with respect to human settlements are in rapidly urbanizing areas with
  - Small and mid-size cities
  - Developing and economical growing regions
  - Where infrastructure is being built and yet not locked-in

But these are often the places where limited financial and institutional capacities persist

- The feasibility of spatial planning instruments for climate change mitigation is highly dependent on a city's financial and governance capability