Sixth Assessment Report
WORKING GROUP III – MITIGATION OF CLIMATE CHANGE

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

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Towards carbon neutral cities: opportunities through spatial planning and infrastructure

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Critical Role of Urban Systems

- The share of emissions attributed to urban areas increased from app 62% of the global total in 2015 to 67-72% in 2020
- Urban systems are essential for achieving deep emissions reductions and advancing climate-resilient development
- Integrated planning that incorporates physical, natural, and social infrastructure is crucial for effective climate action
- Urban areas can create opportunities to increase resource efficiency and significantly reduce GHG emissions through the systemic transition of infrastructure and urban form towards net-zero emissions

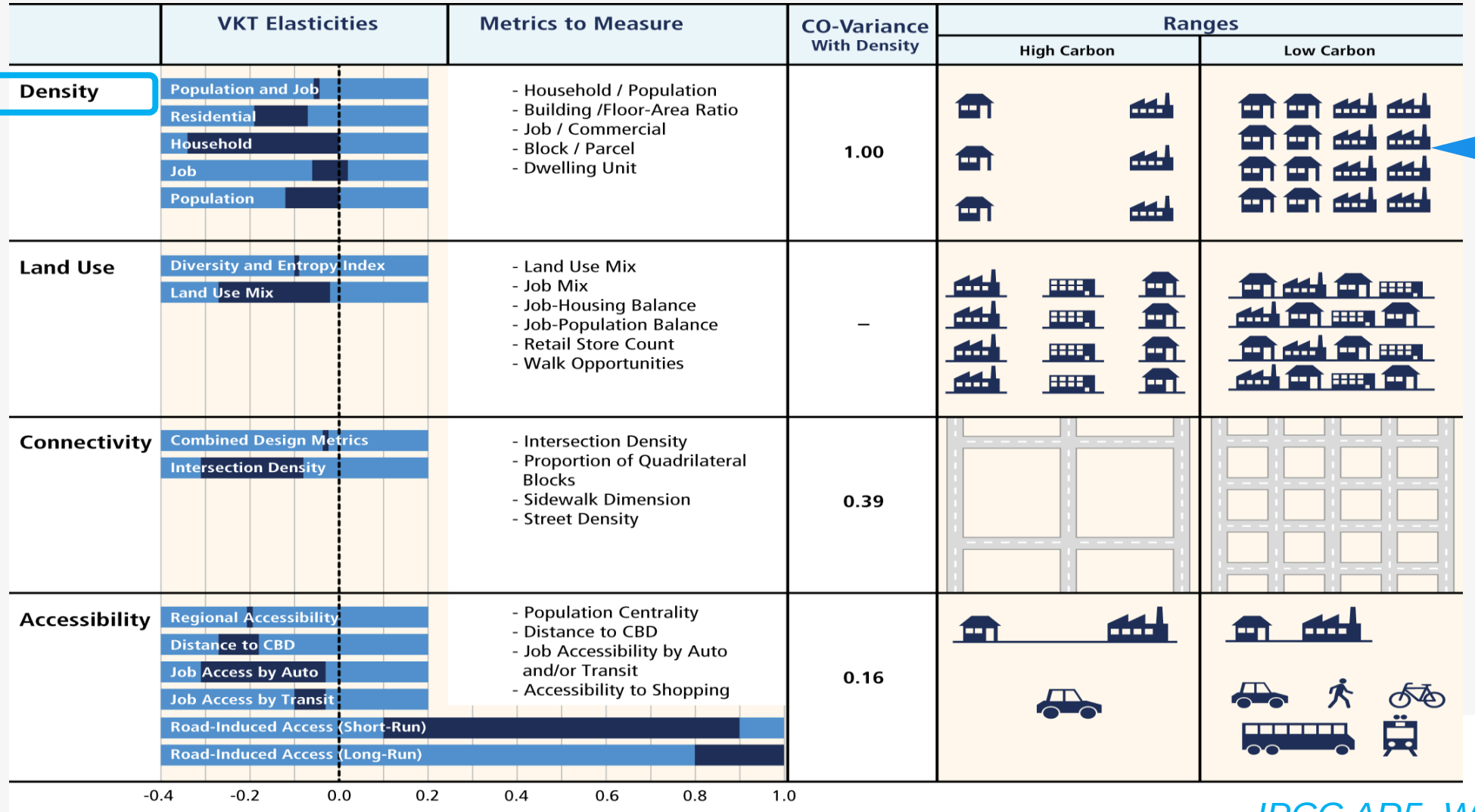
Source: IPCC AR6, SYR

Lock-in risks and opportunities from infrastructure and urban planning

- Infrastructure and urban form commit energy use and emissions for decades/centuries to come
- Ongoing urbanisation patterns risk future lock-in of induced demand on GHG emissions, constraining lifestyles to energy intensive and high CO2-related technologies
- In contrast, high or moderate density, well connected, walkable, mixed use, multi-centered cities with good public transport infrastructure can lock in low emission patterns
- planning cities with multiple walkable sub-centres, where diverse daily destinations, such as shopping, jobs, education and leisure activities can be accessed within a 10 minute walk or bicycle ride, enable low-carbon lifestyle choices (IPCC AR6 WGIII Ch10)

Ürge-Vorsatz et al. "Locking in positive climate responses in cities." *Nature Climate Change* 8.3 (2018): 174

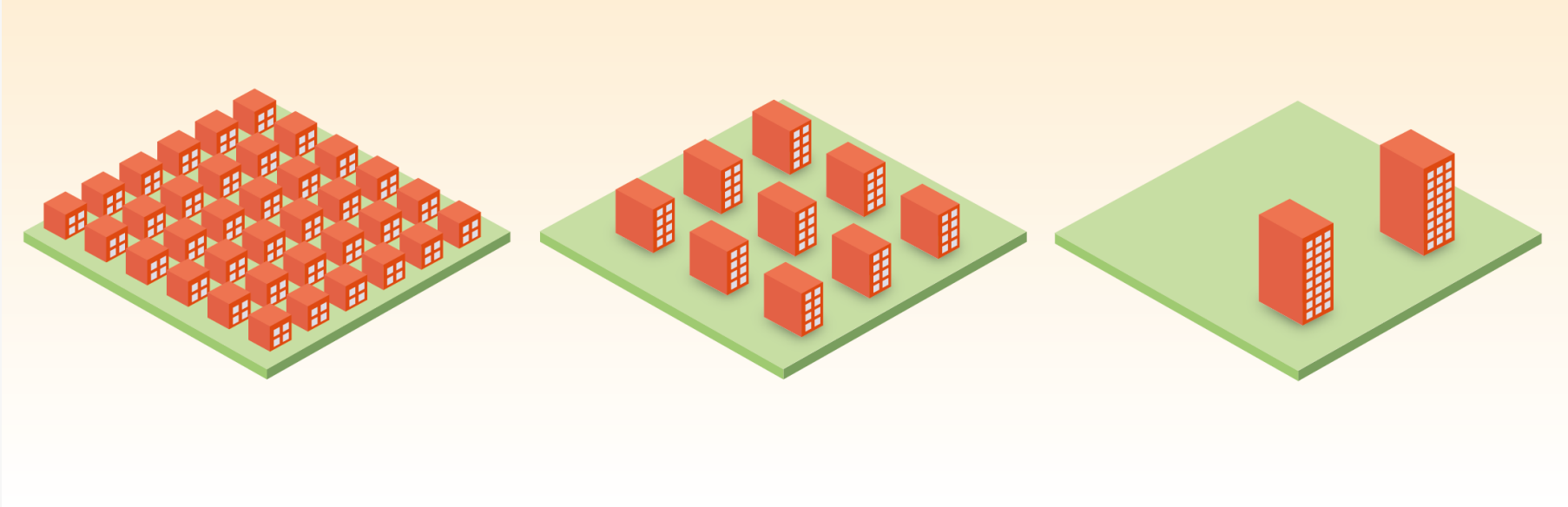
Infrastructure and urban form are strongly linked. Together they lock-in patterns of land use, transport and housing use, and behavior



Higher **density** leads to lower emissions (i.a. shorter distances travelled).

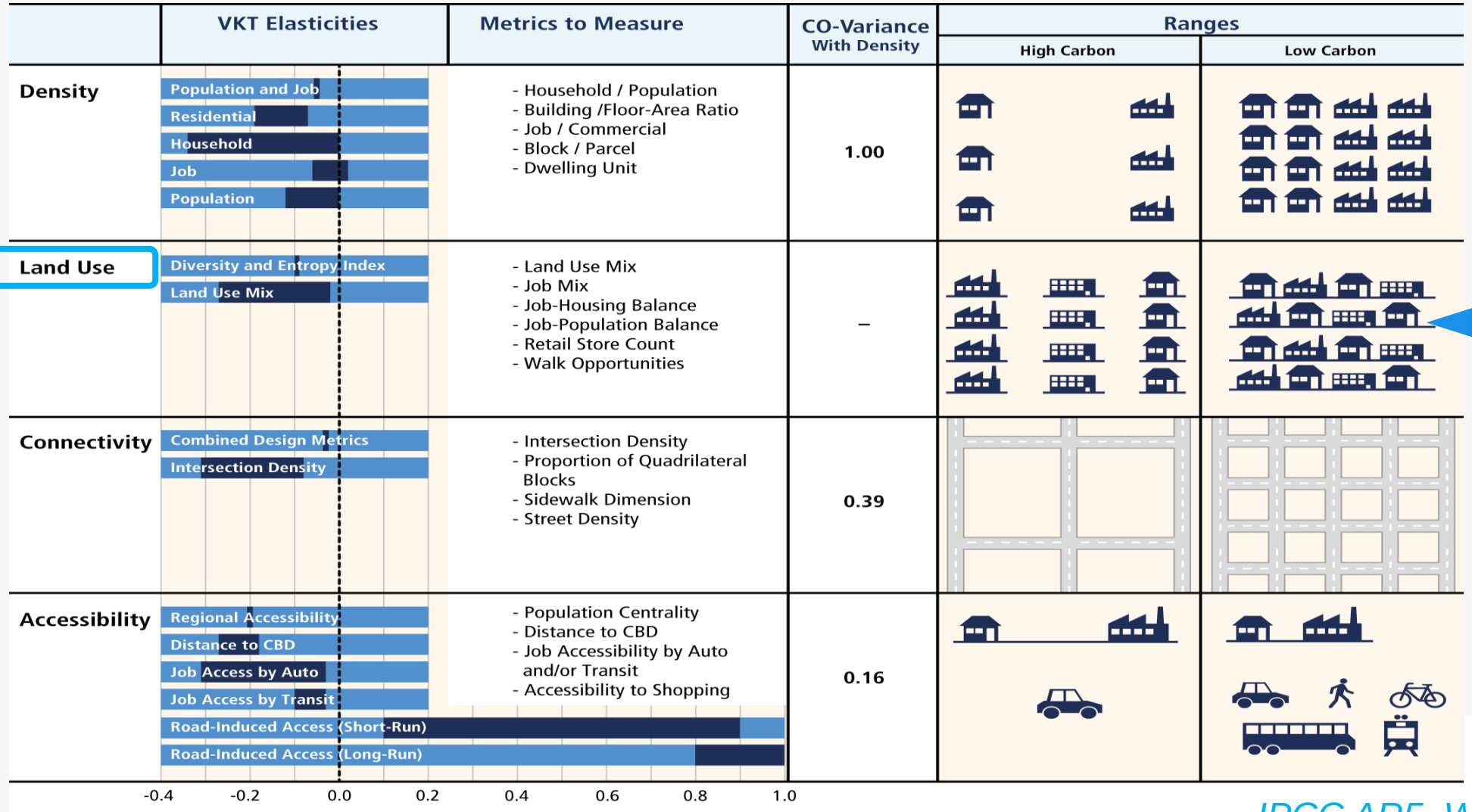
IPCC AR5, WGIII, Fig 12.14

Increasing urban density is a necessary but not sufficient condition for lowering urban emissions



IPCC AR5, WGIII, Fig 12.16

Infrastructure and urban form are strongly linked. Together they lock-in patterns of land use, transport and housing use, and behavior



Mix of land-use reduces emissions

IPCC AR5, WGIII, Fig 12.14

To lower urban emissions, need diverse urban land use mix

IPCC AR5, WGIII, Fig 12.17

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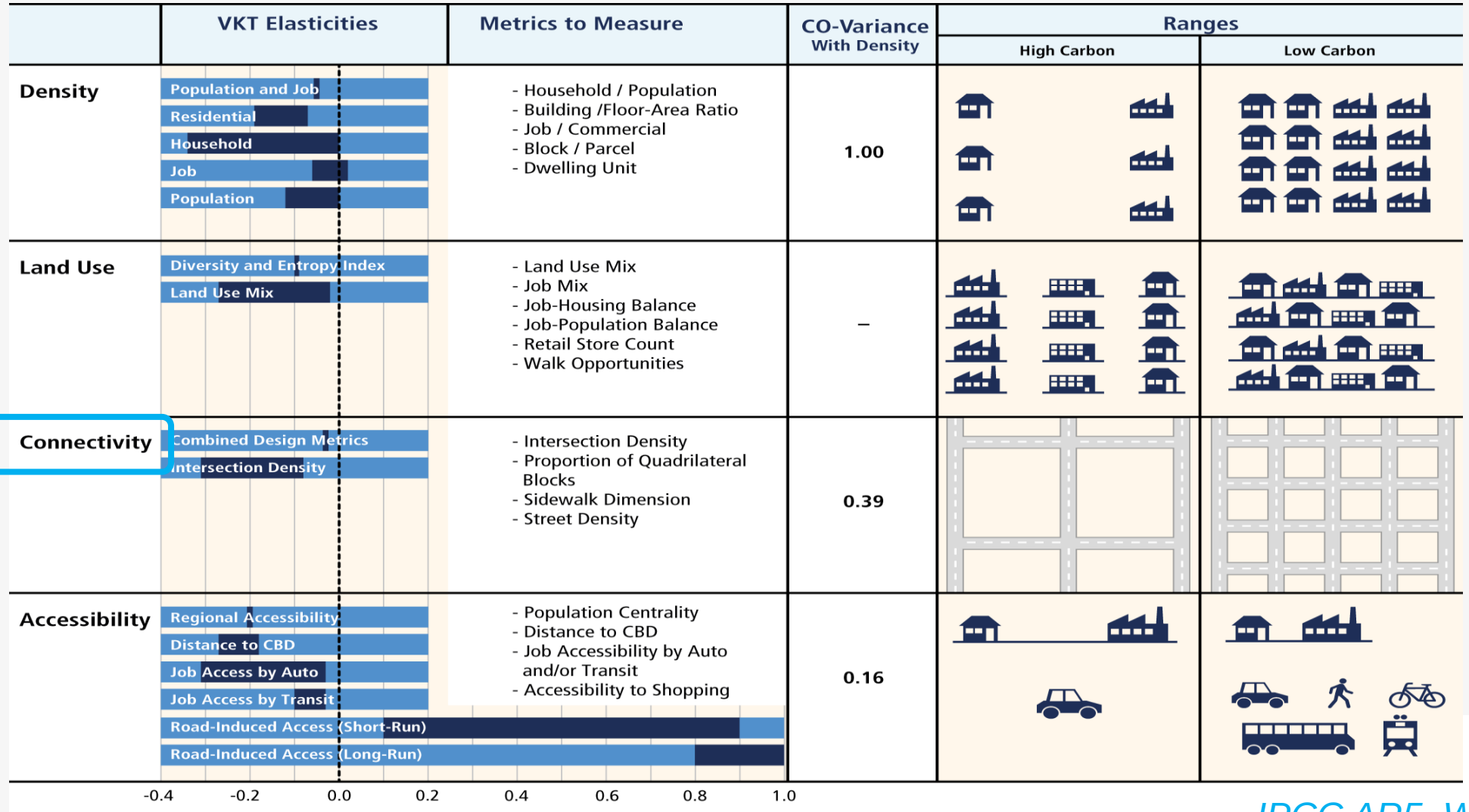

Improved **connectivity,** infrastructural density and design (e.g. streets) reduces emissions

IPCC AR5, WGIII, Fig 12.14

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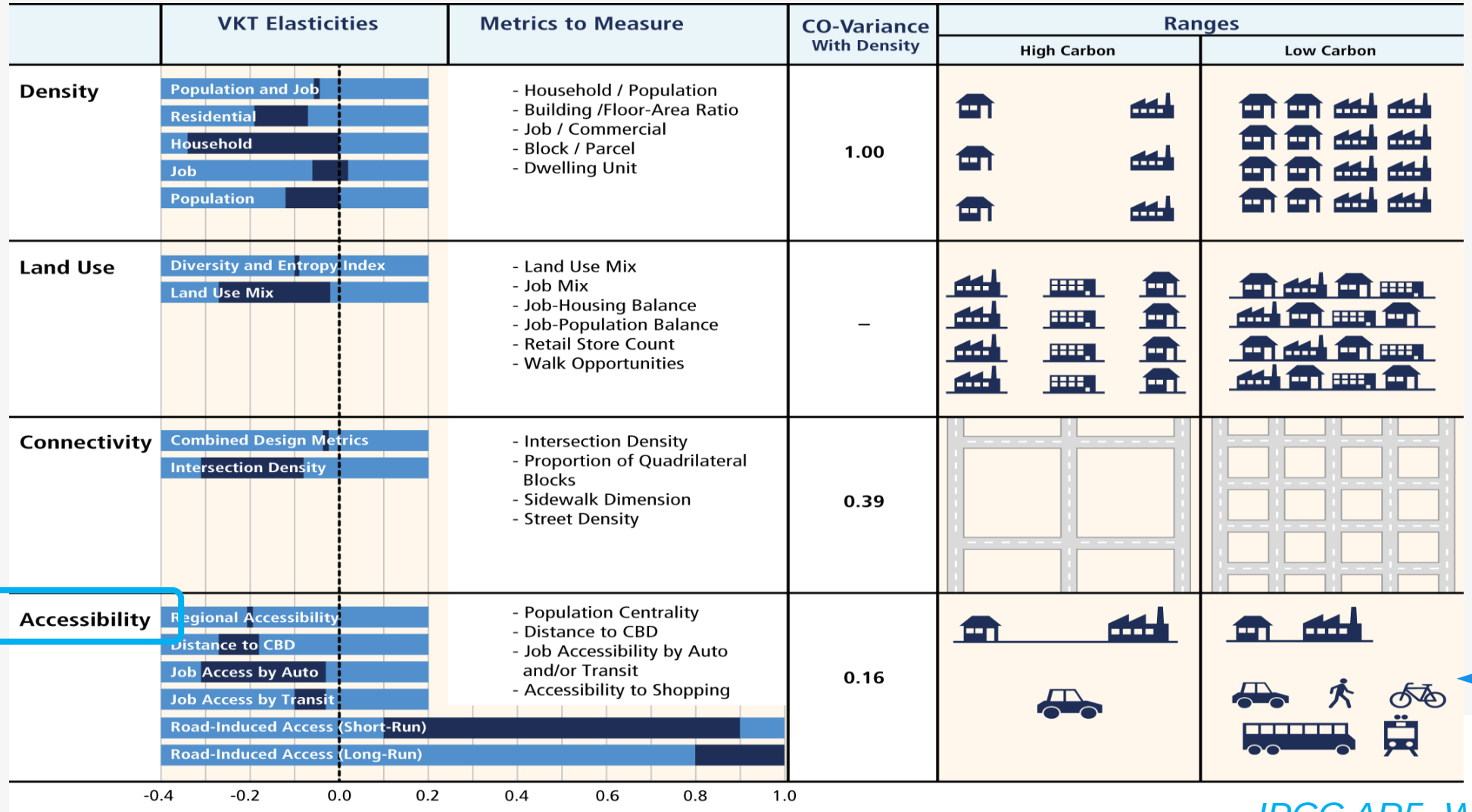


Accessibility to people and places (jobs, housing, services, shopping) reduces emissions.

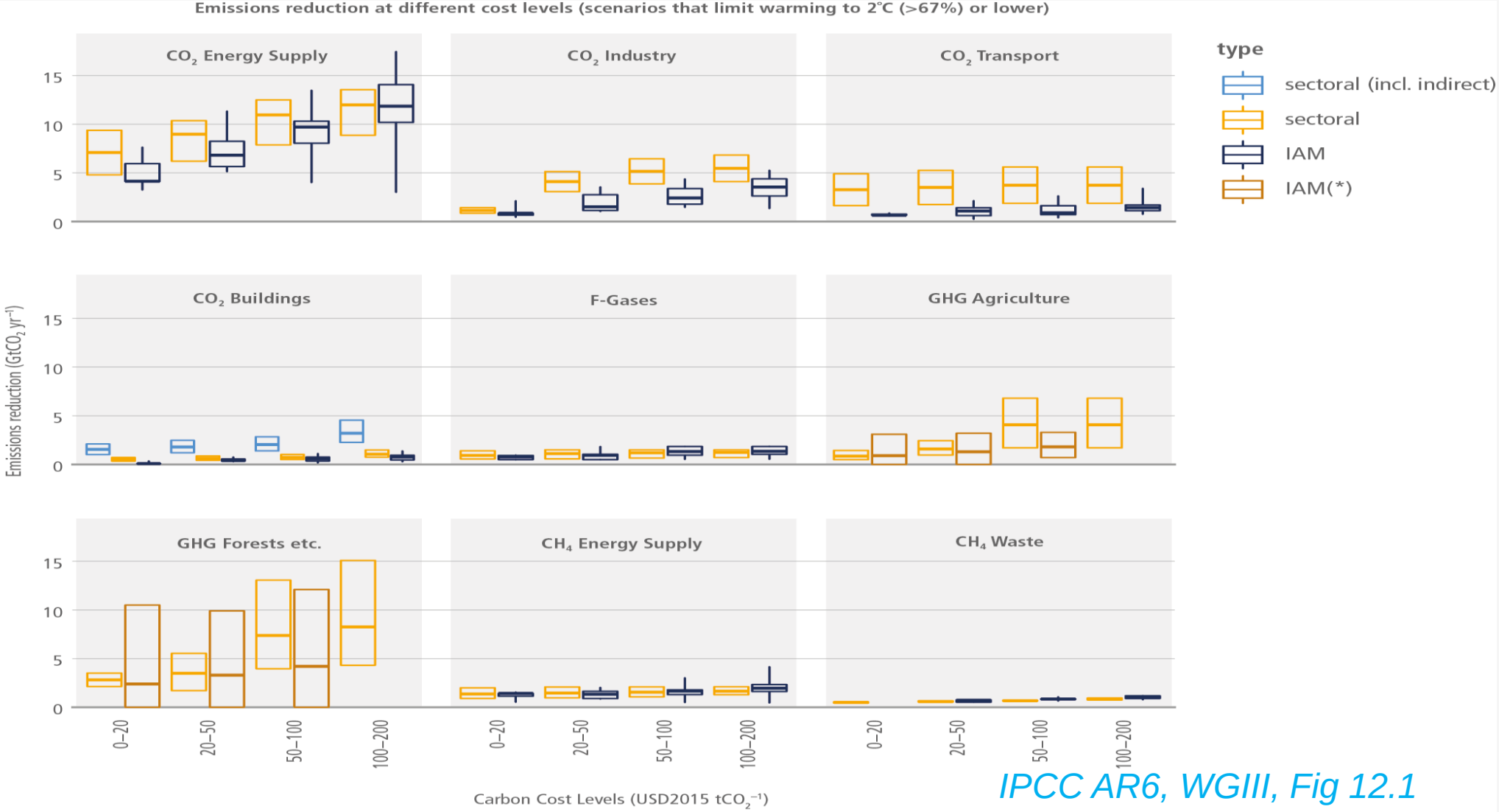
IPCC AR5, WGIII, Fig 12.14

Mitigation opportunities through urban planning and infrastructure

- urban infrastructures can make a difference of **up to a factor of 10** in energy use and induced GHG emissions (Ch10)
- Low-carbon highly accessible urban design is not only a major mitigation option, it also provides for more inclusive city services related to wellbeing
- …together with other co-benefits, such as improved air quality, physical and mental health, reduced congestion, improved productivity, improved social welfare
- Modifying the layout of emerging urbanisation to be more compact, walkable, and co-located can reduce future urban energy use by 20–25% in 2050 while providing a corresponding mitigation potential of 23–26%
- Overall, the mitigation potential of urban planning is about 25% in 2050 compared with a business as usual scenario

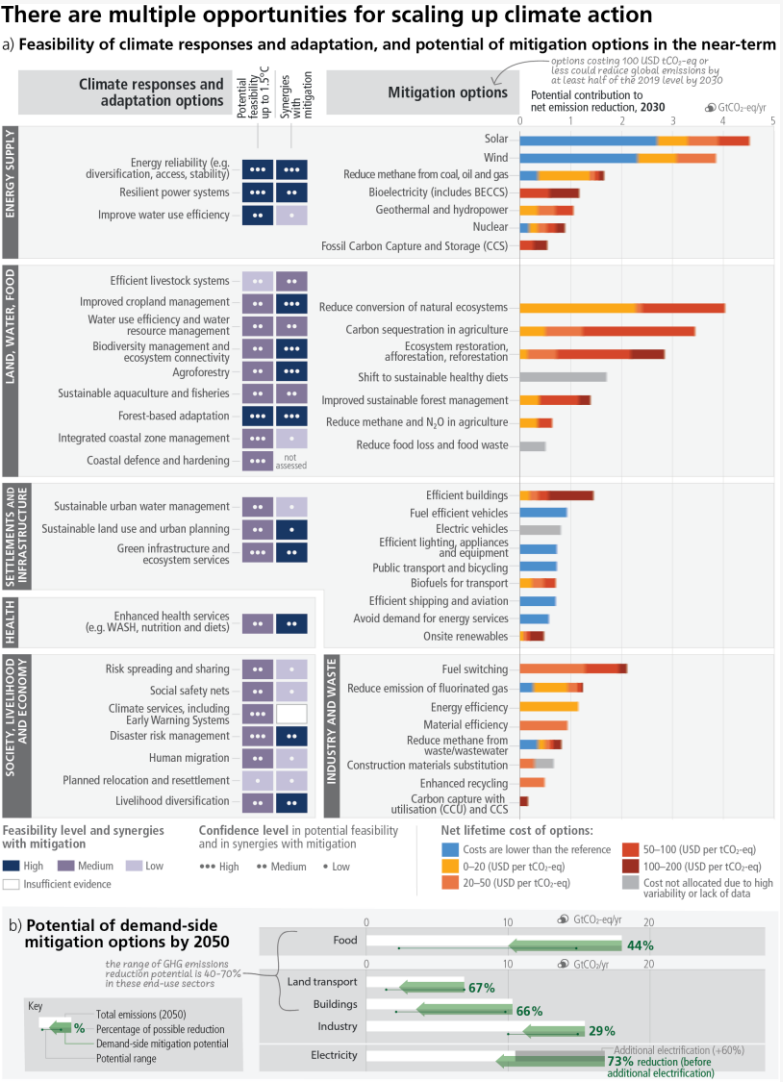
IPCC AR6, WGIII, Ch8

However, global mitigation pathways currently do not adequately capture these opportunities, urban infrastructure/urban planning related major potentials are largely in their blind spot

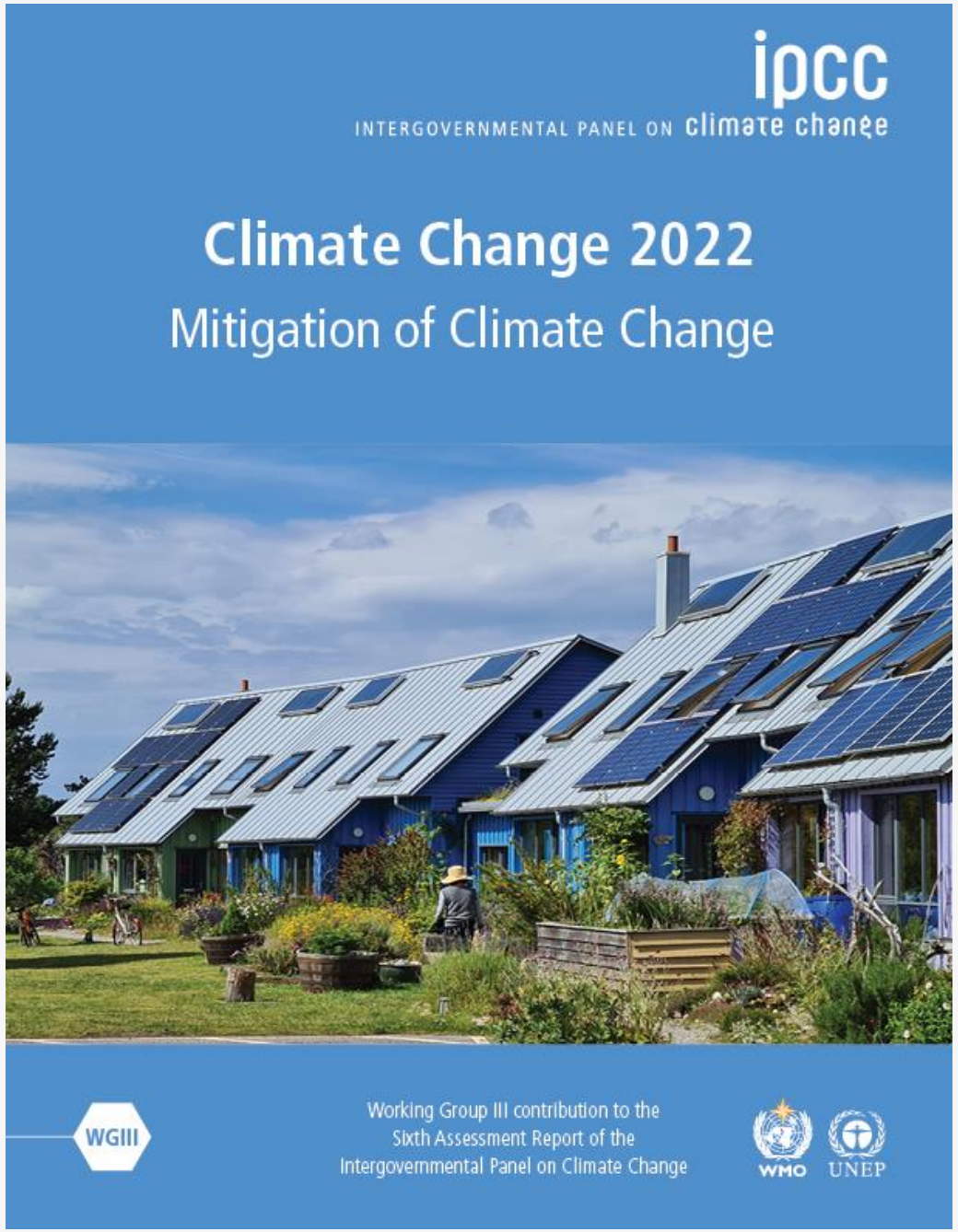


IPCC AR6, WGIII, Fig 12.1

Mitigation options from urban systems, planning and infrastructure optimisation are typical blind spots in other quantitative all-economy comparisons, too



IPCC AR6, SYR, SPM8



Thank you for your attention

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