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INTERGOVERNMENTAL PANEL ON climate change

CLIMATE CHANGE 2014 (and 2021)

Key findings of WGIII in the Fifth Asssessment Report and plans for the Sixth AR

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Central European University

Tokyo, November 29, 2017

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Working Group III contribution to the
IPCC Fifth and Sixth Assessment Reports

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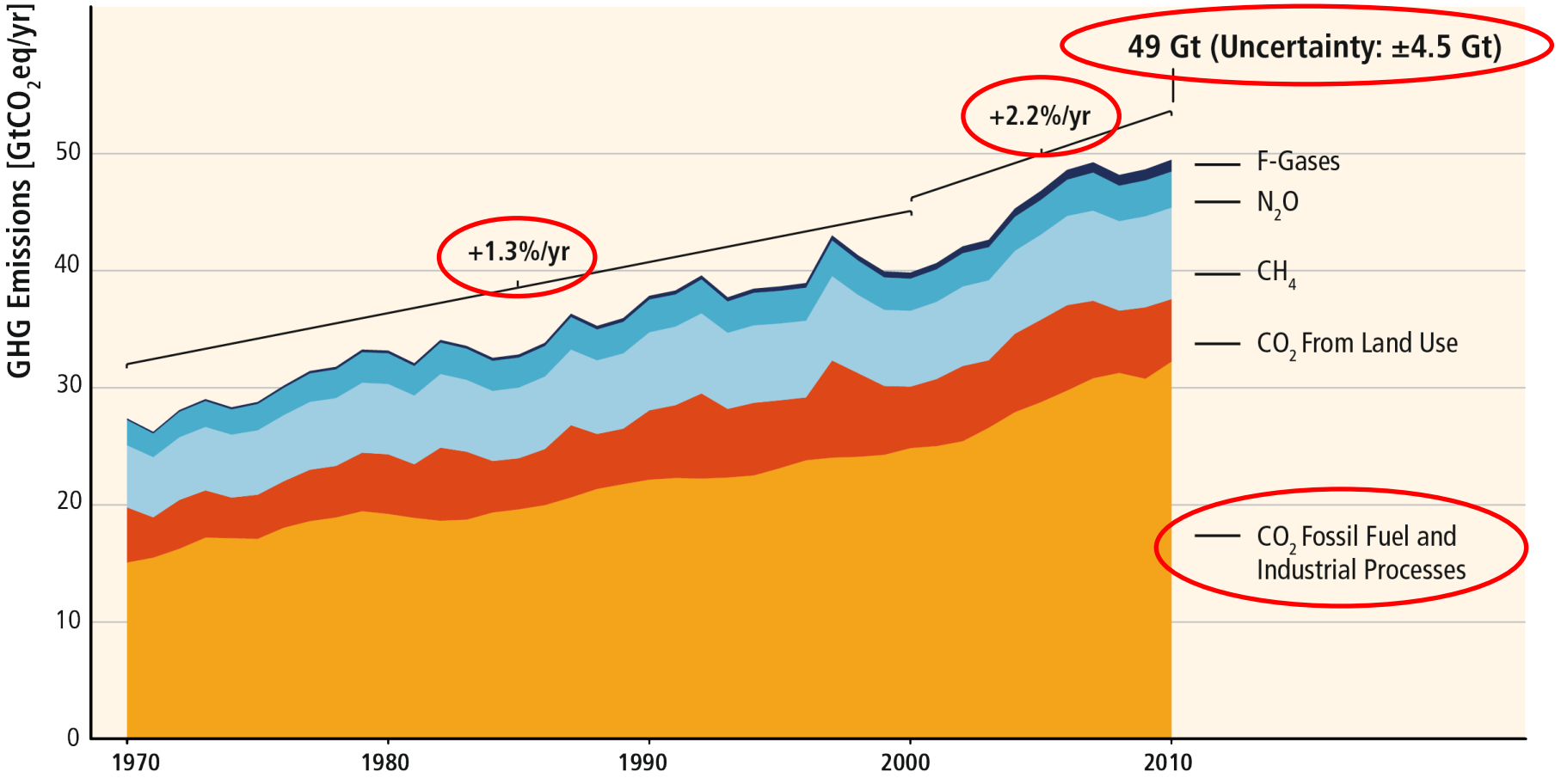
GHG emissions growth has accelerated
despite reduction efforts.

GHG emissions growth between 2000 and 2010 has been larger than in the previous three decades.



Based on Figure 1.3

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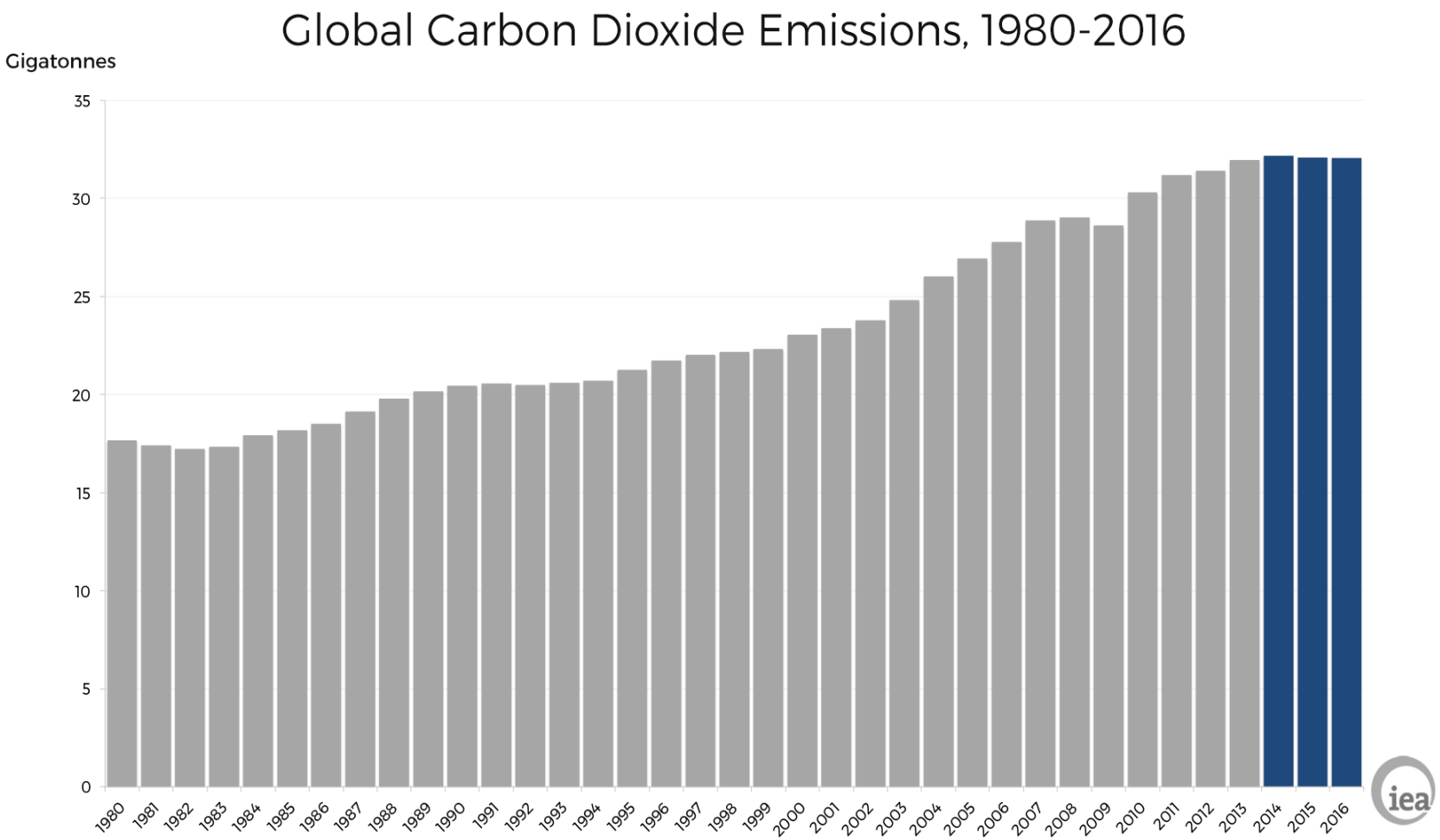
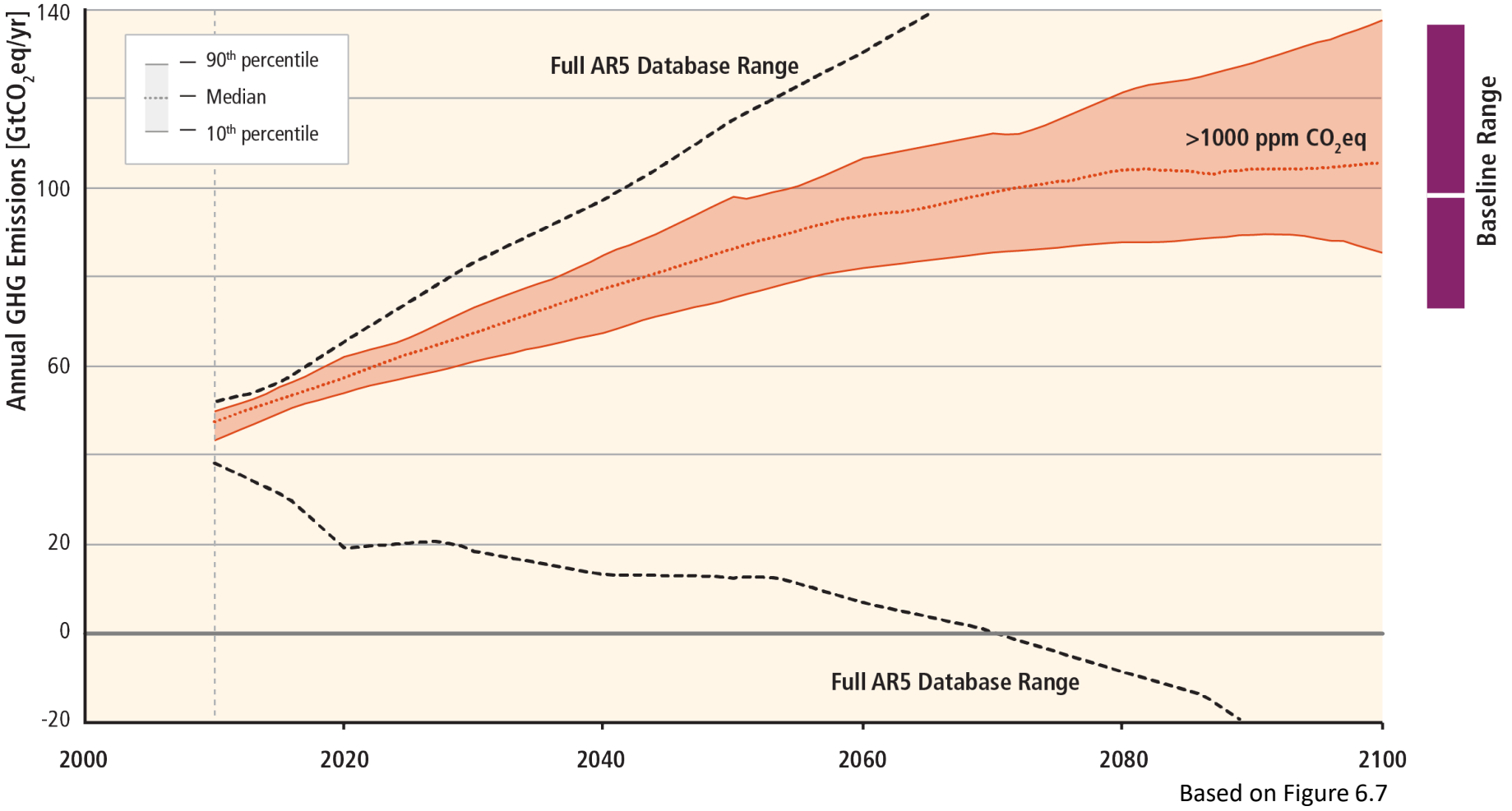
Developments since AR5: global emissions have been level for 3 years despite GDP growth (IEA)



Limiting warming to 2°C is possible but involves substantial technological, economic and institutional challenges

Stabilization of atmospheric GHG concentrations requires moving away from business as usual.



Based on Figure 6.7

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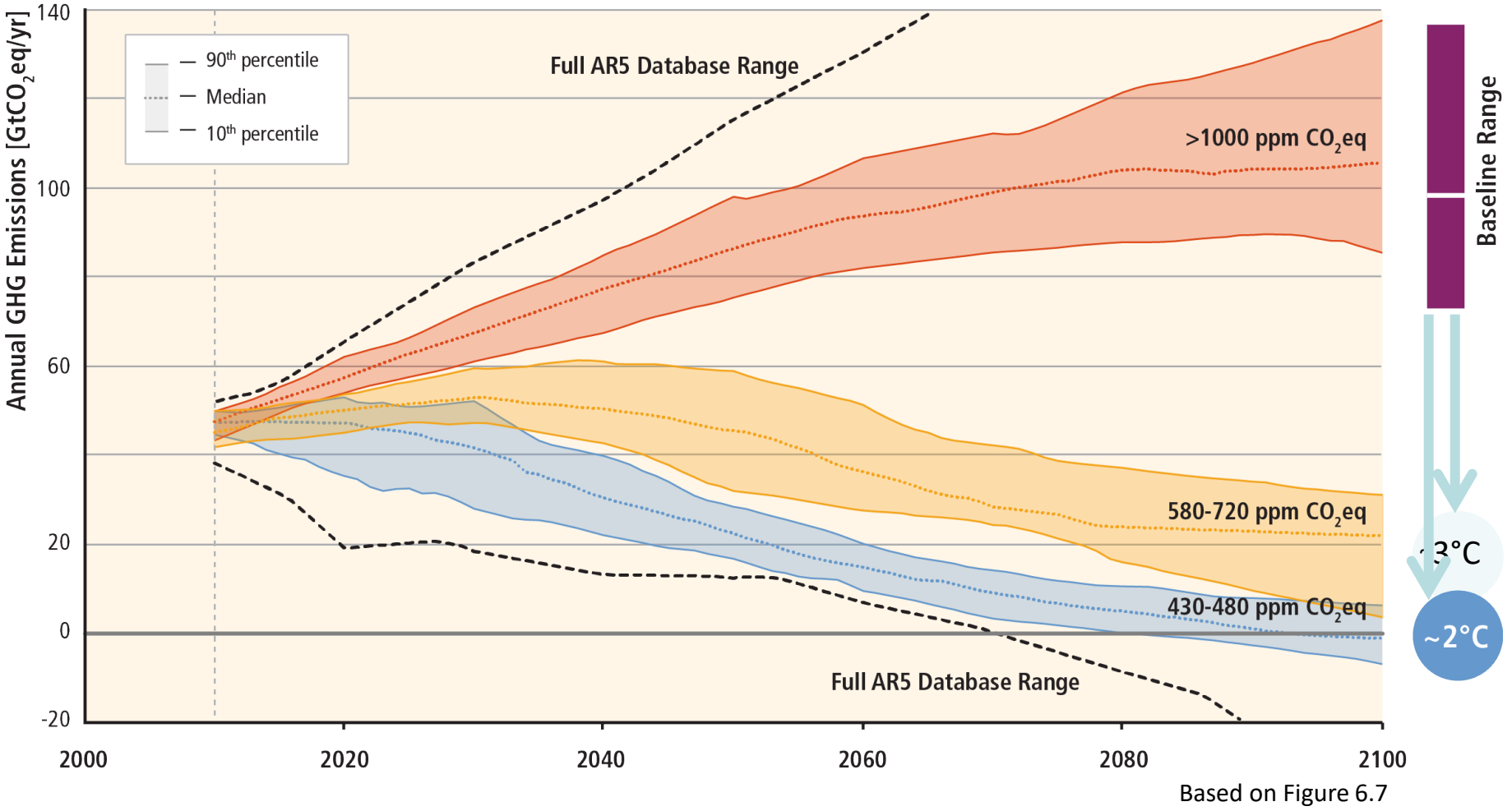
Lower ambition mitigation goals require similar reductions of GHG emissions.



Based on Figure 6.7

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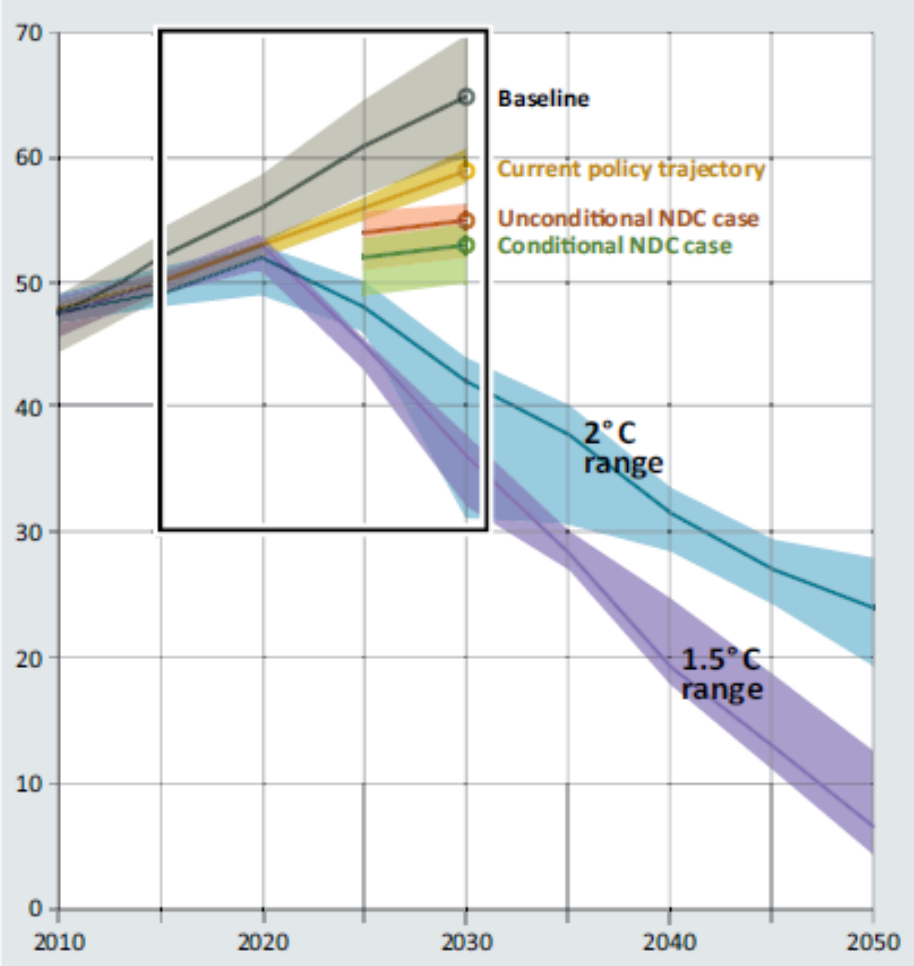
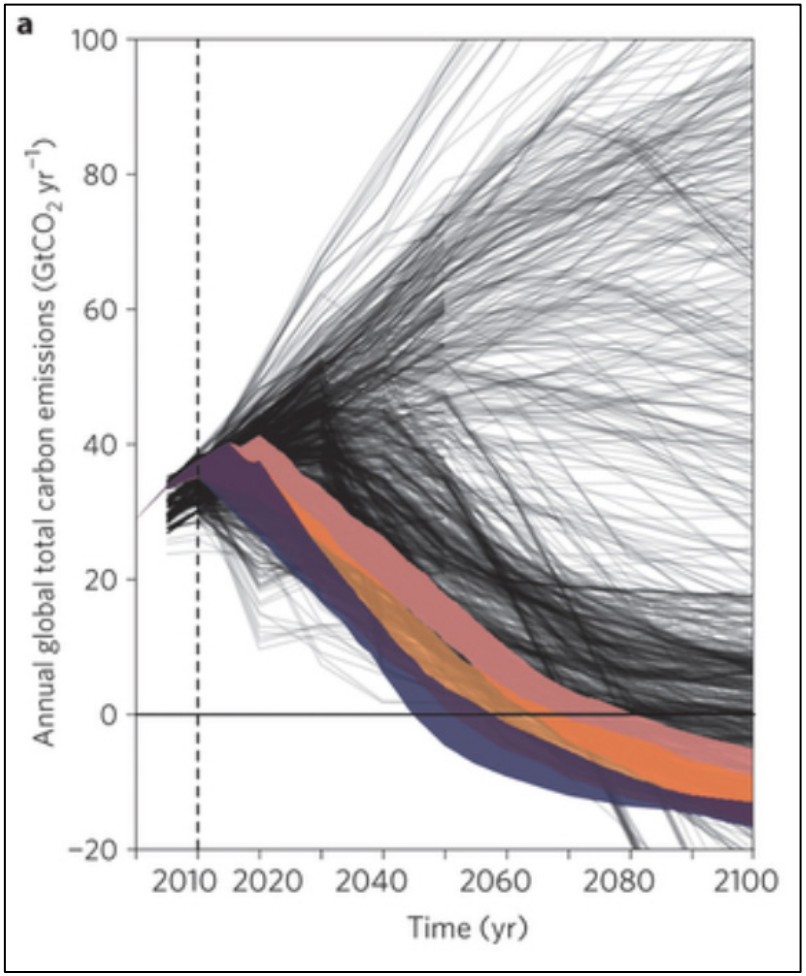
The view to 2050 and beyond



Source: UNEP



Source: Rogelj et al, 2015

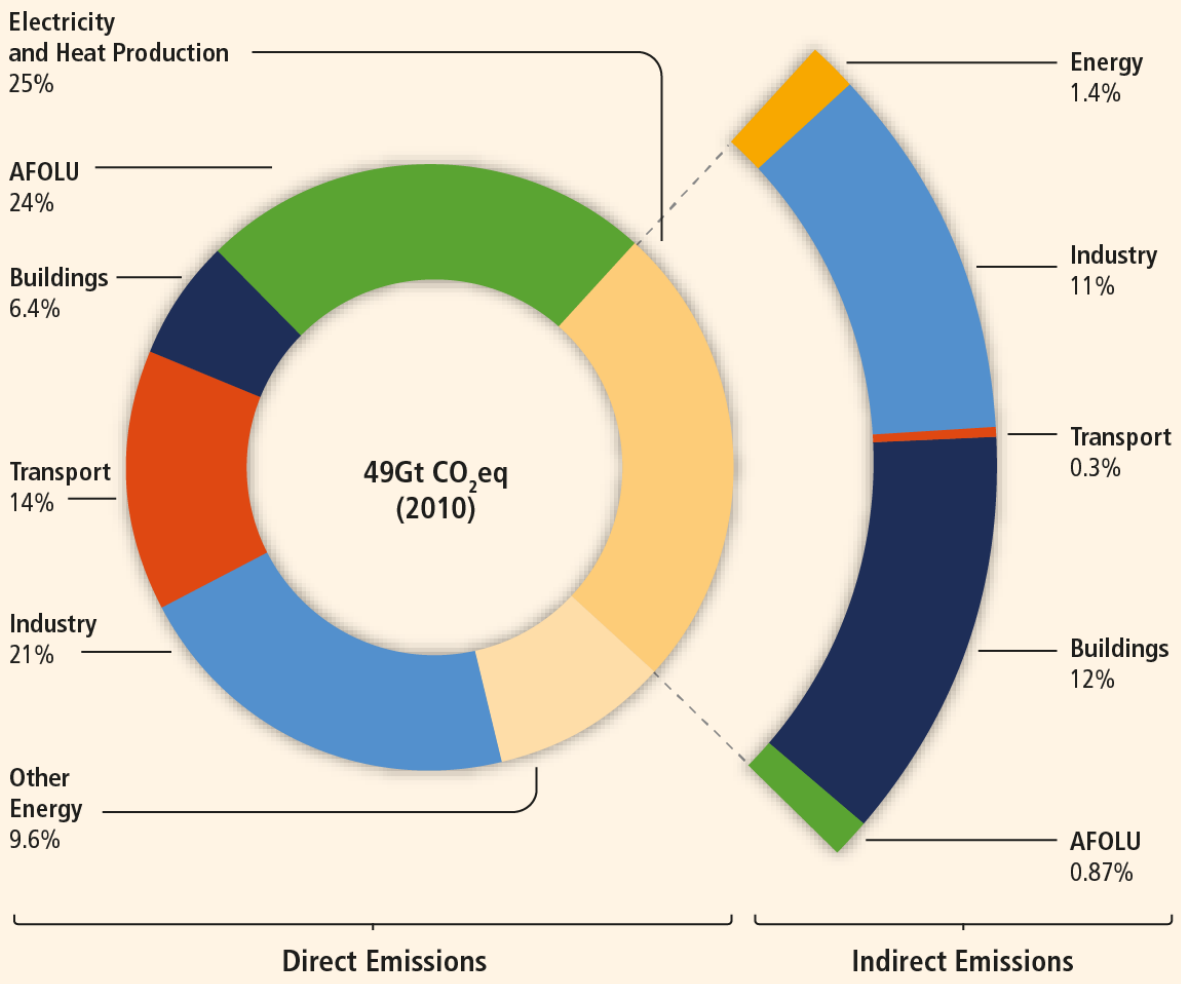
Mitigation cost estimates vary, but do not strongly affect global GDP growth.

Estimates for mitigation costs show moderate effect on development

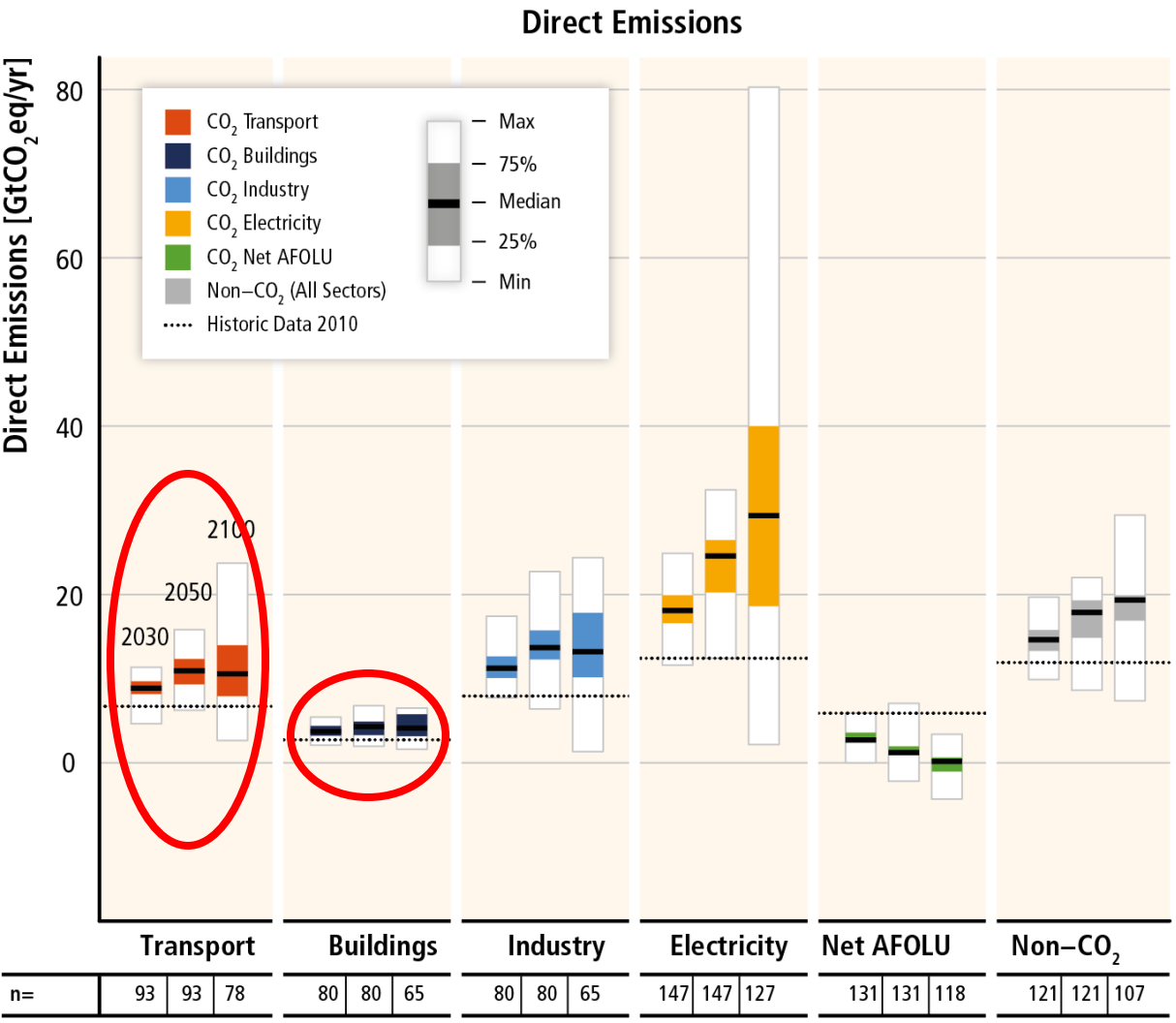
- Reaching 450ppm CO_2eq entails consumption losses of 1.7% (1%-4%) by 2030, 3.4% (2% to 6%) by 2050 and **4.8%** (3%-11%) by 2100 relative to baseline (which grows between **300% to 900%** over the course of the century).
- This is equivalent to a reduction in consumption growth over the 21st century by about **0.06 (0.04-0.14) percentage points a year** (relative to annualized consumption growth that is between 1.6% and 3% per year).
- Cost estimates **exclude benefits** of mitigation (reduced impacts from climate change). They also exclude other benefits (e.g. improvements for local air quality).

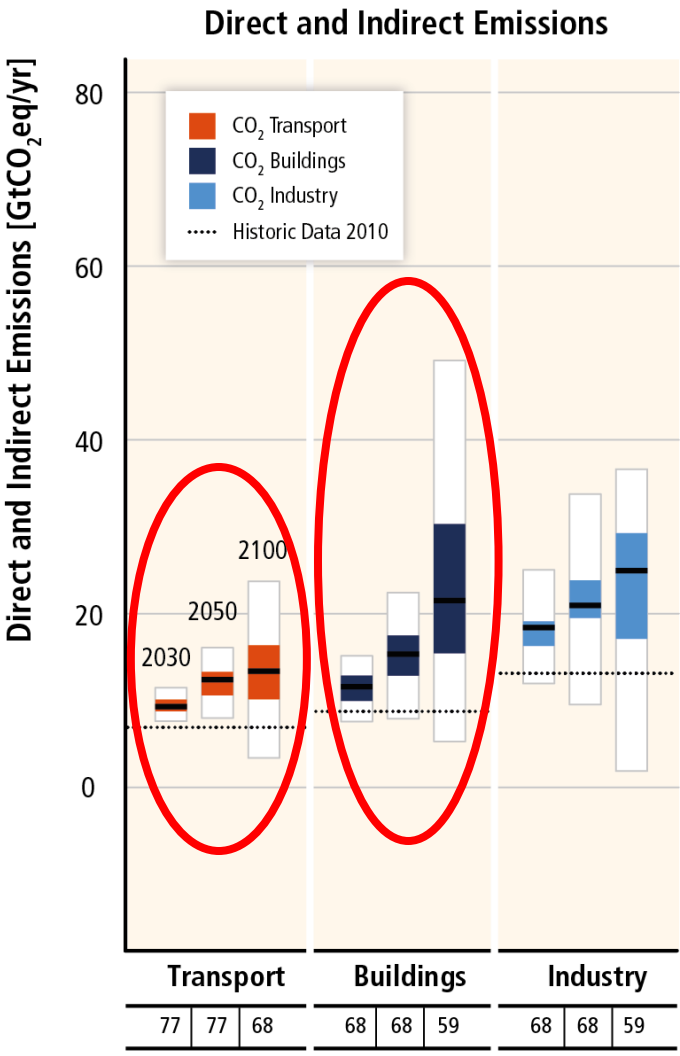
The elements of the solution: Focus on energy end-use and cities

Accounting for indirect emissions has key implications on mitigation strategy!

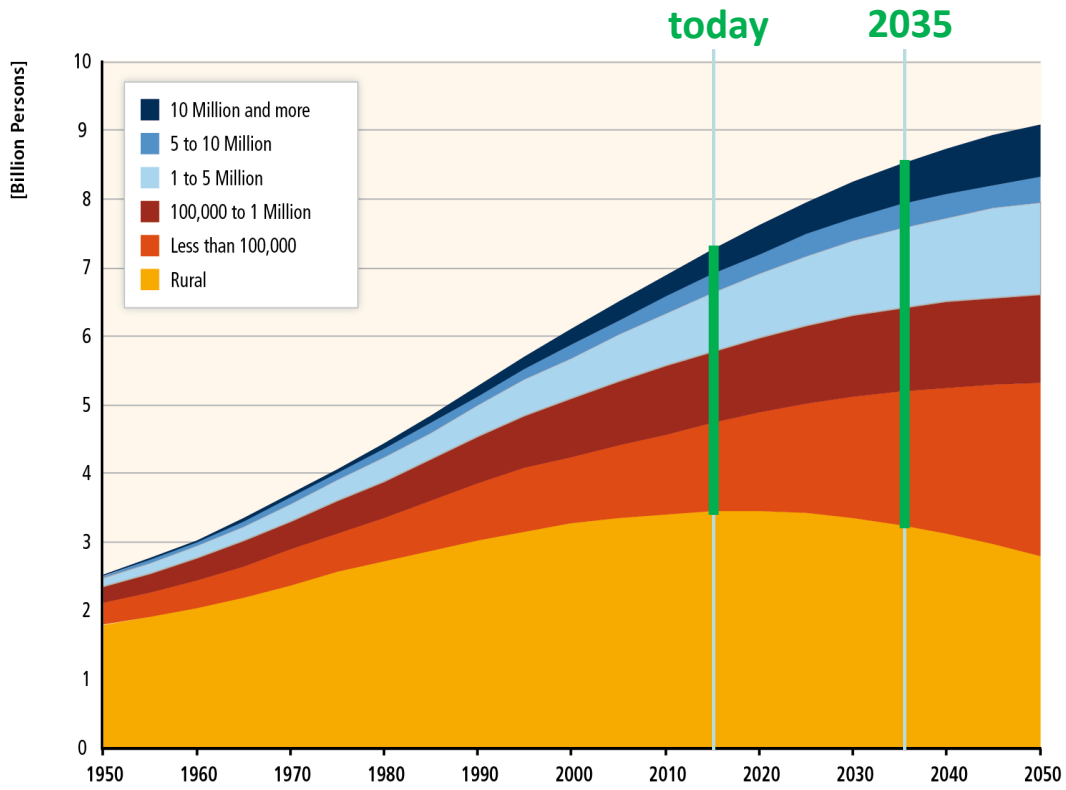


Baseline Scenarios: Direct vs. Indirect Emission Accounting





Source: Volker Krey, using IPCC AR5 Figure SPM.10, TS.15 **Source: Figure TS.15**



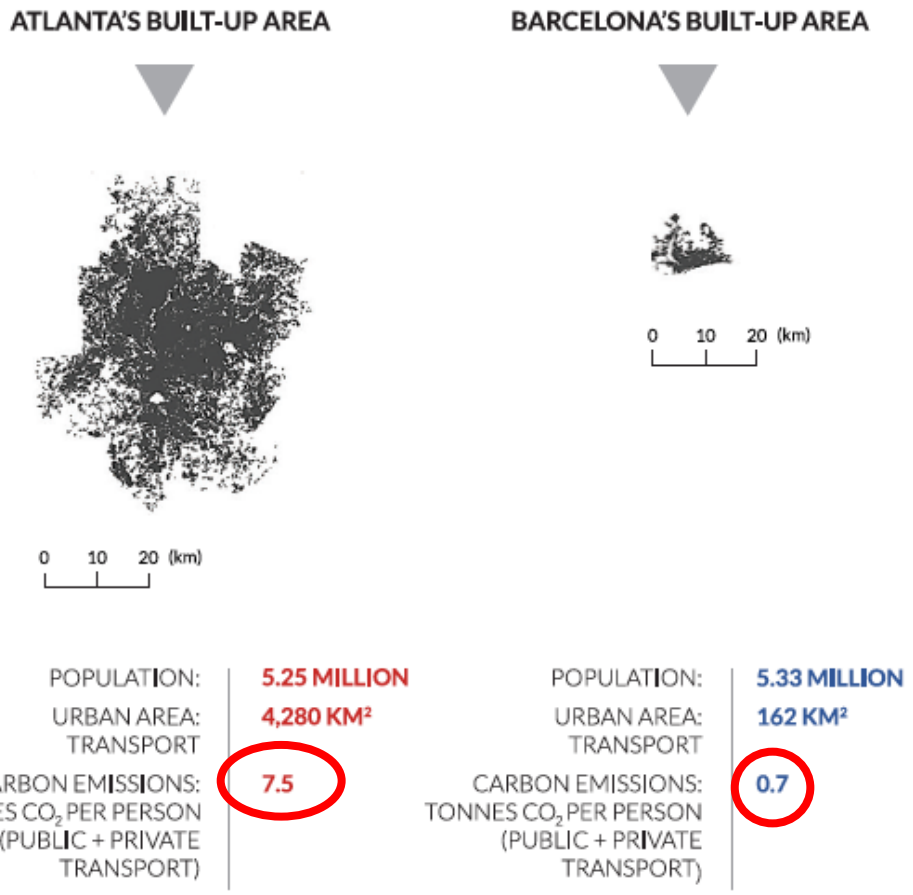
A substantial share of emission increase in the next few decades will come from cities

- Urban areas generate 80% of GDP and 71% - 76% of CO2 emissions from global energy use
- Each week the urban population increases by 1.3 million
- By 2050 urban population is to increase by up to 3 billion
- Over 70% of global building energy use increase will take place in developing country cities
- This enormous expected increase poses both an opportunity and responsibility

A broad array of opportunities exist to keep these emissions at bay while maintaining or increasing service levels

- Urban design and form
- Energy-efficient transport systems
  - Encouraging non-motorized and public transport
  - Efficient, small vehicles
- Energy efficient buildings
  - low-energy architecture
  - High-efficiency appliances, lighting and equipment
  - High performance operation of buildings (mainly commercial)
- Fuel switch to low-carbon energy sources (RES) or high-efficiency equipment using energy contributing to CC
  - Hi eff cookstoves
- Lowering embodied energy in the built infrastructure and products –
  - affordable low-carbon, durable construction materials
  - Towards the circular economy: reuse and sharing economy
- Carbon storage in construction materials?
- Lifestyle, behavior, culture

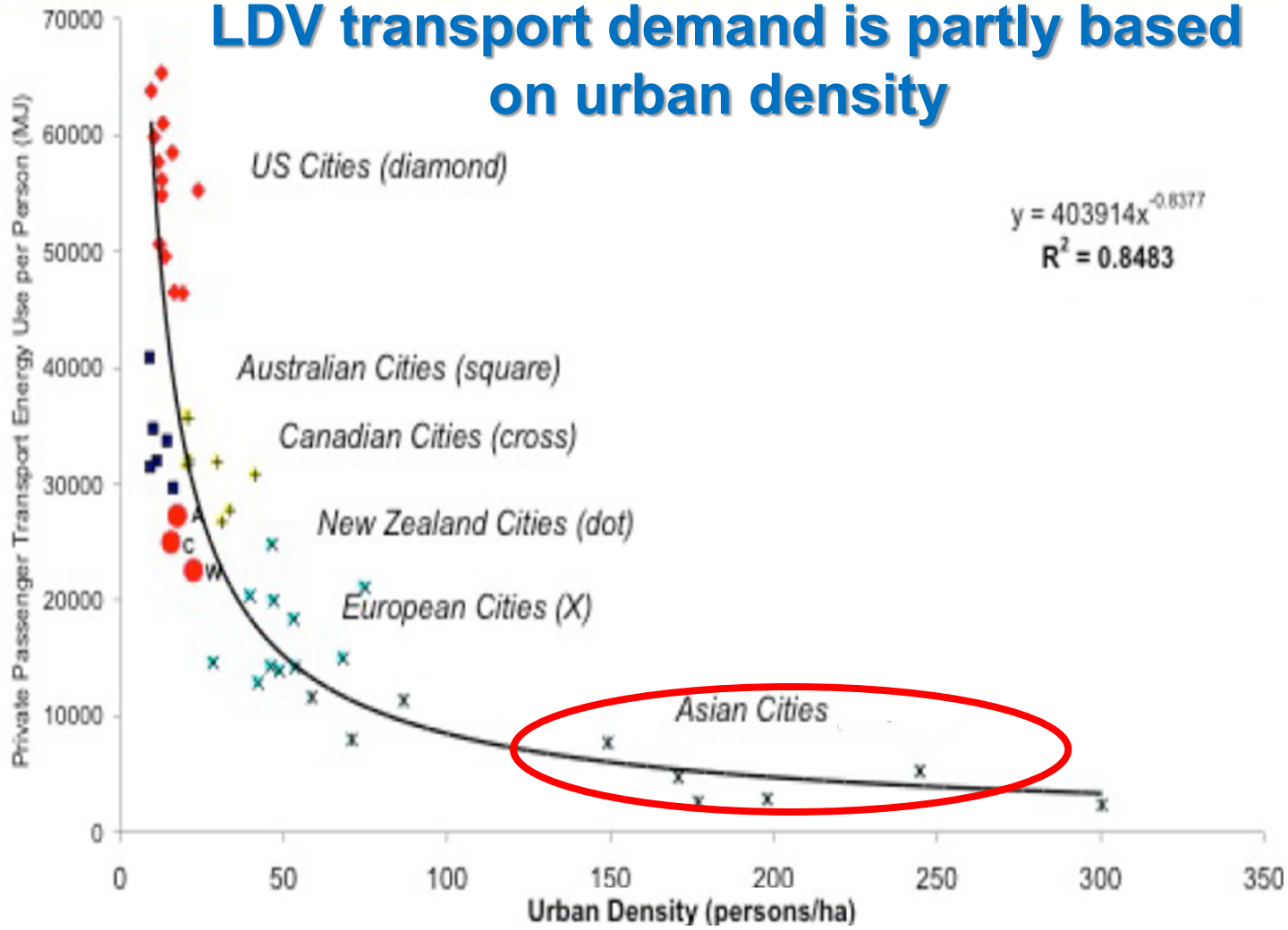
Barcelona vs atlanta



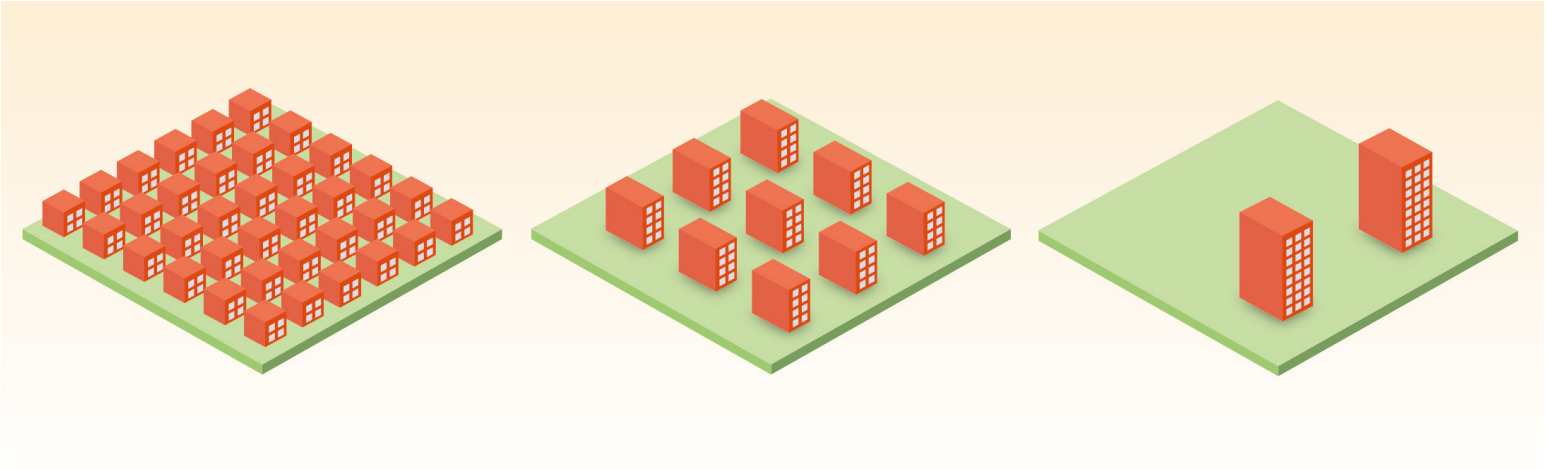
Urban planning can make a very significant difference in urban emissions

Source: UN 2014 as cited by Fischedick, CFCC 2015

LDV transport demand is partly based on urban density

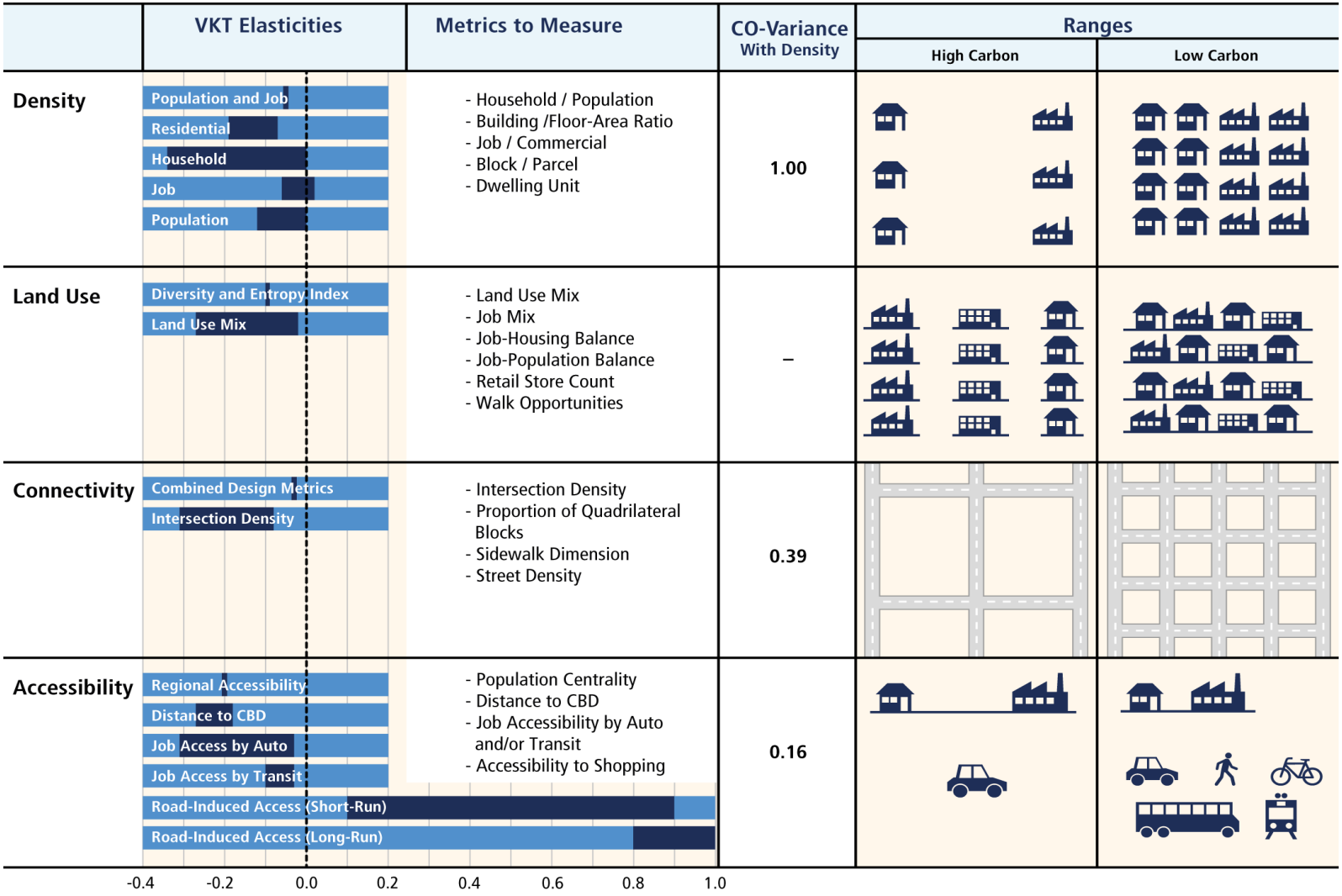


Increasing urban density is a necessary but not sufficient condition for lowering urban emissions



Working Group III contribution to the IPCC Fifth Assessment Report, courtesy of Karen Seto

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



Mitigation opportunities through urban planning:

1. increasing accessibility
2. increasing connectivity
3. increasing land use mix
4. increasing transit options
5. increasing and co-locating employment and residential densities
6. increasing green space and other carbon sinks
7. Increasing white and light-colored surfaces

Example of savings by reconstruction

Before reconstruction

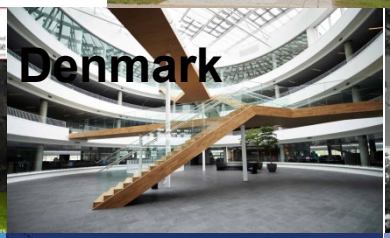
over 150 kWh/(m²a)

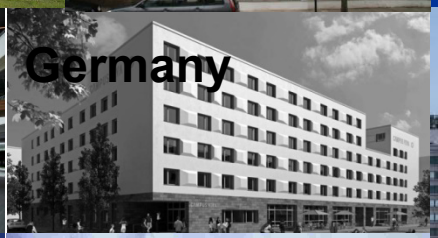
-90%

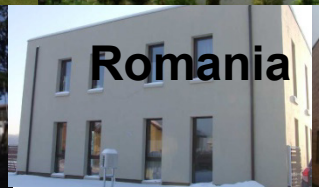
Reconstruction according to the passive house principle

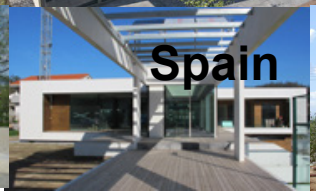
15 kWh/(m²a)

55.000 Passive Houses exist in 28 European member countries









PASSIVHAUS Austria
www.passivhaus-austria.org

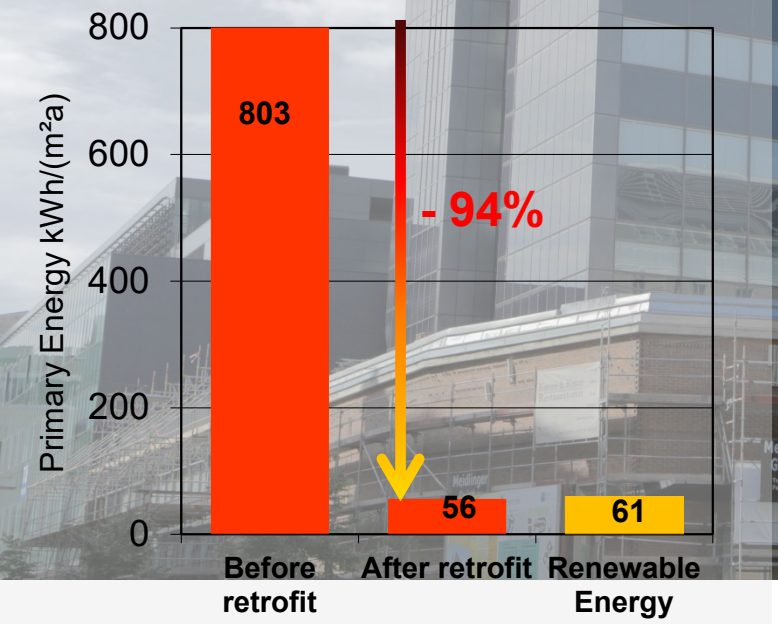
International PASSIVE HOUSE Association iPHA

Passive House Institute

First retrofit to Passive House Plus

Office building **Technical University Vienna**
Architect: Arch. DI Gerhard Kratochwil
Building physics: Schöberl & Pöll GmbH
Owner: BIG Bundesimmobilien gesmbH

Treated floor area: 7,322 m² = 80,000 ft²
Heating demand: 14 kWh/m²a = 4.4 kBTU/ft²a
Heat load: 9 W/m² = 2.85 BTU/ft²
Primary energy: 56 kWh/m²a = 17.75 kBTU/ft²a



PASSIVHAUS Austria www.passivhaus-austria.org
International PASSIVE HOUSE Association iPHA
Passive House Institute

Passsive houses spread around the world

Based on draft UNEP Emissions Gap Report, contributed by PHI

World's largest Passive House city district

Zero-Emission-City areal **Heidelberg-Bahnstadt**

116 ha, 1,700 flats

Passive House as Standard for urban development

www.heidelberg-bahnstadt.de

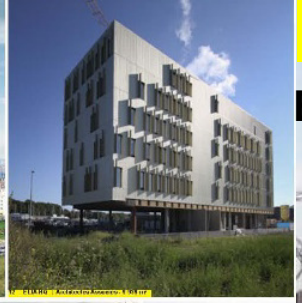
PASSIVHAUS Austria
www.passivhaus-austria.org

International PASSIVE HOUSE Association iPHA

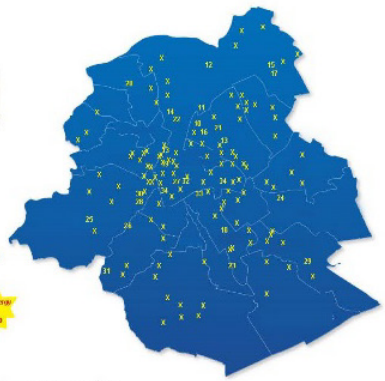
Passive House Institute

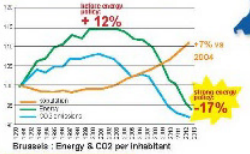
Belgian Energy provider Elia

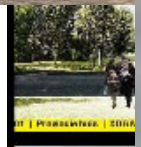
Brussels mandated Passive House in January 2015



Sinds 2010:
all public buildings
are passivehouse







>2015:
all new
building must
achieve
Passivehouse
standard

Brussels

High rise renovation to full PH

PASSIVHAUS
Austria
www.passivhaus-austria.org

International
PASSIVE HOUSE
Association
iPHA

Passive House
Institute

Brussels Environnement Ministry

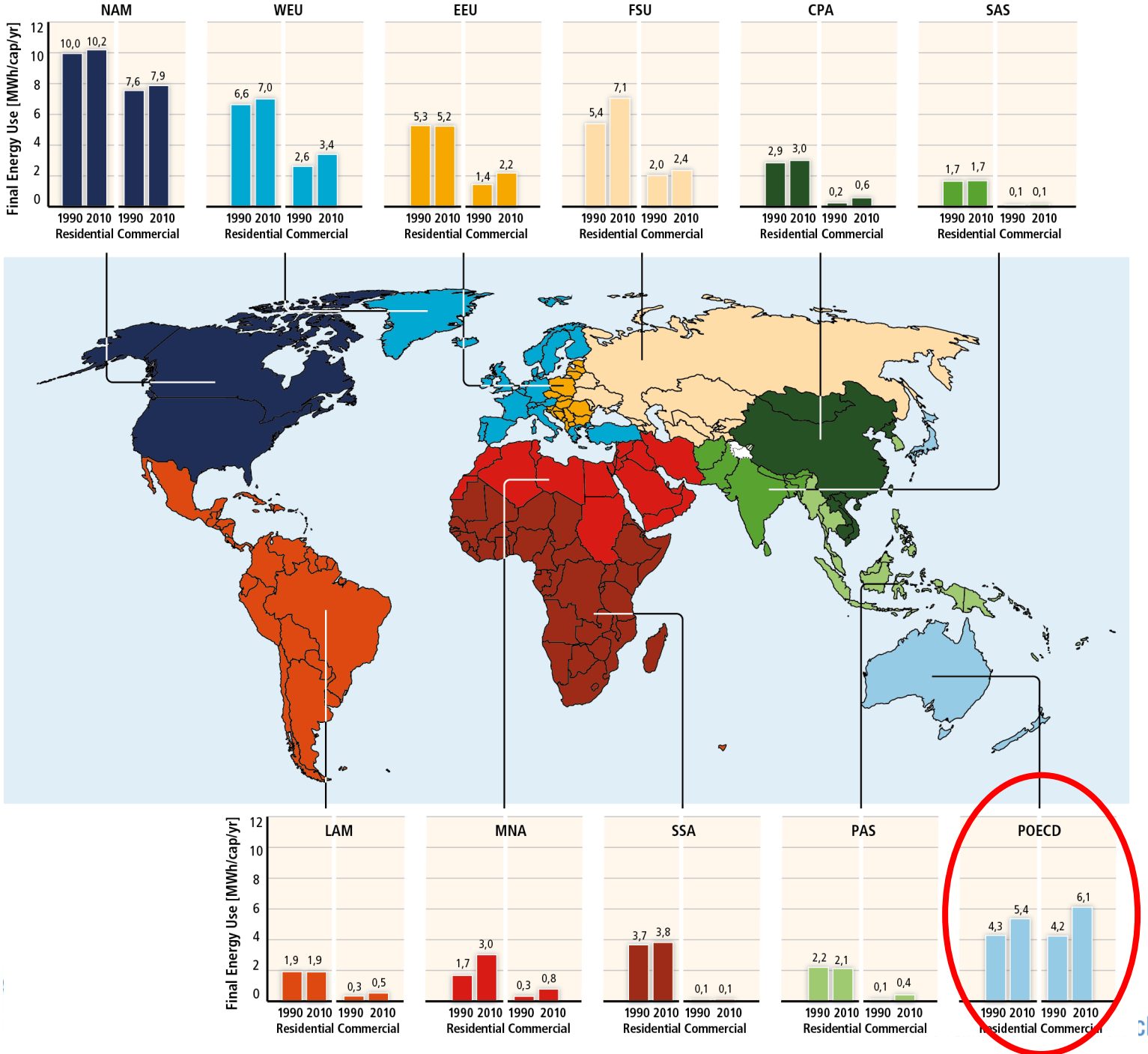
New York City may go Passive

A Roadmap for New York City's Buildings:

"The City Government will implement leading edge performance standards for new construction that cost effective achieve highly efficient buildings, **looking to Passive House to inform the standards**"

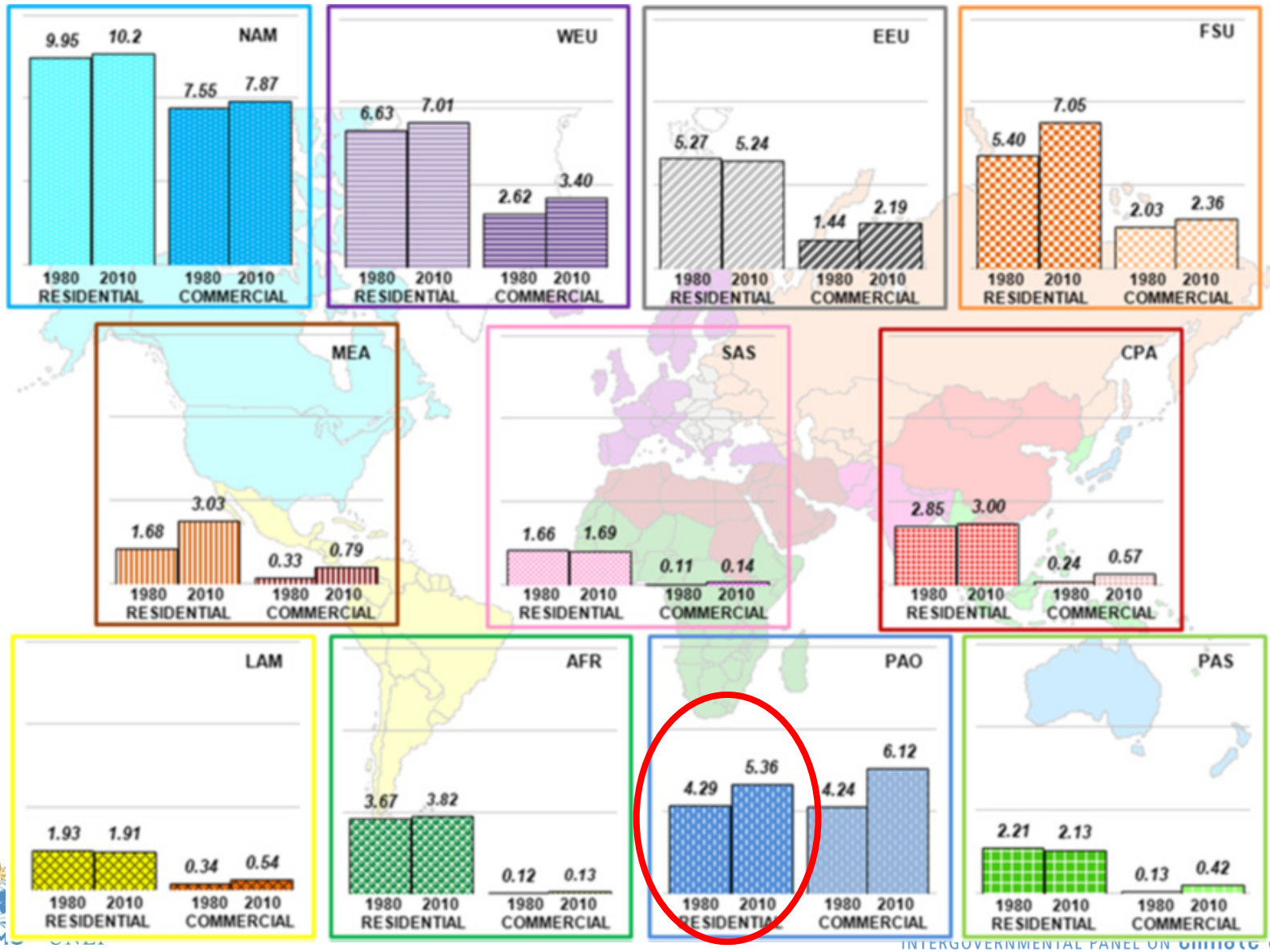
Increased efficiency has been a very powerful tool to keep emission and energy demand increases at bay for decades

Per capita residential and commercial energy use, 1990 - 2010



ipcc climate change

Per capita final energy use in IEA regions, 1980 and 2010



There are several mitigation options that can also contribute towards development goals

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"Overall, the potential for co - benefits for energy end - use measures outweigh the potential

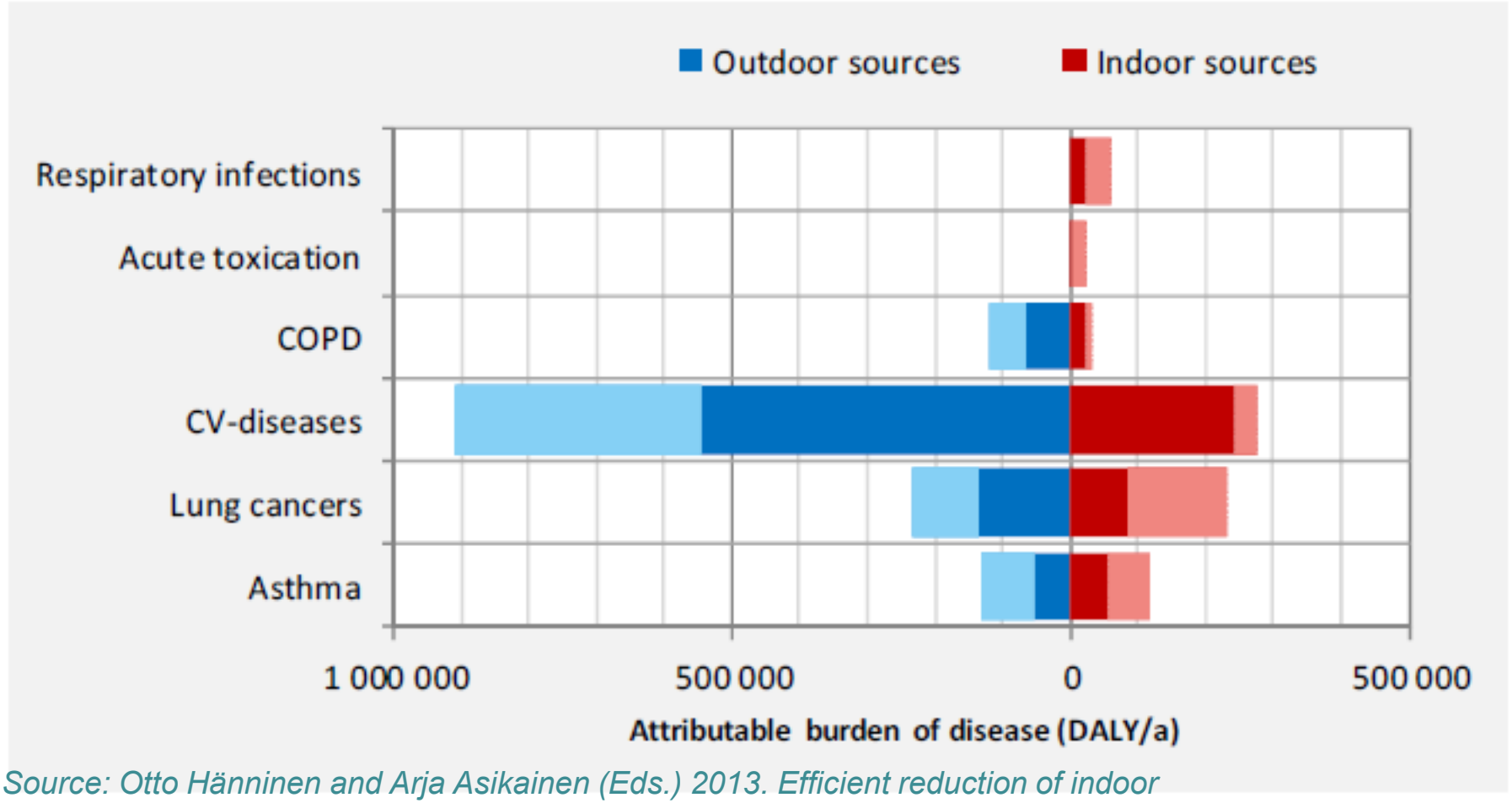
for adverse side - effects, whereas the evidence suggests this may not be the case for all energy supply and AFOLU measures." (SPM 4.1)

How mitigation options can go hand-in-hand with development goals (co-benefits)

- Air quality improvement – indoor and outdoor
- Health – e.g. through indoor and outdoor air quality improvement, reduced thermal stress, increased activity
- Energy security
- Efficiency increases access to energy services
  - fuel poverty could be eliminated
- Better employment and economic opportunities through accessivity
- Reduced congestion
- Others: biodiversity conservation, water availability, food security, income distribution, improved productivity, efficiency of the taxation system, labour supply and employment, urban sprawl, and the sustainability of the growth of developing countries

Attributable burden of diseases due to indoor exposures in 2010 in EU26

The lighter shade represents the maximum reducible fraction through well operated ventilation systems



Source: Otto Hänninen and Arja Asikainen (Eds.) 2013. Efficient reduction of indoor exposures Health benefits from optimizing ventilation, filtration and indoor source controls

Plans for the Sixth Assessment Report Cycle

Outlook to AR6

- Key new developments since AR5: Paris Agreement, Sustainable Development Goals
  - How to integrate these with the climate agenda?
  - Sustainable development is now the key framing concept for AR6 products
  - Special Report on 1.5C climate change
- how to bridge the emissions gap? More emphasis on SRM, CDR, and other disruptive innovations
- While the technological solutions, economic costs, implementation pathways and governance options are more or less well understood, the human-social aspects have been less covered by IPCC before
- Among others,AR6 will have more emphasis on the social science aspects

Main Products during the AR6 cycle

1) The Special Reports

Special Report on Global Warming of 1.5°C (SR15)

PARIS2015

Approval Sept 2018

Special Report on Ocean and Cryosphere (SROCC)

Special Report on Climate Change and Land (SRCCL)

Approval Sept 2019

ribution to the
sessment Reports

WMO

INTERGOVERNMENTAL PANEL ON climate change

Agreed outline of WG III AR6

Framing (1 chapter)

1. Introduction and framing

High-level assessment of emission trends, drivers and pathways (3 chapters)

2. Emissions trends and drivers
3. Mitigation pathways compatible with long-term goals
4. Mitigation and development pathways in the near- to mid-term

Sectoral chapters (8 chapters)

5: Demand, services and social aspects of mitigation
6: Energy systems
7. Agriculture, Forestry, and Other Land Uses
8. Urban systems and other settlements
9. Buildings
10. Transport
11. Industry
12. Cross sectoral perspectives

Institutional drivers (2 chapters)

13. National and sub-national policies and institutions
14. International cooperation

Financial and technological drivers (2 chapters)

15. Investment and finance
16. Innovation, technology development and transfer

Synthesis (1 chapter)

17. Accelerating the transition in the context of sustainable development

Set up sustainable development as key framing concept

Balancing sources and sinks/warming levels

NDCs, emissions peaking, mid-century long-term low greenhouse gas emission development strategies

Orients sectors to human needs

The sectoral core: maps on to inventories

Responses not captured by sectoral framing

Institutions, policies and cooperation

Financial flows + technological innovation

Synthesis sustainable development in different geographical scales

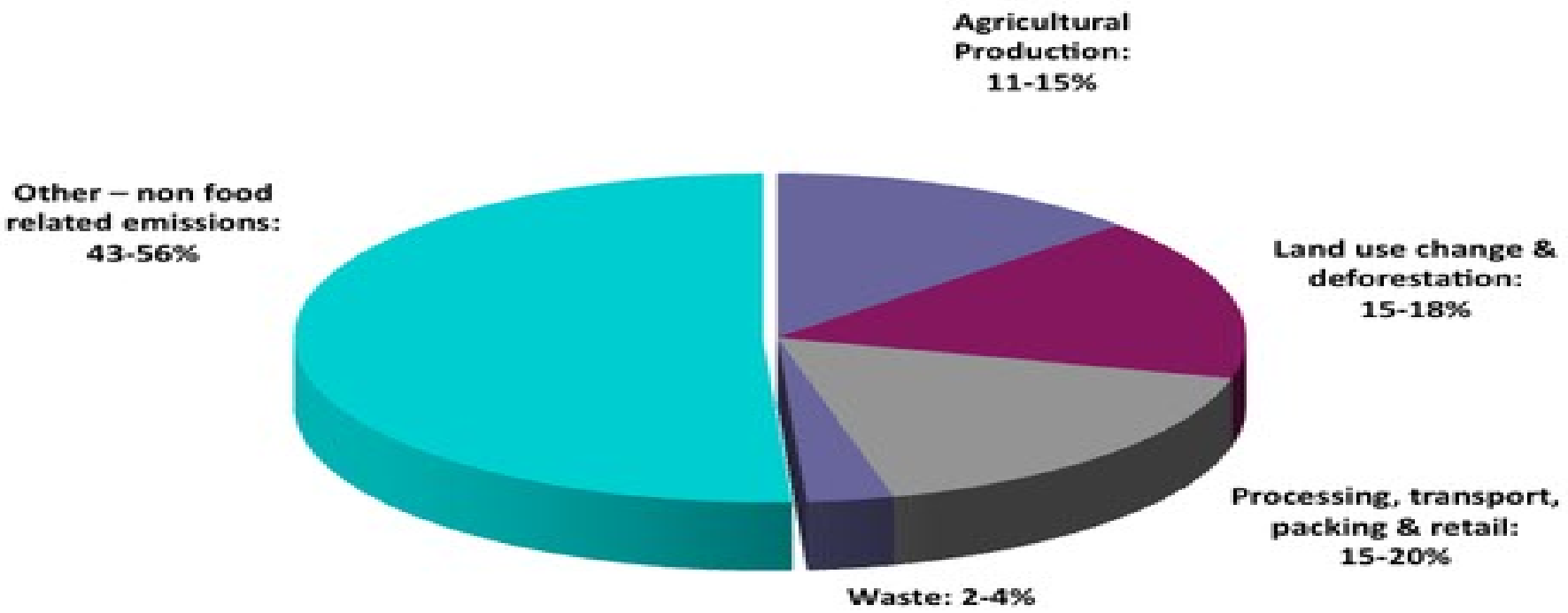
Chapter 5: Demand, services and social aspects of mitigation

- Mitigation, sustainable development and the SDGs (human needs, access to **services**, and affordability)
- *Patterns of development* and **indicators of wellbeing**
- *Sustainable consumption and production*
- Culture, social norms, practices and behavioural changes for lower resource requirements
- Sharing economy, collaborative consumption, community energy
- Implications of **information and communication technologies for mitigation** opportunities taking account of social change
- **Circular economy** (maximising material and resource efficiency, closing loops): and insights from life cycle assessment and material flow analysis
- Social acceptability of supply and demand solutions
- Leapfrogging, capacity for change, feasible rates of change and lock-ins
- Identifying actors, their roles and relationships
- Impacts of non-mitigation policies (welfare, housing, land use, employment, etc.)
- Policies facilitating **behavioural and lifestyle change**

Chapter 12: cross-sectoral perspectives

- Summary of **sectoral costs and potentials**
- Comparison of sectoral costs and potentials with integrated assessments
- Summary of sectoral **co-benefits and trade-offs**
- Aspects of **GHG removal techniques** not covered in chapters 6 to 11 (land based, ocean based, direct air capture): status, costs, potentials, governance, risks and impacts, co-benefits, trade-offs and spill-over effects, and their role within mitigation pathways
- Impacts, risks and opportunities from large-scale land-based mitigation: land, water, food security; use of shared resources; management and governance
- Emissions intensity of **food systems** and mitigation opportunities across the food system (production, supply chain, demand and consumption) including emerging food technologies
- Policies related to food system and food security including food waste and food demand
- Links to adaptation and sustainable development (including co-benefits, synergies and trade-offs)

Food and climate change



Source: Grain 2011: file:///C:/Users/USER/Downloads/grain-4357-food-and-climate-change-the-forgotten-link.pdf

The IPCC needs your expertise.
How can you contribute?

Getting involved

1

Contribute to existing literature

IPCC assessments are as good as the literature available. Look out for the various cut off dates for literature for the different reports.

2

As Authors or Review Editors

Bureaux selects Authors and Review Editors from lists of nominations provided by governments and observer organizations. Look out for the calls for nomination of authors and contact your IPCC Focal Point if you are interested in being nominated.

3

As Expert Reviewers

To be involved at the the two review stages; Expert Review of the First Order Draft and Government and Expert Review of the Second Order Draft.

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Author teams – CLAs, LAs, REs

Usually more experienced scientists and practitioners

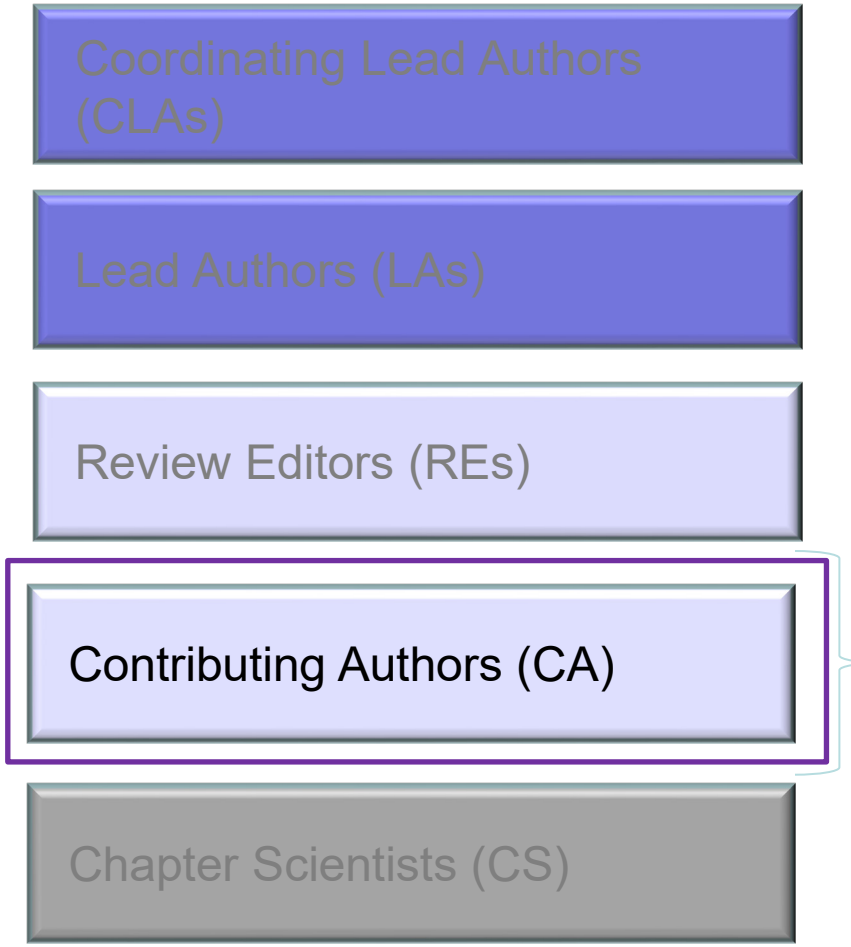
- CLAs and LAs develop the chapter content
- REs ensure comments from the review process are taken into consideration by the team

Selected following a call for nominations

- Proposed by IPCC focal Points from governments and observer organisations, and the IPCC Bureau
- Selected by the Bureau of the relevant IPCC Working Group or Task Force

Call for nominations are published on the IPCC website:
http://ipcc.ch/

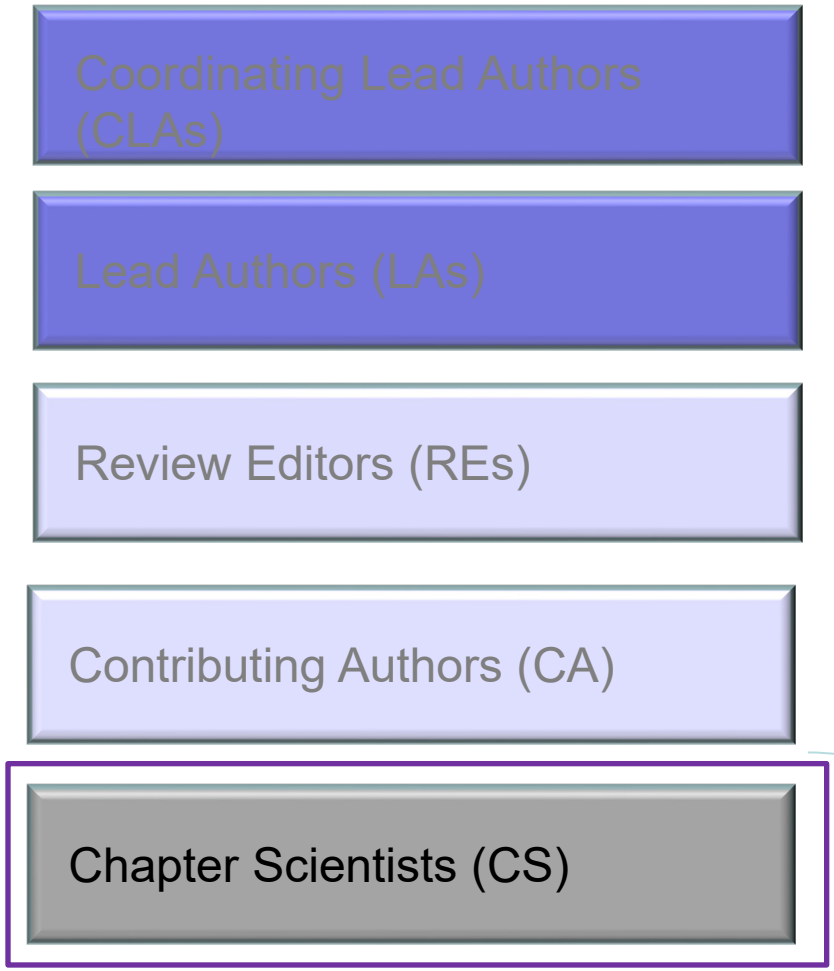
Author teams – CAs



Prepare technical information in the form of text, graphs or data

Contributions
- Solicited by LAs
- Unsolicited contributions also encouraged

Author teams – CS



Scientific assistants who provide support to the author teams

- Technical aspects including cross-checking between findings in different parts of the report
- Additional fact-checking
- Reference management

Recruited

- Directly by CLAs
- Through a call issued by the TSUs

http://wg1.ipcc.ch/
http://www.ipcc-wg2.awi.de/
http://www.ipcc-wg3.ac.uk/
http://www.ipcc-nggip.iges.or.jp/

Products and Important Milestones

	SR15	SRCCL	SROCC	TFI MR	AR6
Call for nominations					Oct 17
First Order Draft	Jul 17	May 18	Apr 18	Dec 17	
Second Order Draft	Jan 18	Oct 18	Nov 18	Jul 18	
Final Government Review	May 18	Apr 19	Jun 19	Jan 19	
Approval Plenary	Oct 18	Aug 19	Sept 19	May 19	

Other Activities	
Cities and Climate Change Science Conference	Mar 18
Expert meeting on SLCF	May 18
Expert meeting on Regional Aspects	May 18

www.citiesipcc.org

How to Contribute?

2017 | 2018 | 2019

SR15

SRCCL

SROCC

FOD – July

SOD – Jan
Approval – Oct

FOD – May
SOD – Oct

Approval – Aug

FOD – Apr
SOD – Nov

Approval – Sept

Expert Reviewer

Contributing Author

Outreach Activities

Thank you for your attention

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Vice Chair, WGIII, IPCC

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Supplementary slides

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AND SUSTAINABLE ENERGY POLICY

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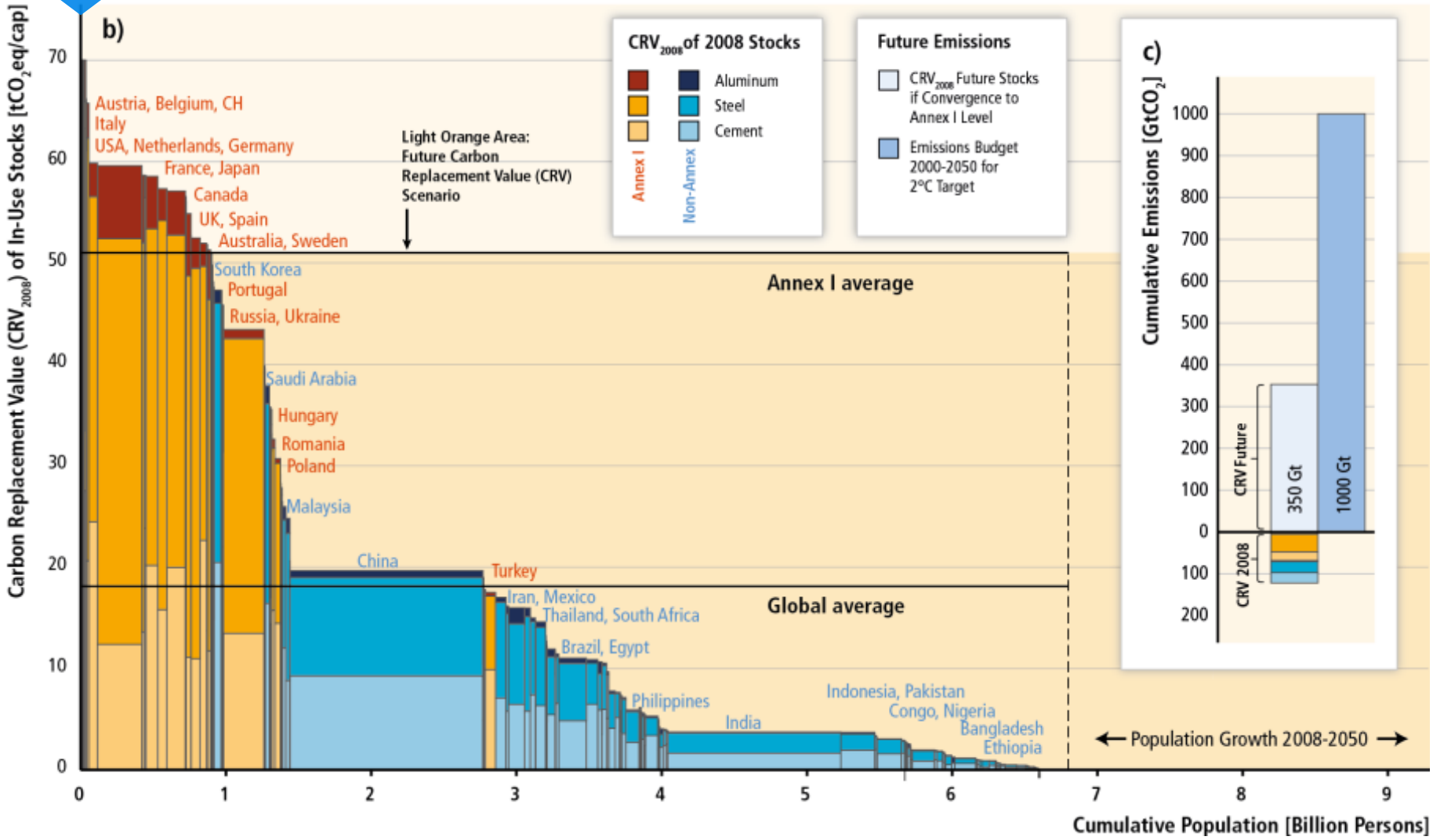
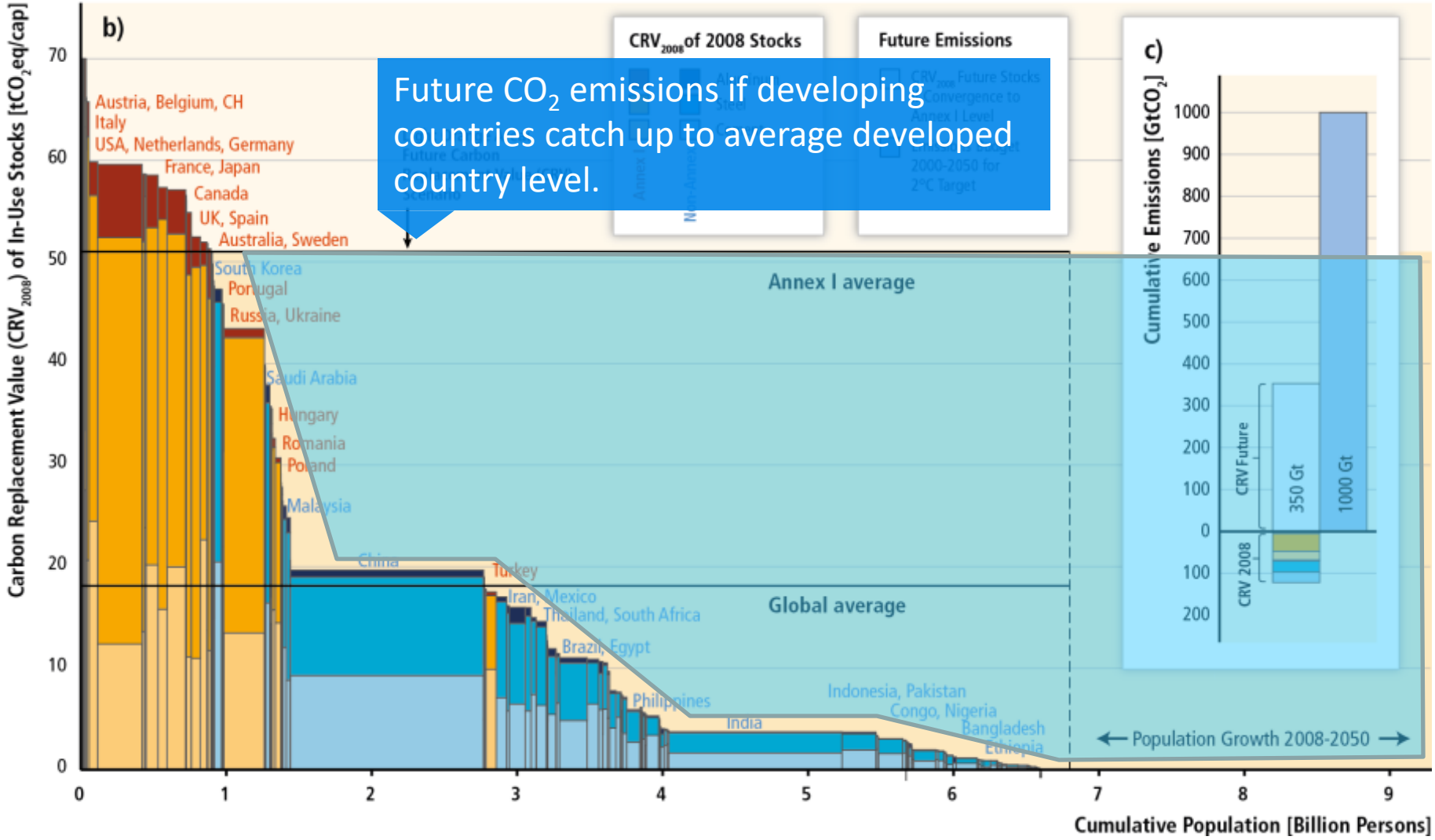
Key Message 4: Infrastructure build-up over the next few decades will result in significant emissions

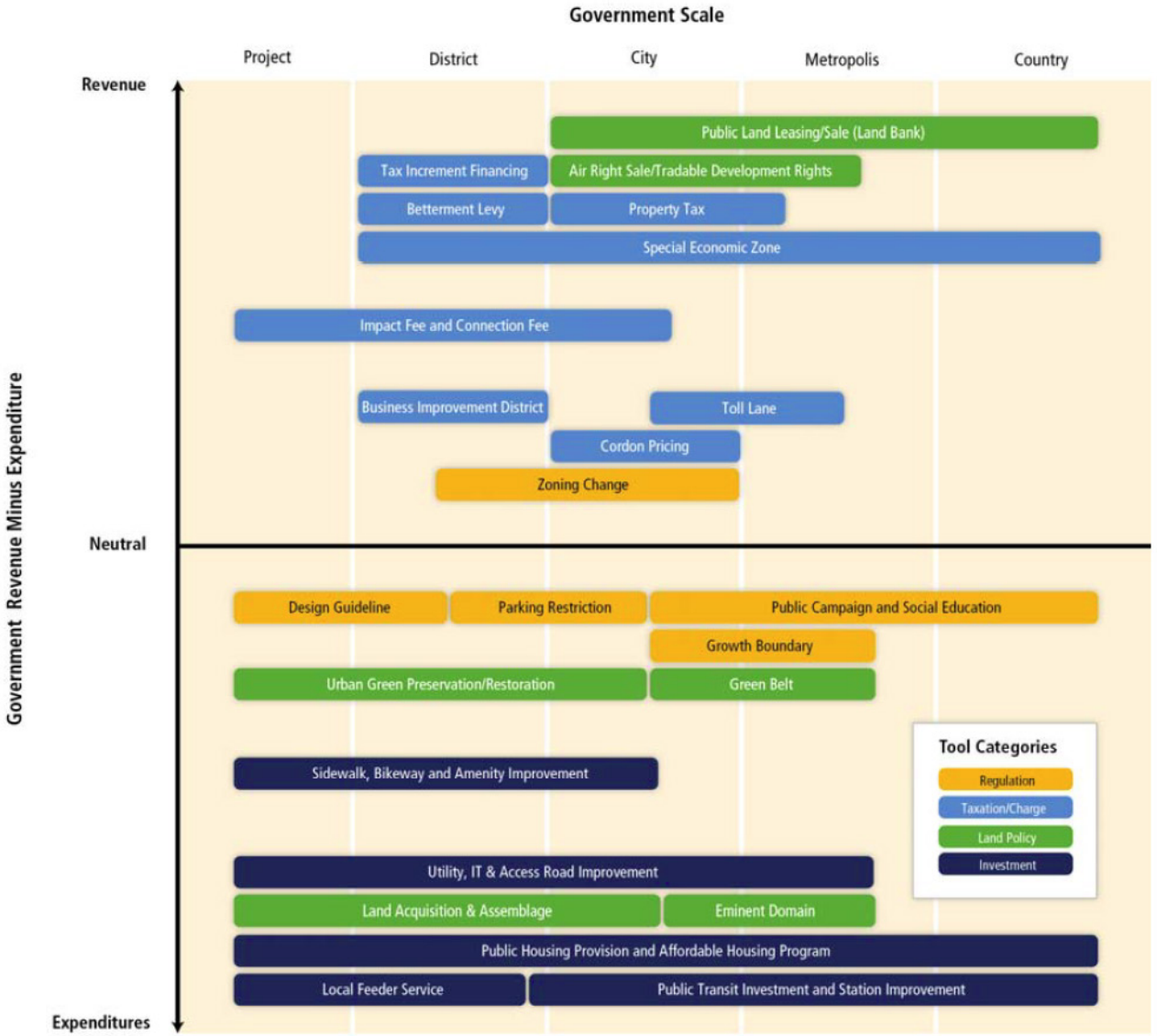
Total CO_2 emissions (per capita) needed to build up today's infrastructure



Key Message 4: Infrastructure build-up over the next few decades will result in significant emissions



Key Message 5: Large mitigation opportunities exist where urban form is not locked in, but often where there are limited financial and institutional capacities



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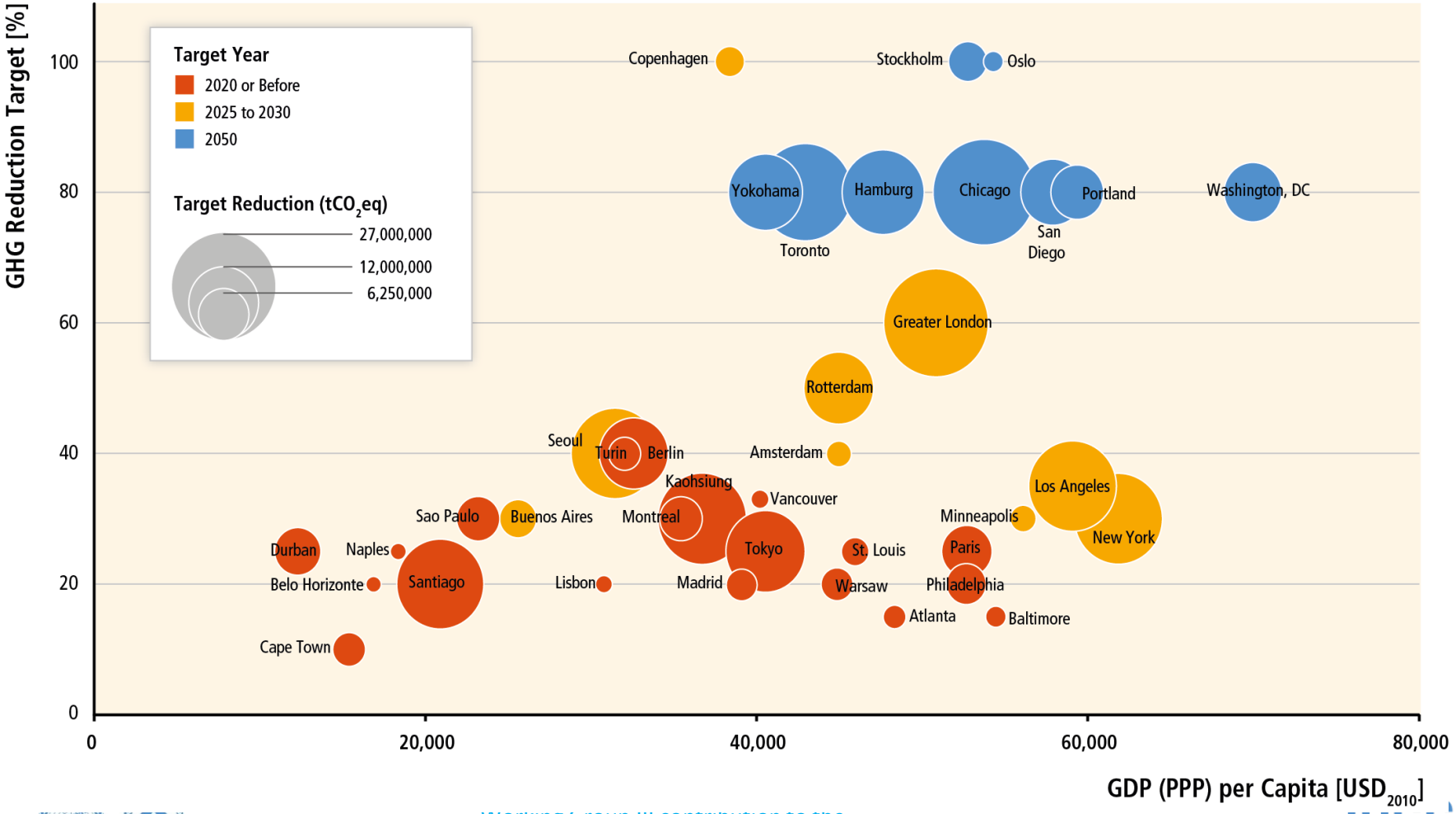
Key Message 6: Thousands of cities are undertaking climate action plans, but their impact on urban emissions is uncertain



Summary

1. Urban areas contribute considerably to global primary energy demand and energy-related CO_2 emissions.

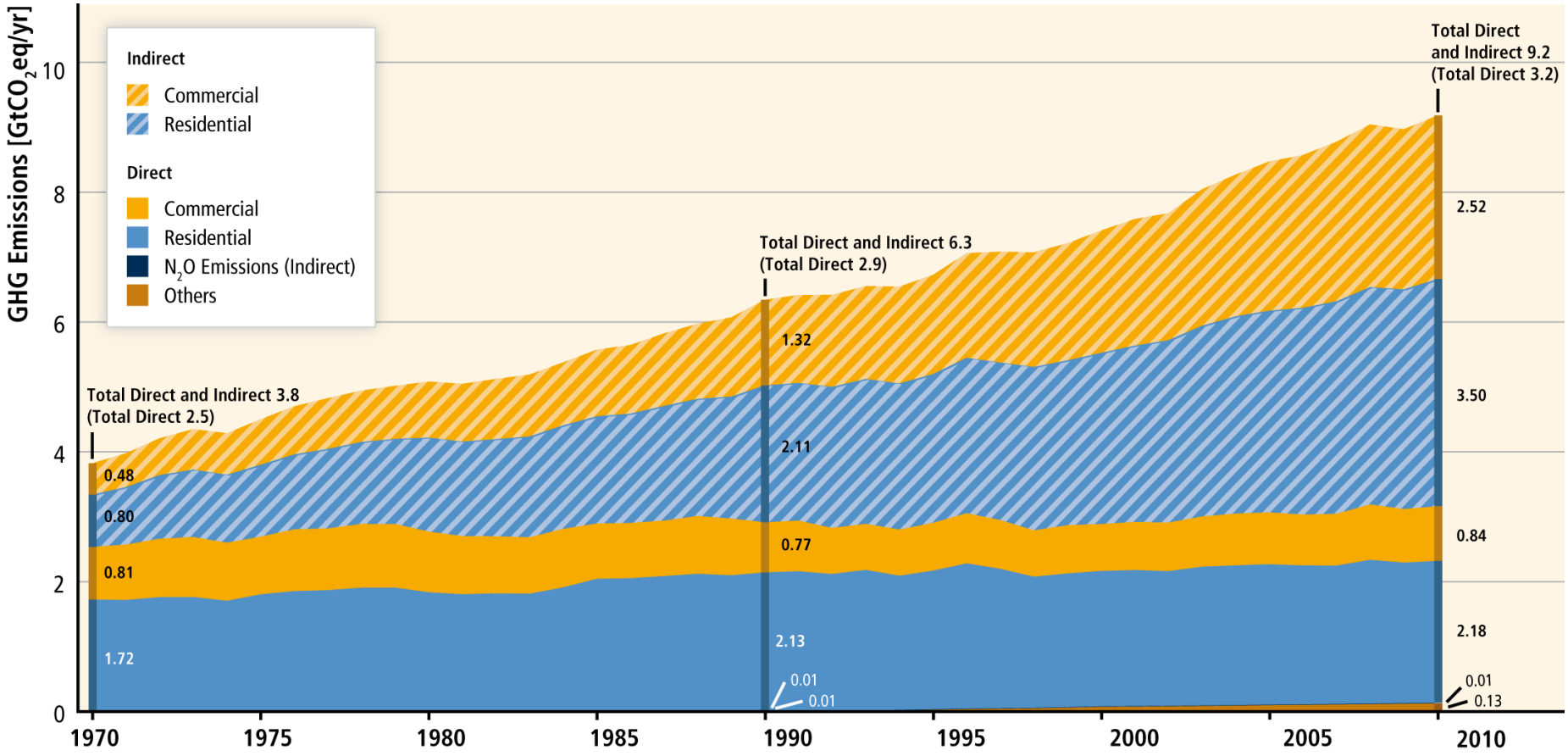
2. The feasibility of spatial planning instruments for climate change mitigation depends highly upon each city's financial and governance capability.

3. Urban planning mitigation options include:
    1. increasing accessibility
    2. increasing connectivity
    3. increasing land use mix
    4. increasing transit options
    5. increasing and co-locating employment and residential densities
    6. increasing green space and other carbon sinks

1. The building sector is responsible for a high share of emissions

In 2010, the building sector accounted for

- 117 EJ or 32% of global final energy
- 25% of energy - related CO2 emissions (9.2 Gt CO2e)
- 51% of global electricity consumption
- a significant amount of F - gas emissions: up to a third of all such emissions
- app. one-third of black carbon emissions



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Working Group III contribution to the
IPCC Fifth and Sixth Assessment Reports

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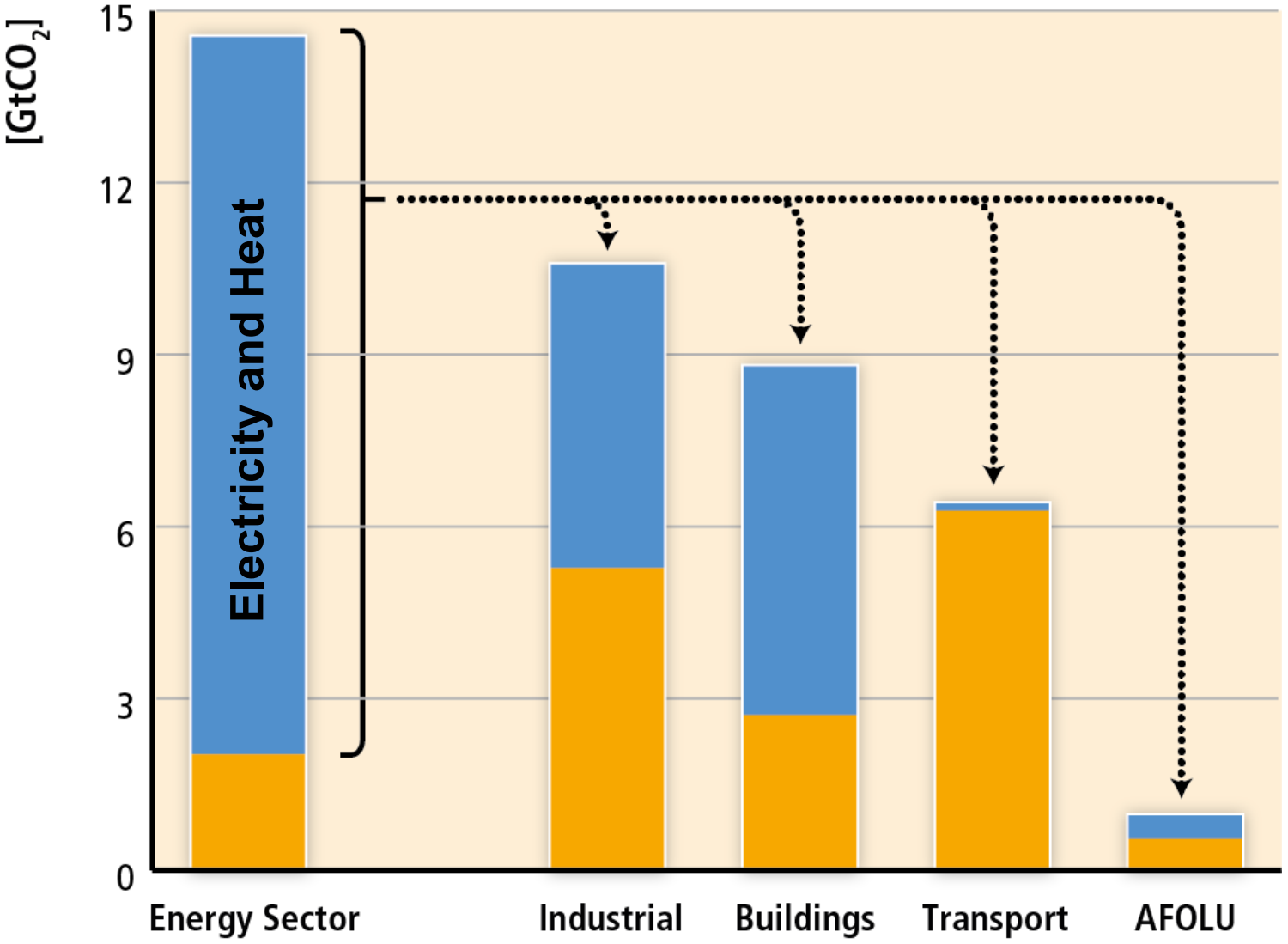
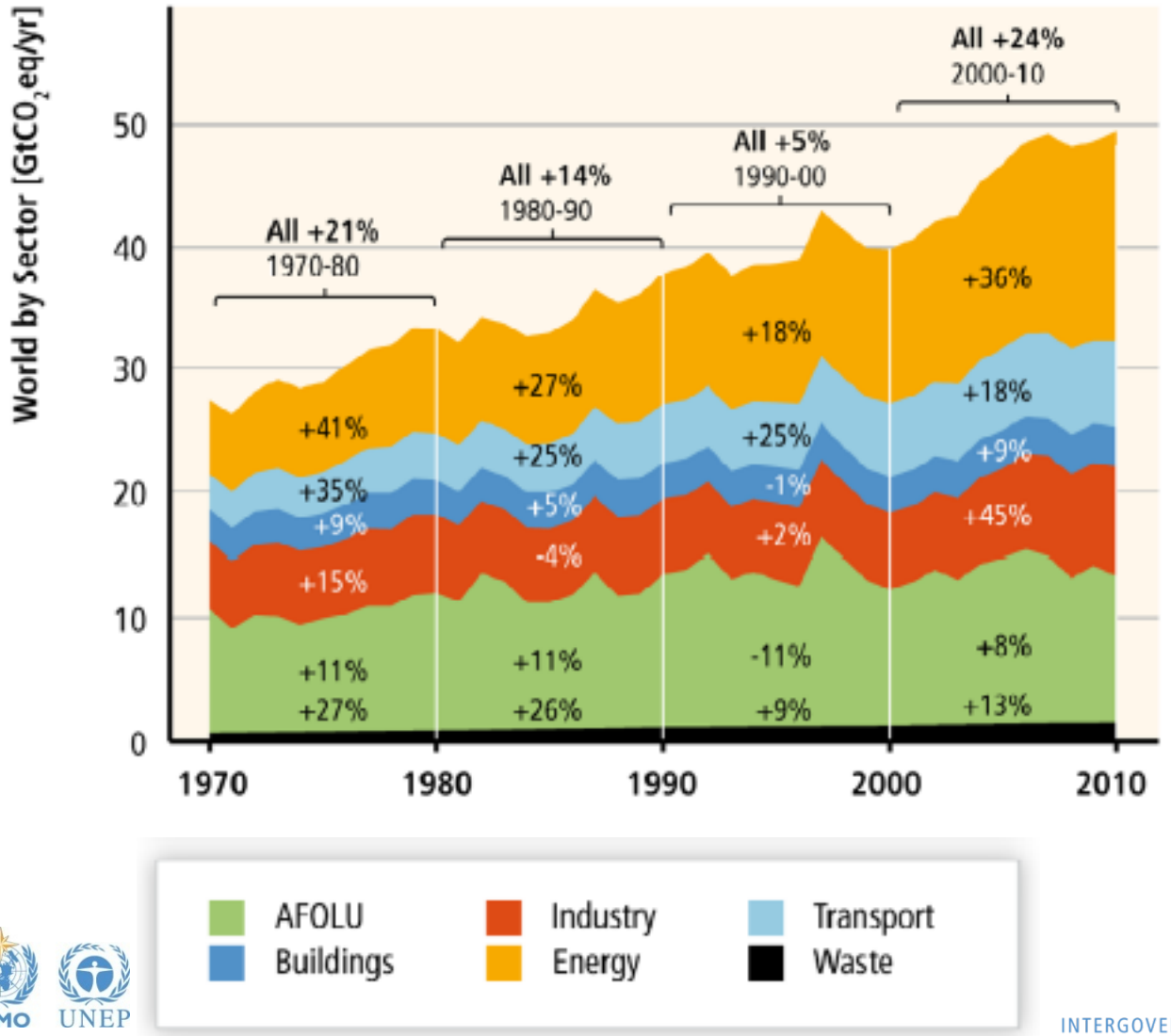
Allocation of Electricity/Heat Generation Emissions to End-use Sectors for 2010



Source: Figure A.II.2

Historical development of emissions by sector (fig 5.18)

(note: direct emissions only)



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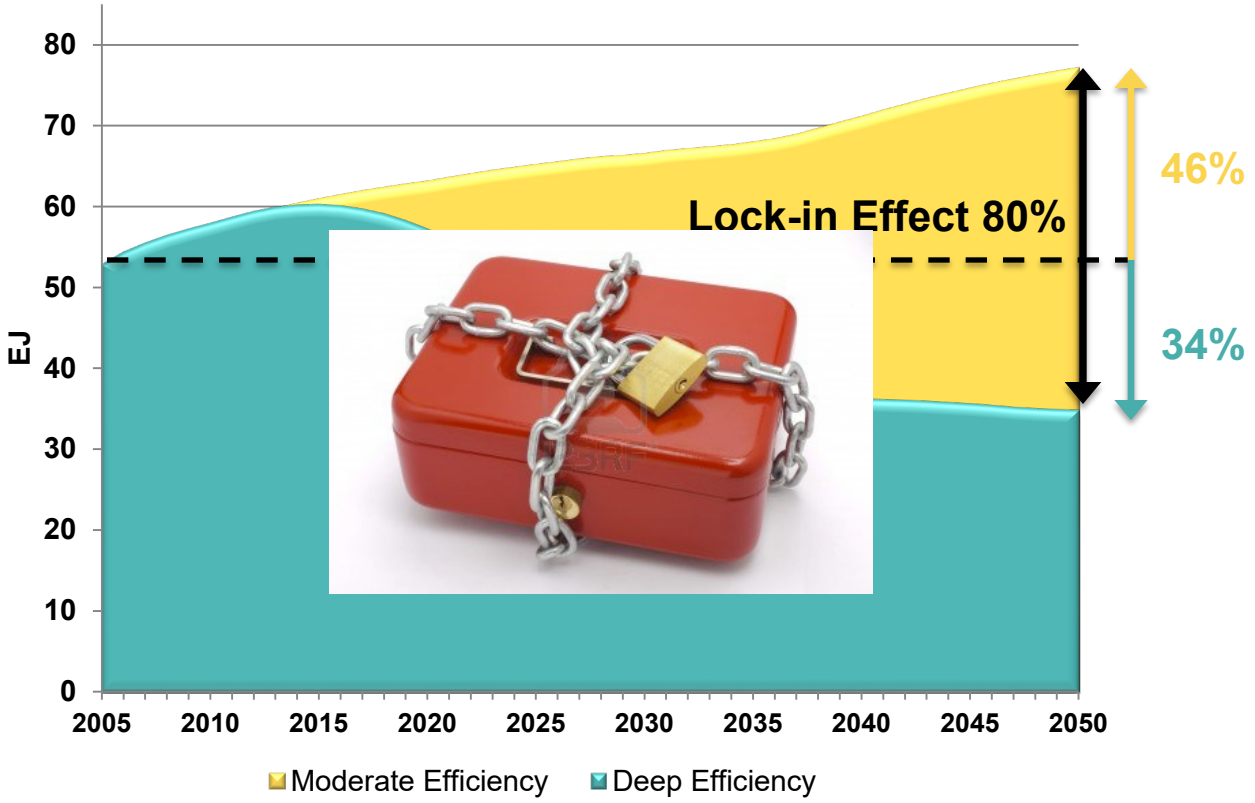
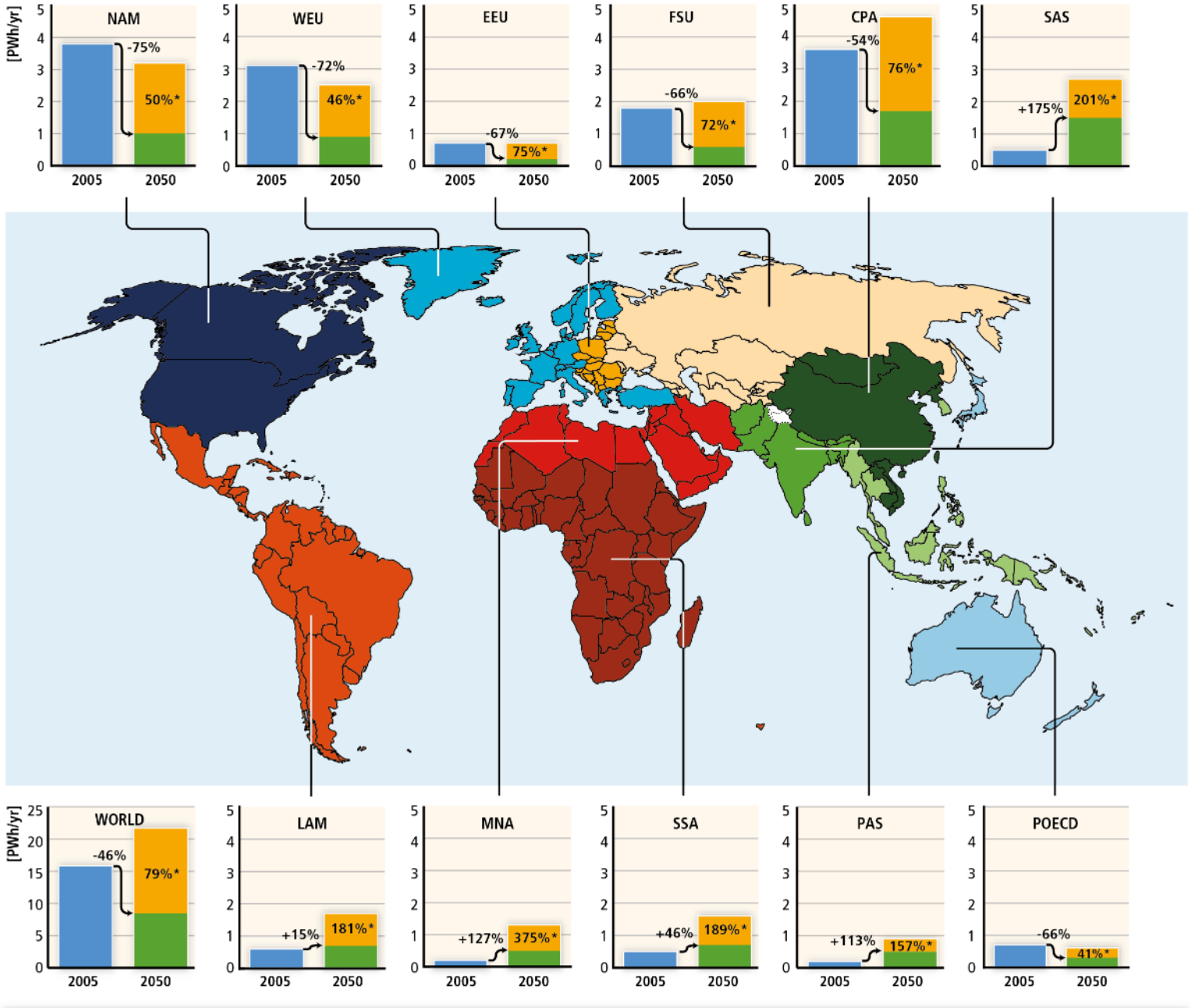
Importance of building sector emissions

- In developed countries most future building emissions can be affected by retrofits….
- …while in developing countries through new construction.

The Lock-in Risk: global heating and cooling final energy in two scenarios



The lock-in risk: heating and cooling energy demand by two scenarios



*Lock-in Risk of Sub-Optimal Scenario Realative to Energy Use in 2005.

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