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Climate change and the role of urban areas

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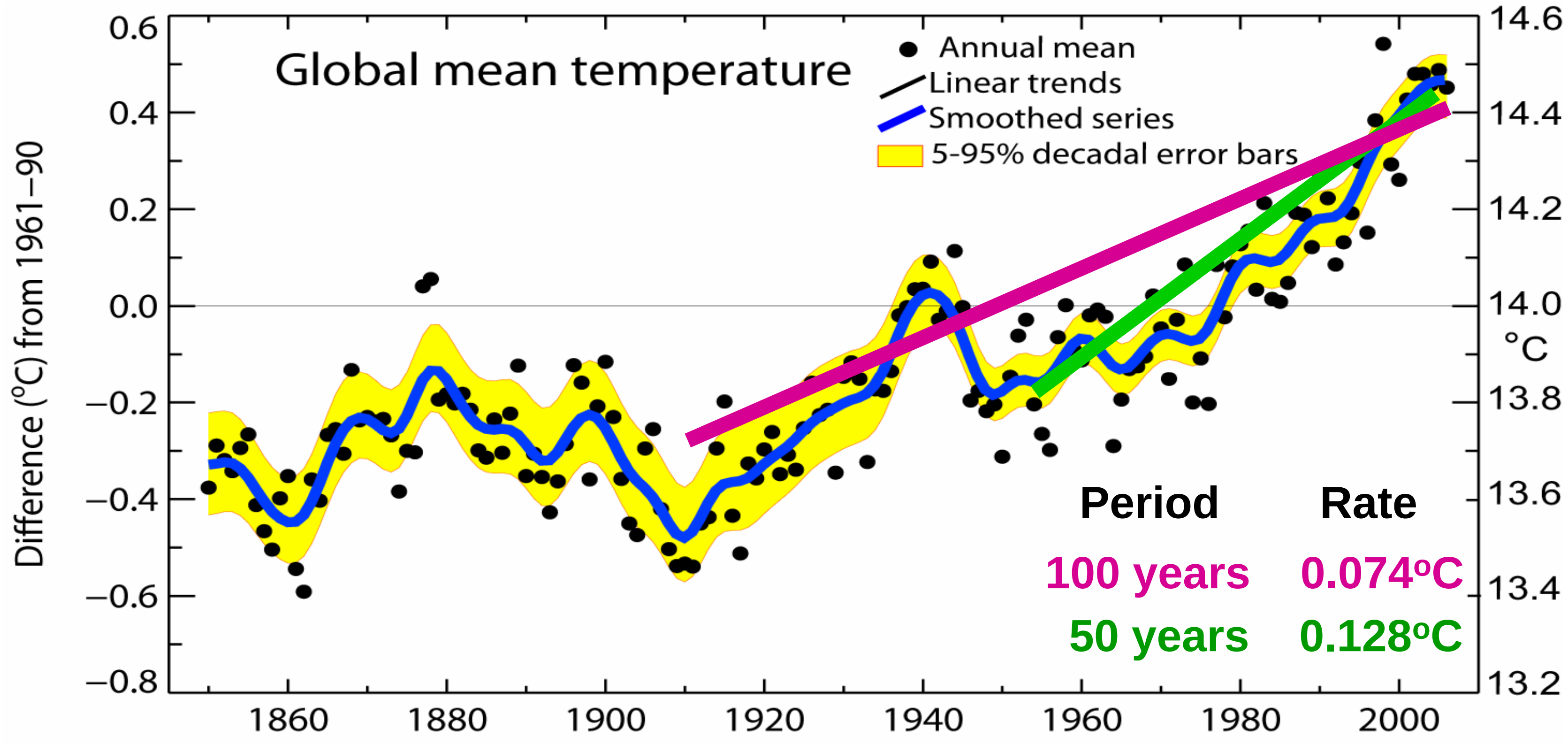
I. Observed changes in climate

Warming of the climate system is unequivocal, as is now evident from observations of increases in average air and ocean temperatures, widespread melting of snow and ice, and rising average sea level

I. Observed changes in climate

Changes in global average surface temperature



Eleven of the last twelve years rank among the twelve warmest years in the instrumental record of global surface temperature

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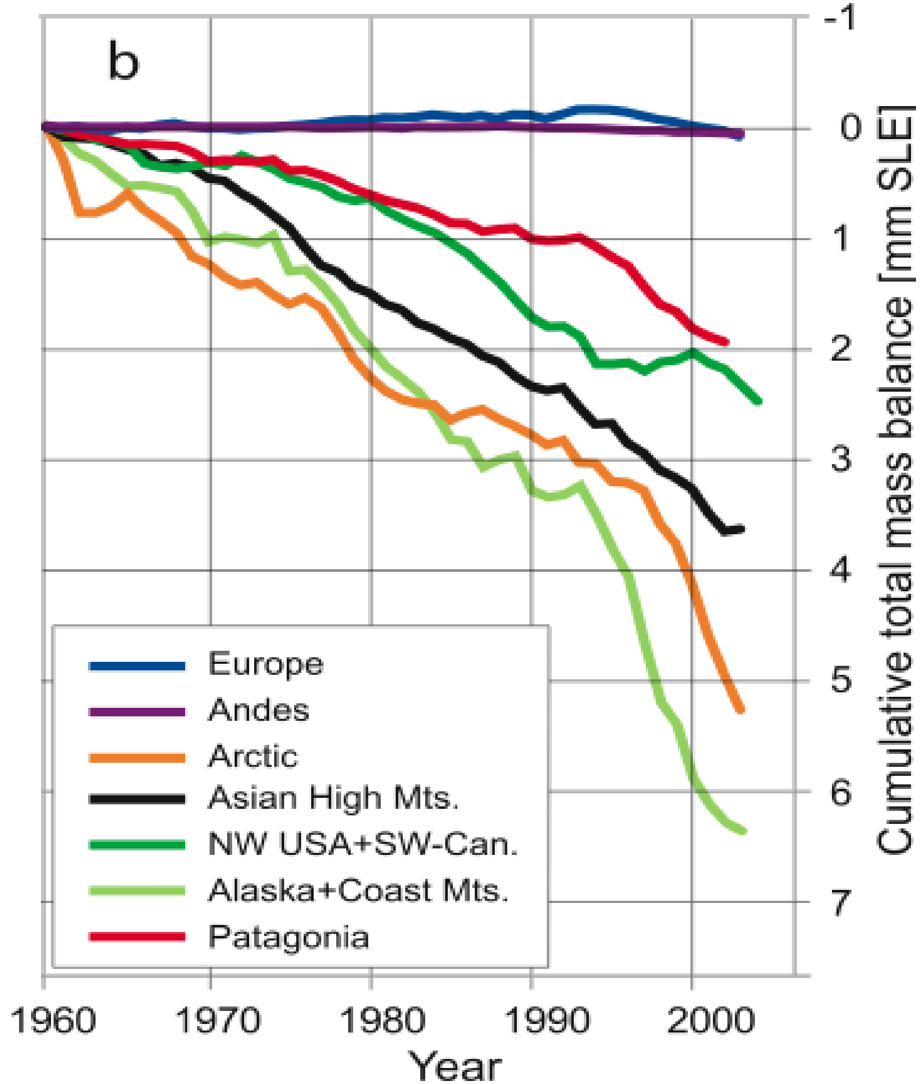
I. Observed changes in climate

Cumulative balance of glacier mass

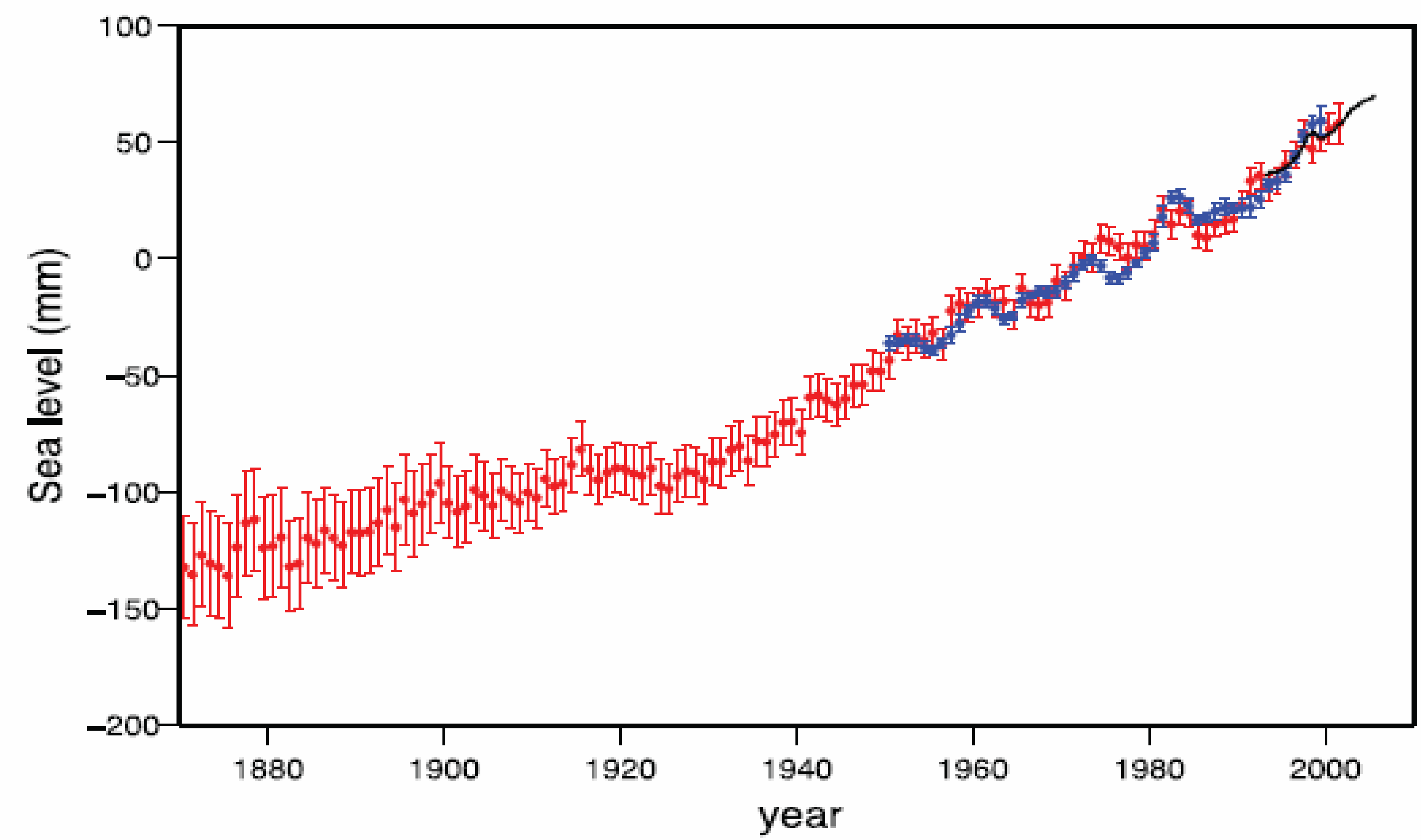
Water supplies stored in glaciers are projected to decline in the course of the century

Decreases in glaciers have contributed to sea level rise



I. Observed changes in climate

Changes in global average sea level



Global average sea level has risen since 1961 at an average rate of 1.8mm/yr and since 1993 at 3.1mm/yr

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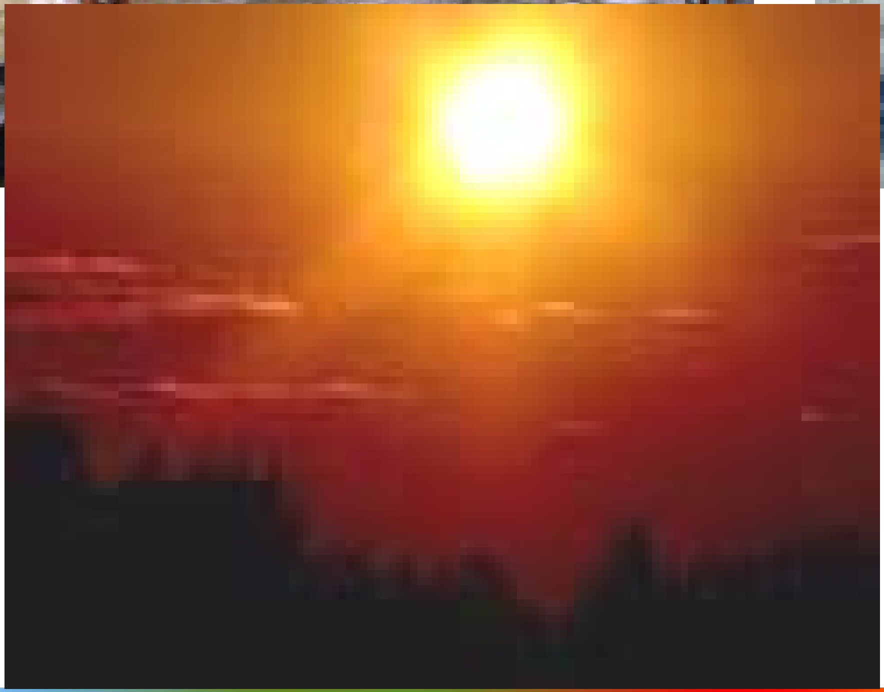
I. Observed changes in climate



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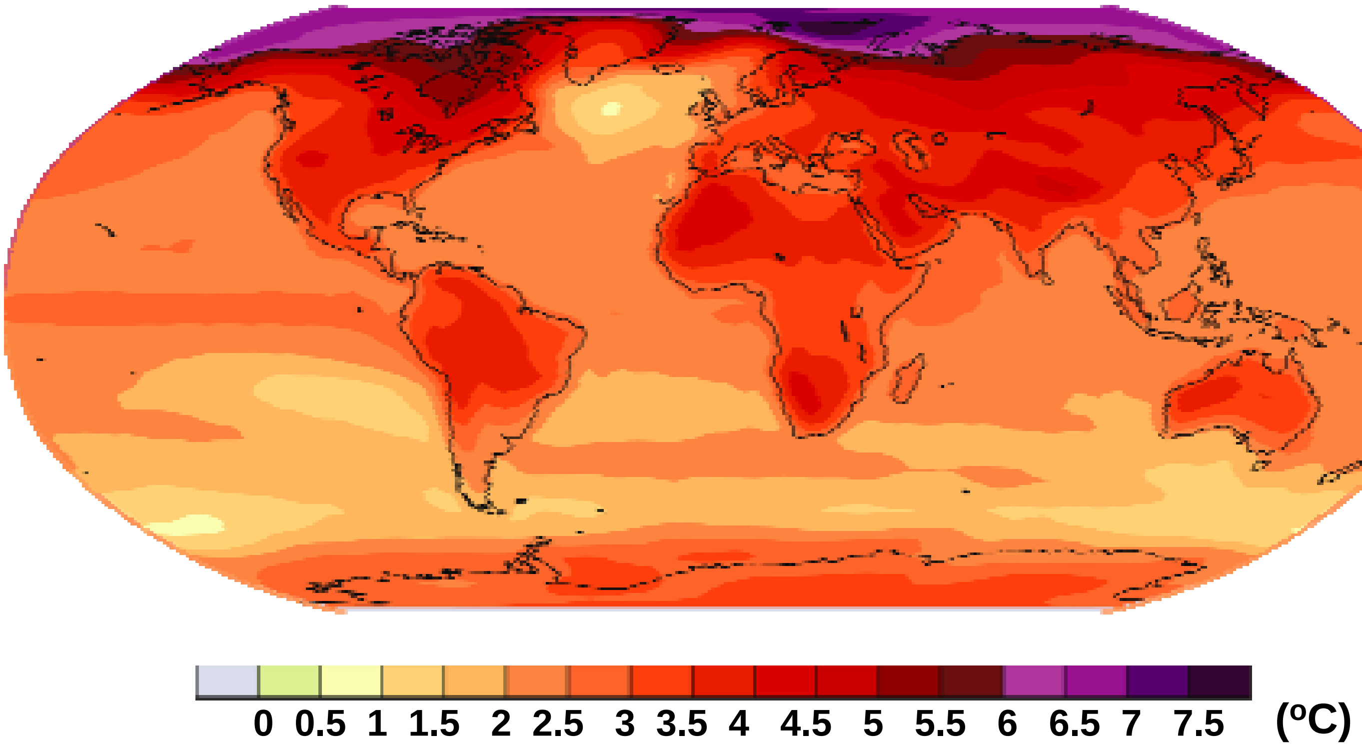
II. Projections and impacts

Projected surface temperature changes
(2090-2099 relative to 1980-1999)



Continued emissions would lead to further warming of 1.8ºC to 4ºC over the 21st century

II. Projections and impacts

Climate change could lead to some abrupt or irreversible impacts:

20-30% of species are likely to be at risk of **extinction** if increases in warming exceed 1.5-2.5°C

Partial **loss of ice sheets** on polar land could imply metres of sea level rise

III. Key vulnerabilities

Security

The threats to stability and human security inherent in the impacts of climate change have been acknowledged by the Norwegian **Nobel** Committee in 2007

Climate change will adversely impact **basic needs**:

- Access to food and resources
- Stable health conditions
- Security of settlements

III. Key vulnerabilities

Vulnerable populations

The poor have **limited adaptive capacities** and are more dependent on **climate-sensitive resources**

Vulnerability in **Africa, Asia and Latin America** is aggravated by other multiple stresses

Within other areas, **the poor, marginalised communities and the elderly** are particularly at risk

III. Key vulnerabilities

Water availability

Water availability will be affected for consumption, agriculture and energy generation due to:

- Changes in precipitation patterns
- Increasing salinity of groundwater
- Glaciers melting decreasing river flows

Ranges of people exposed to increased water stress:

- 120 millions to 1.2 billion in Asia by 2020
- 75 to 250 millions in Africa by 2020
- 16 to 44 millions in Europe by 2070

III. Key vulnerabilities

Food supply

Agricultural productivity at low latitudes likely to suffer severe losses because of:

- high temperature
- drought
- flood conditions
- soil degradation

Possible yield reduction of:

- 50% by 2020 in some African countries
- 30% by 2050 in Central and South Asia
- 30% by 2080 in Latin America

III. Key vulnerabilities

Coastal deltas

Coastal populations are expected to increase rapidly, while coastal settlements are at increased risk of sea-level rise

III. Key vulnerabilities

Urban areas

Urban population from 2000 to 2030:

- 47% to 60% worldwide
- 72% to 78% in Europe

Most population growth will take place in cities, largely in urban areas of **developing countries**

Urbanization is a special concern, as cities concentrates people and assets

IV. Adaptation options

Adaptation is already taking place through a **range of practices**

But climate change might go **beyond what traditional coping mechanisms** can handle

Even **societies with high adaptive capacity** remain vulnerable to climate change

Climate change poses new risks that will require new investments in adaptive responses

IV. Adaptation needs

Key adaptation options

Protecting from **sea level rise**

Increasing **agriculture** adaptive capacity

Preventing **water** scarcity

Improving **disaster preparedness** and management

Improving **health care systems**

Promoting **good governance**,
including empowering communities

IV. Adaptation needs

Adaptation is necessary to address impacts resulting from the warming which is already unavoidable due to past emissions

But **adaptation alone cannot cope** with all the projected impacts of climate change

Need for a mix of strategies including adaptation and mitigation of GHG emissions

V. Mitigation options

Characteristics of stabilisation scenarios

Stabilization level (ppm CO_2-eq)	Global mean temp. increase (ºC)	Year CO_2 needs to peak	Global sea level rise above pre-industrial from thermal expansion (m)
445 – 490	2.0 – 2.4	2000 – 2015	0.4 – 1.4
490 – 535	2.4 – 2.8	2000 – 2020	0.5 – 1.7
535 – 590	2.8 – 3.2	2010 – 2030	0.6 – 1.9
590 – 710	3.2 – 4.0	2020 – 2060	0.6 – 2.4

Mitigation efforts over the next two to three decades will have a large impact on opportunities to achieve lower stabilisation levels

V. Mitigation options

Estimated global costs in 2030

Stabilisation levels (ppm CO2-eq)	Range of GDP reduction (%)	Reduction of average annual GDP growth rates (percentage pts)
590 - 710	-0.6 – 1.2	< 0.06
535 - 590	0.2 – 2.5	< 0.1
445 - 535	< 3	< 0.12

Mitigation measures would induce 0.6% gain to 3% decrease of GDP in 2030

V. Mitigation options

Energy supply

Technologies currently available	Improved supply and distribution efficiency; fuel switching from coal to gas; nuclear power; renewable heat and power; combined heat and power; early applications of Carbon Dioxide Capture and Storage (CCS)
Technologies projected to be commercialised before 2030	CCS for gas, biomass and coal-fired electricity generating facilities; advanced nuclear power; advanced renewable energy, including tidal and wave energy, concentrating solar, and solar photovoltaics
Policies, measures and instruments	Reduction of fossil fuel subsidies; taxes or carbon charges on fossil fuels; feed-in tariffs for renewable energy technologies; renewable energy obligations; producer subsidies

V. Mitigation options

Transport

Technologies currently available

More fuel efficient vehicles; hybrid vehicles; cleaner diesel vehicles; biofuels; modal shifts from road transport to rail and public transport systems; non-motorised transport; land-use and transport planning

Technologies projected to be commercialised before 2030

Second generation biofuels; higher efficiency aircraft; advanced electric and hybrid vehicles with more powerful and reliable batteries

Policies, measures and instruments

Fuel economy, biofuel blending and CO_2 standards for road transport; taxes on vehicle purchase, registration; road and parking pricing, land use regulations; infrastructure planning; public transport facilities, non-motorised forms of transport

V. Mitigation options

Buildings

Technologies currently available	Efficient lighting and daylighting; efficient electrical appliances and heating and cooling devices; improved cook stoves, insulation; passive and active solar design; alternative refrigeration fluids, recovery and recycling of fluorinated gases
Technologies projected to be commercialised before 2030	Integrated design of commercial buildings including intelligent meters that provide feedback and control; integrated solar photovoltaics
Policies, measures and instruments	Appliance standards and labelling; building codes and certification; demand-side management; public sector leadership; energy service companies

VI. The role of cities

Adapting to climate change

The threats of climate change are focused at a **local scale**

Good governance is a key to climate change risk management

- Effective zoning can prevent house building on slopes prone to erosion and landslides
- Adequate investment in and maintenance of infrastructure make the settlement less vulnerable to weather extremes

Local authorities can facilitate the mobilisation of **stakeholders** to contribute their technical and financial resources

- Cf. London Climate Change Partnership

VI. The role of cities

Mitigating climate change

Urban activities generate 80% of global CO_2

Urban planning should promote construction density and green spaces

Public transport presents great mitigation potential but also many local benefits in terms of social equity, financial savings, space gain, public health

Local authorities can promote energy efficient **buildings**, cleaner **production techniques** and renewable **energy production**

Networking provides cities with support and a platform to influence national and global policies

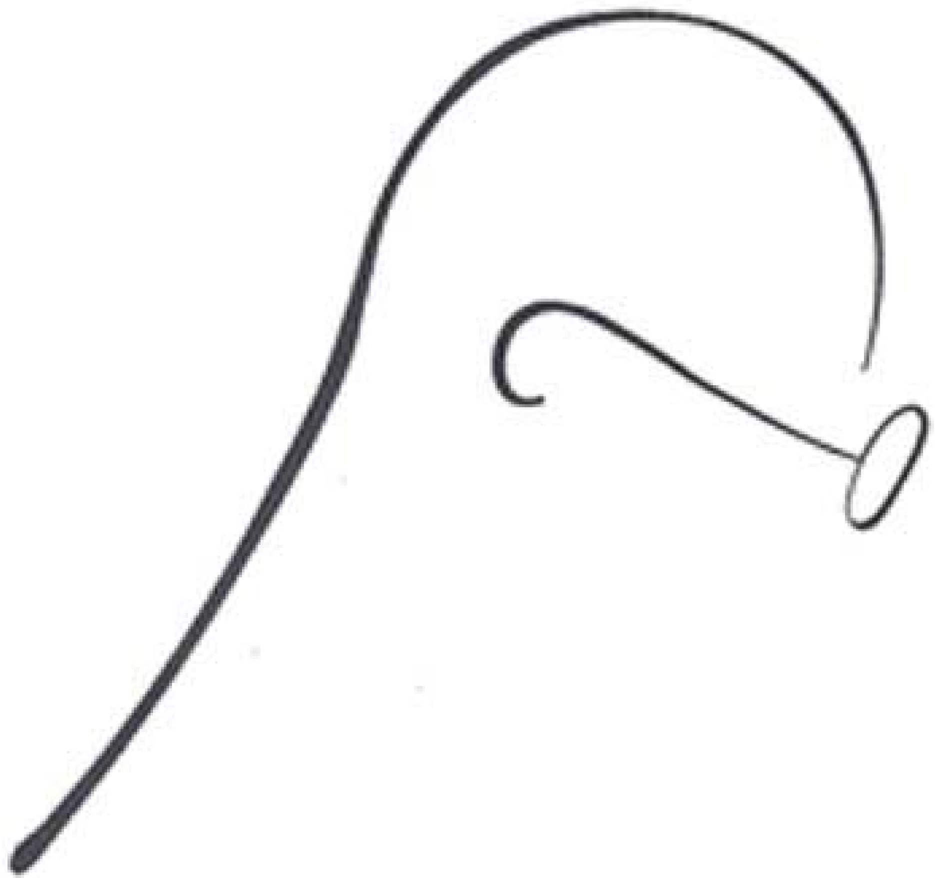
VI. The role of cities

The **dominant path to industrialisation** has been characterised by high concurrent GHG emissions

Committing to alternative development paths would require **major structural changes**:

- Institutional arrangements and trade patterns
- Consumption patterns
- Geographical distribution of activities
- Urban design and transport infrastructure

Cities have the opportunity and responsibility to lead the move towards sustainable development



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