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Energy Efficiency in Space Cooling

Through Policies (and Technologies)

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WHY IS ENERGY EFFICIENCY IN SPACE COOLING IMPORTANT?

Energy demand for space cooling will grow in due to changes in:

Wealth + Comfort

Population

Climate Conditions

Construction Practices

Electronics Usage

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Example:
Mexico Space Cooling Projections

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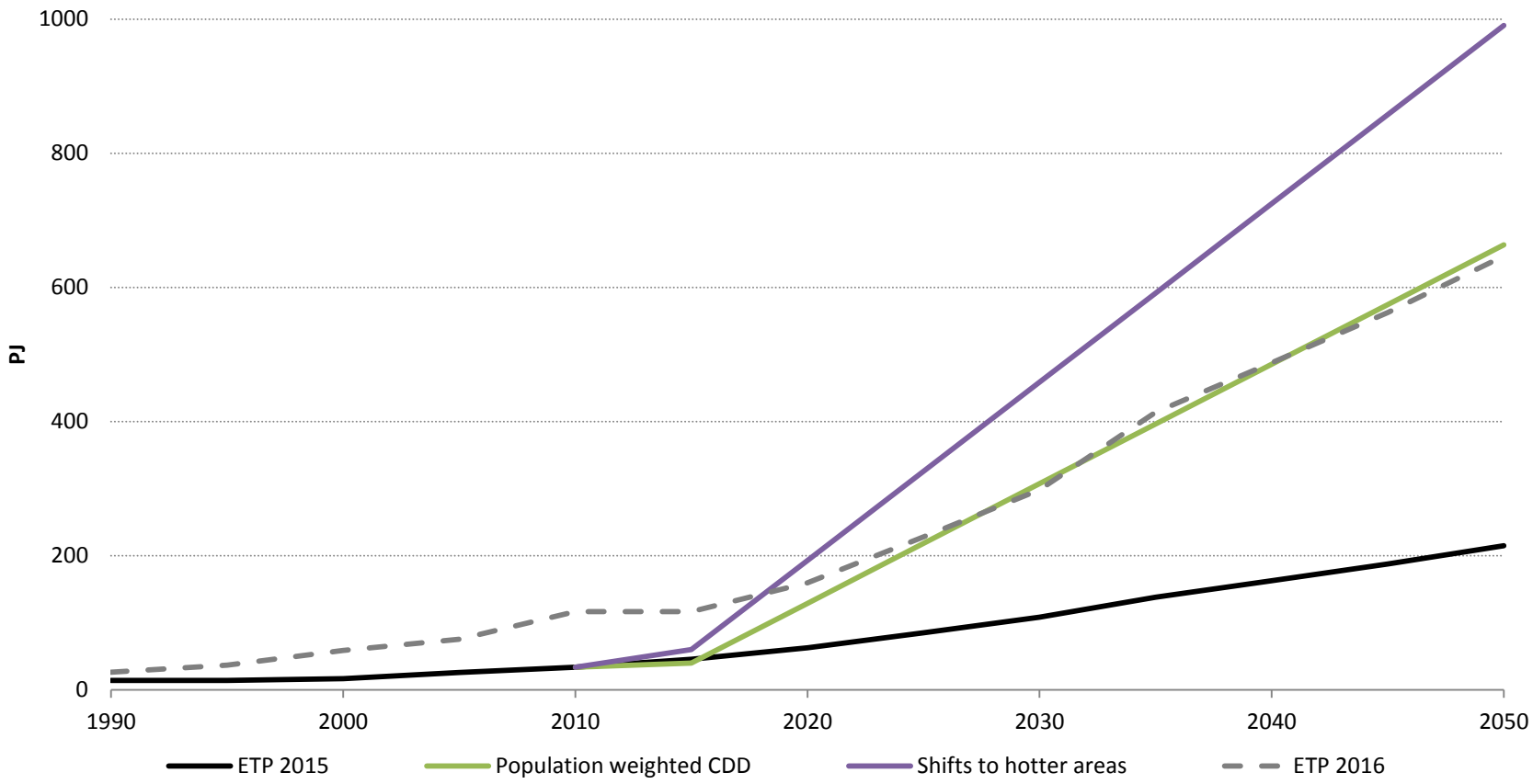
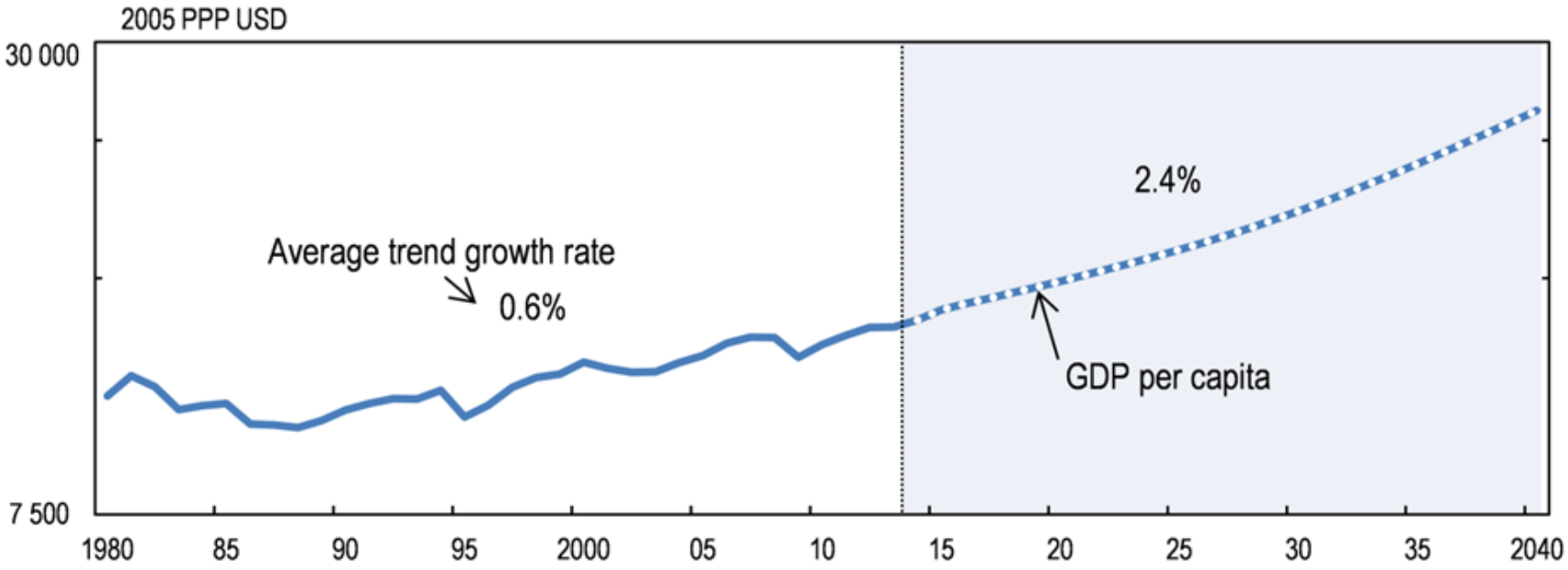


Every projection shows increases in space cooling energy demand

Why discuss Space Cooling in Mexico?

- **Increasing Wealth:** Income per Person

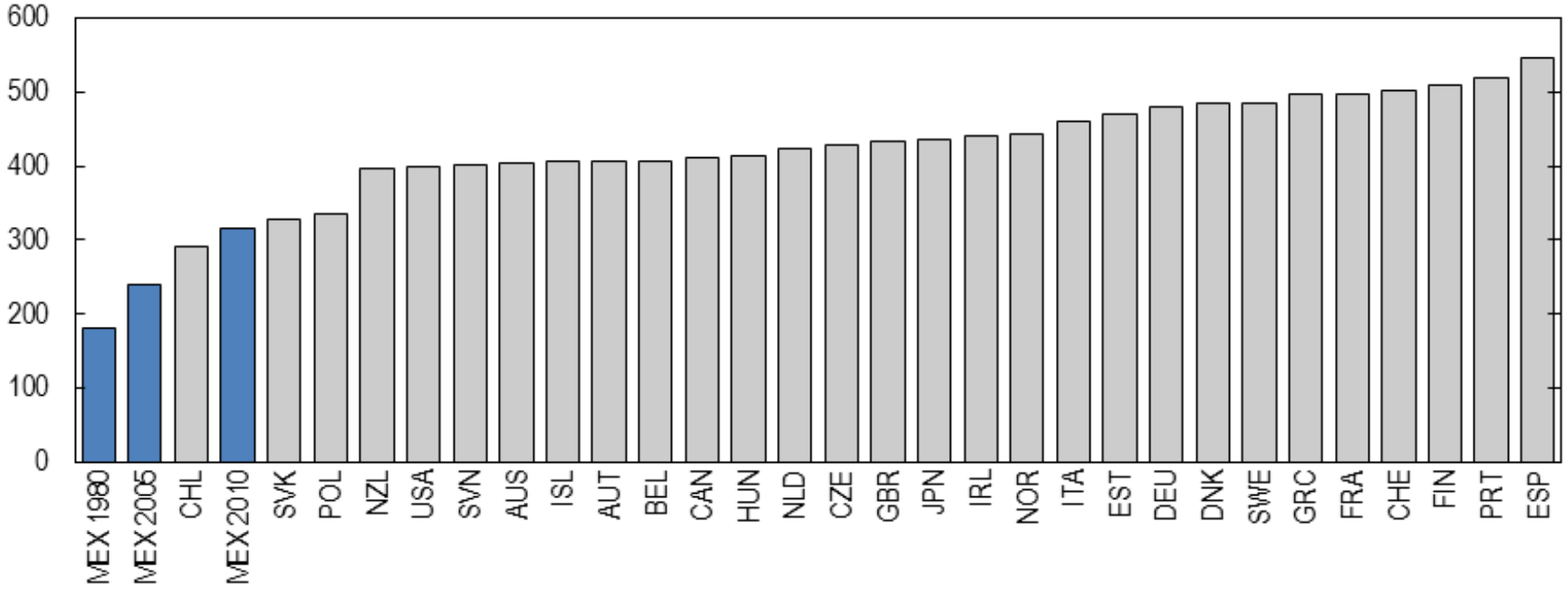
OECD Long-Term Growth Scenarios on GDP per capita for Mexico



Why discuss Space Cooling in Mexico?

- **Increasing Wealth:** Results in fewer people per home

The number of dwellings per 1000 inhabitants increased significantly between1980, 2005 and 2010



Why discuss Space Cooling in Mexico?

- **Penetration of Air Conditioners (ACs) in Mexico:**
  - IEA estimates growth of ~5% to ~11% penetration from 2002 to 2008 in residential buildings (IEA) & space cooling energy use was estimated to double from 2002 to 2008 (IEA)
  - World Bank estimates 20% AC penetration, with similar climate regions in US having 95% AC penetration
    - EXAMPLE: US residential buildings with AC grew from ~10% in 1965 to ~87% today
- **Trends:**
  - Population growth from 122 million to 160 million by 2050
  - Housing stock to increase by 50% in 2030 (from 2005 levels)
  - UNEP SBCI estimates a significant increase in cooling energy intensity (from 0.68 to 4.10 MWh/yr) for residential buildings from 2006 to 2050

Why discuss Space Cooling?

Growing area of concern in most countries:

1. **Wealth/Comfort**: An increasing desire for and ability to achieve personal temperature comfort through air conditioning
2. **Population:** An increase in population in warmer climates from high birthrates and from population shifts from colder climates
3. **Climate:** A general trend toward increasing annual average temperatures and an increasing occurrence of extreme temperatures
4. **Construction:** A change in building design and construction type from heavy (high thermal mass) materials to low-cost and quick construction materials
5. **Electronics:** An increasing quantity of personal electronic devices that generate heat as a byproduct

Opportunities:
Policies and Technologies

Traditionally… many policies are based on…

- **Reduce the <u>energy used</u> for space cooling**
  - Equipment efficiency that enables development goals

Opportunities: Policies and Technologies

However… energy efficiency cost optimisation suggests…

- **First: Reduce the need for space cooling**
- **Second: Reduce the energy used for space cooling**

Opportunities: Policies and Technologies

Therefore…

- **Reduce the need for space cooling**
  - Through efficiency
  - This is *not Conservation*
  - This is efficiency that enables increase in comfort and development goals
- **Then, reduce the energy used for space cooling**
  - After reducing the *need* for space cooling
  - Equipment efficiency that enables development goals

Opportunities: Policies

- **Policies that reduce the need for space cooling**
  - Buildings Codes/Standards/Norms
  - Incentives for building envelope technologies
  - Capacity building/training for designers and contractors
- **Policies that reduce the energy use to space cool**
  - Cooling equipment Minimum Energy Performance Standards (MEPS)
  - Cooling equipment energy labelling
  - Subsides/tax incentives for energy efficient equipment
  - Capacity building/training for designers and equipment contractors

Opportunities: Technologies

- **Technologies to reduce the need for space cooling**
  - High thermal resistance materials
  - Increased controlled natural airflow
  - Reduced uncontrollable air leakage
  - Shading and shutters
  - Cool roof, green roof and reflective materials
- **Technologies to reduce the energy use to space cool**
  - High efficiency cooling and fan equipment
  - High efficiency district cooling
  - Economizers and heat exchangers

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Existing approaches in many countries to reduce space cooling?

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- **Technologies that reduce the need for space cooling**
  - Thick thermal mass walls
  - Insulation
  - Overhangs/shading
  - Space zoning
    - conditioning rooms as needed
    - outdoor living spaces/gathering spaces
- **Technologies that reduce the energy use to space cool**
  - High efficiency inverter ACs
  - High efficiency heat pumps

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Discussion

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