

# A low-carb diet for the power sector\*

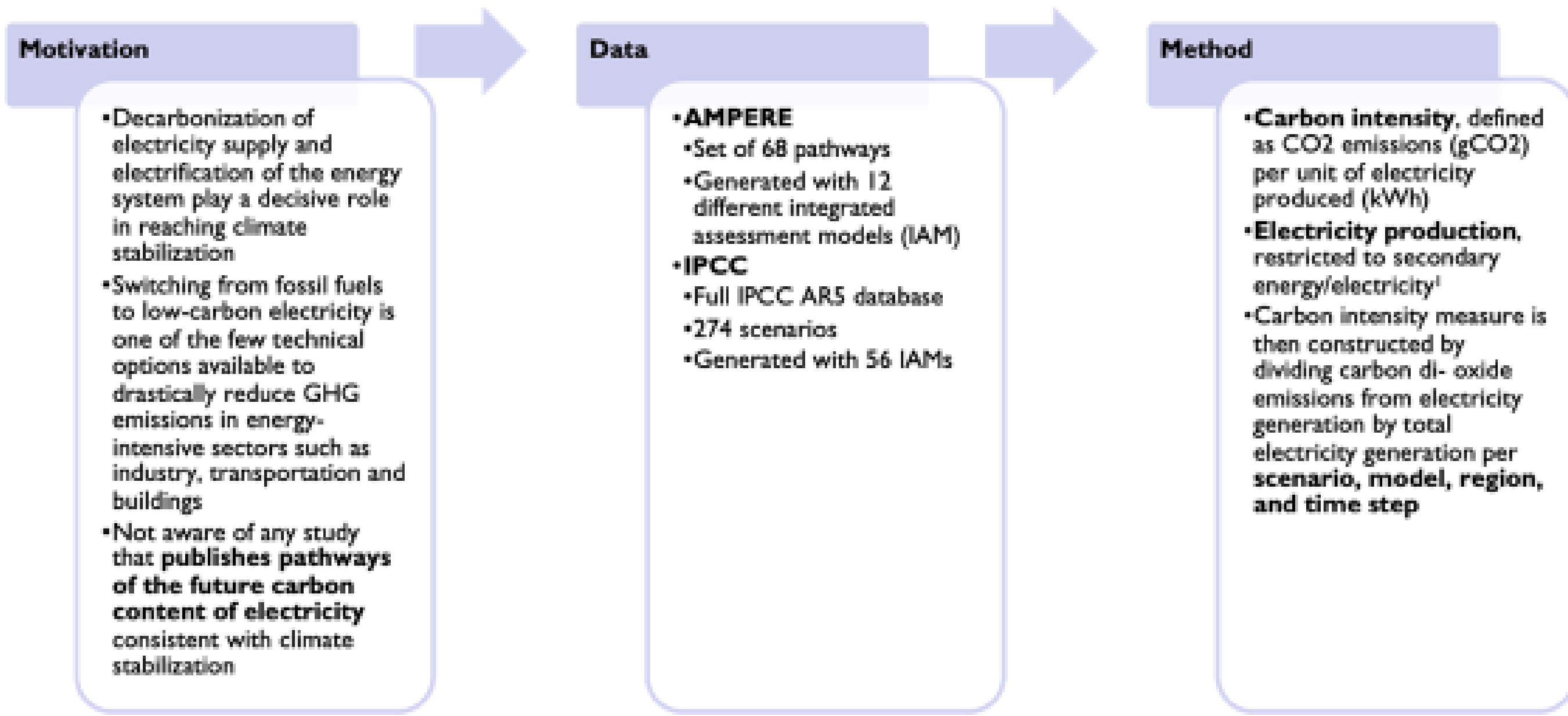
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\*Audoly, R., Vogt-Schilb, A., Guivarch, C. and Pfeiffer, A., 2018. Pathways toward zero-carbon electricity required for climate stabilization. Applied Energy, 225, pp.884-901.

## Motivation, data, and methods



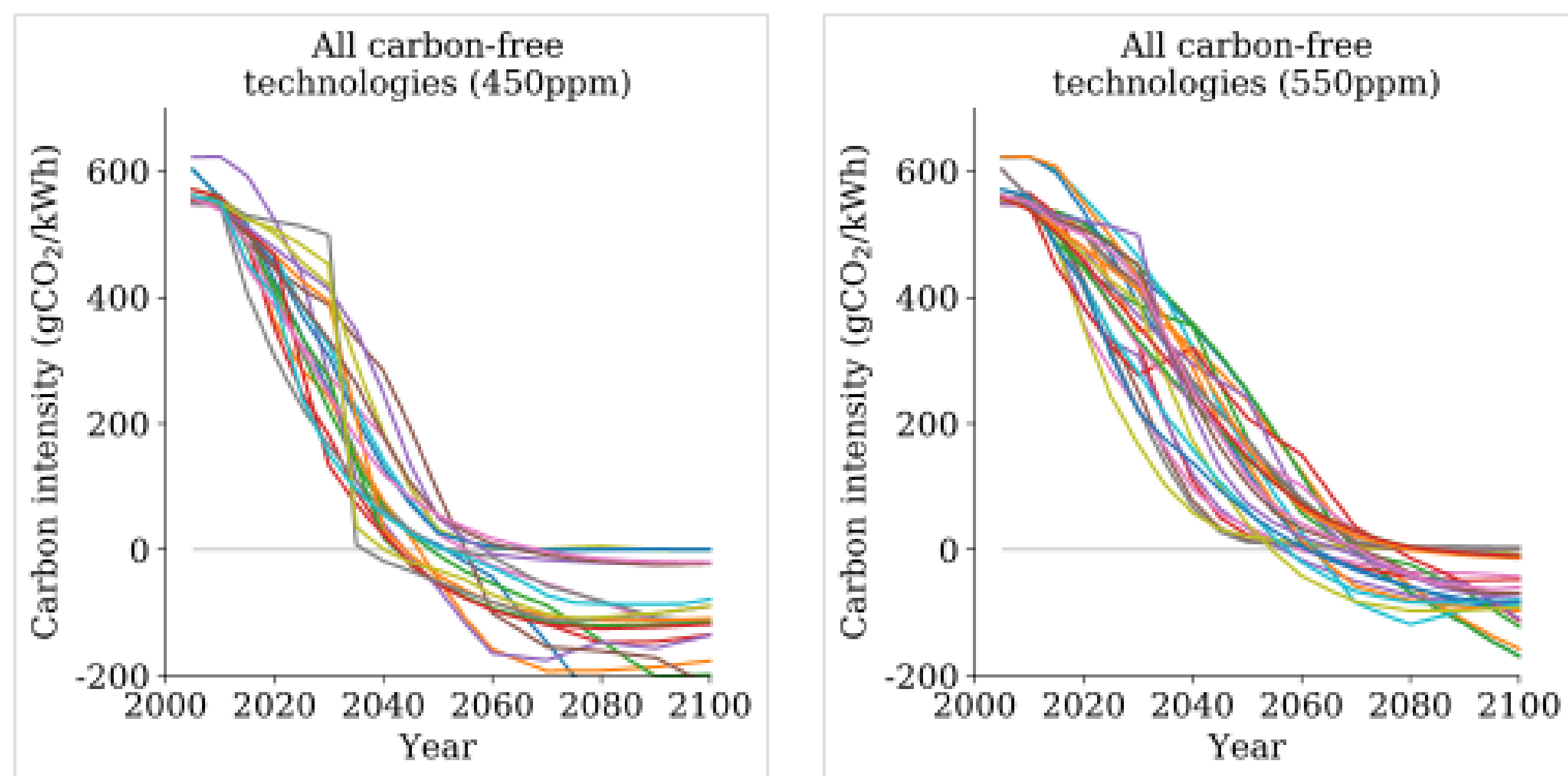
1 total electric energy produced by the power sector, excluding that used by the power supply sector itself for transformation, transportation and distribution

## Findings

- Climate **stabilization requires zero-carbon electricity** even under less ambitious climate goals
- Near-zero-carbon electricity does not require all carbon-free technologies to be available
- Decarbonization of electricity generation **happens in all modelled regions** and countries
- Electrification of road transport as means to decarbonize must be **timed carefully**

### 1 Climate stabilization requires zero-carbon electricity even under less ambitious climate goals

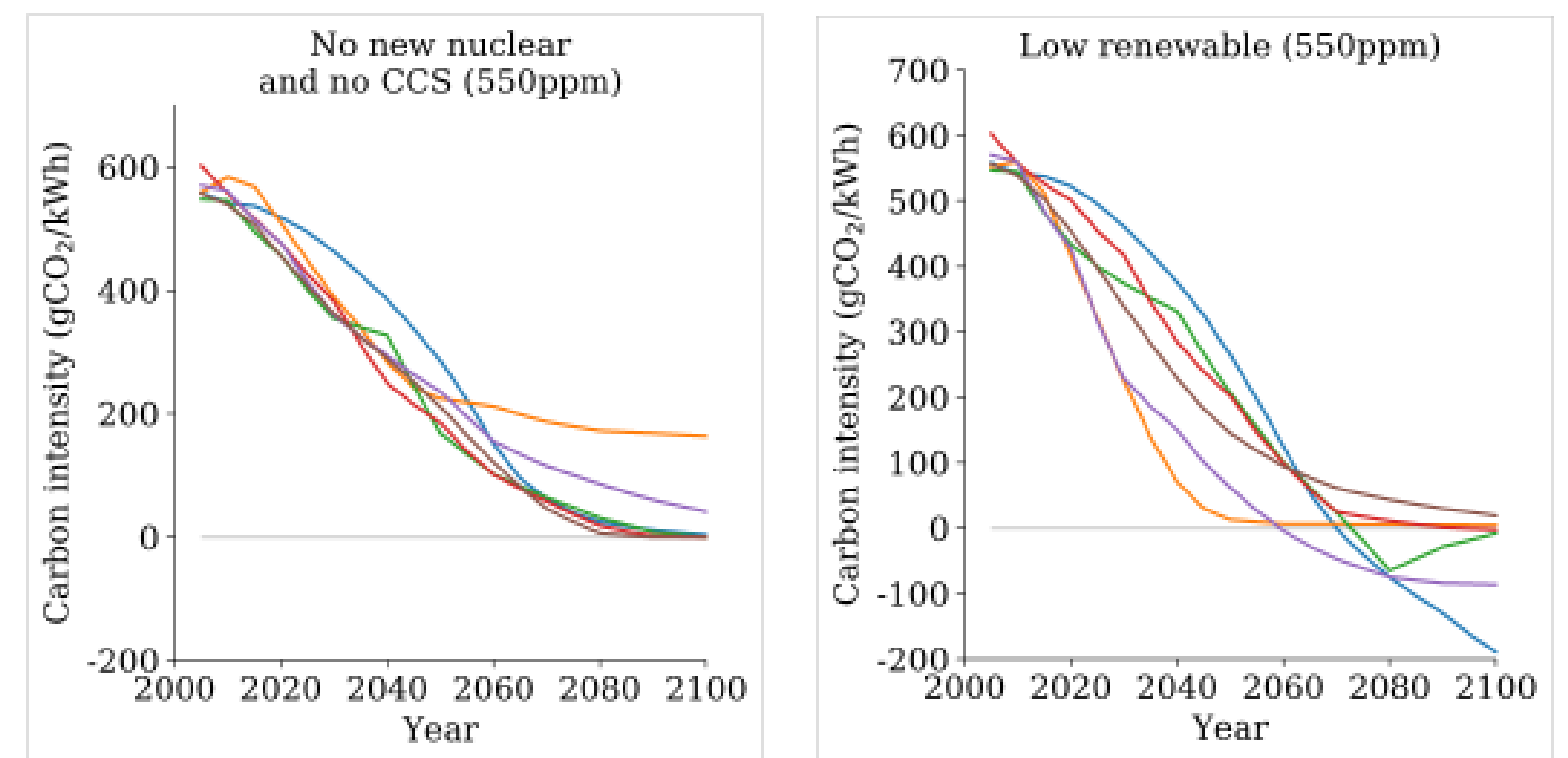
Carbon-intensity of electricity generation, 2000-2100 [gCO<sub>2</sub>/kWh] Global  
 No technology restriction  
 450-ppm and 550-ppm pathways



Source: AMPERE and IPCC AR5 scenario database

### 2 Near-zero-carbon electricity does not require all carbon-free technologies to be available

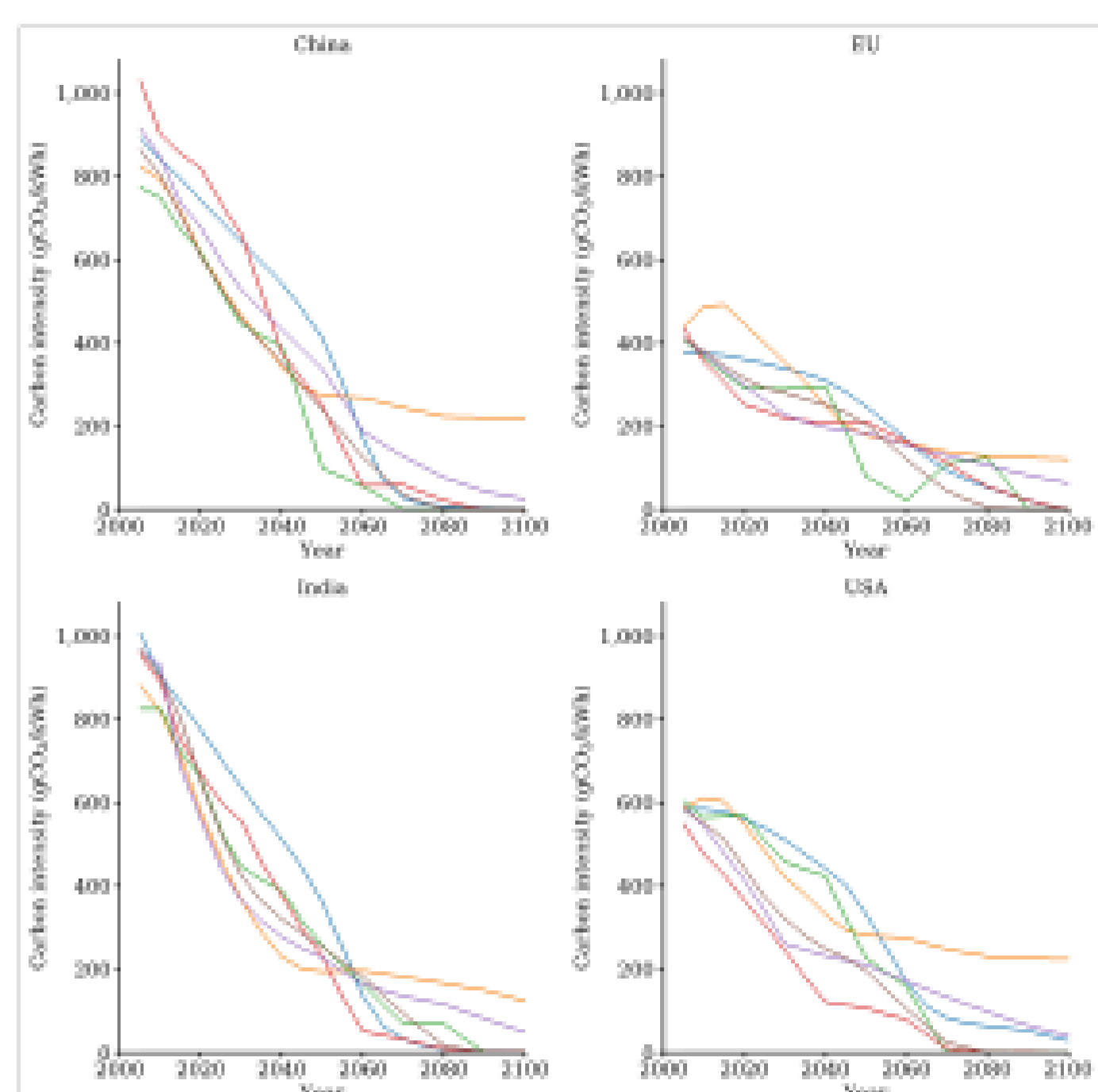
Carbon-intensity of electricity generation, 2000-2100 [gCO<sub>2</sub>/kWh] Global  
 Technology restrictions  
 Only 550-ppm pathways



Source: AMPERE and IPCC AR5 scenario database

### 3 Decarbonization of electricity generation happens in all modelled regions and countries

Carbon-intensity of electricity generation, 2000-2100 [gCO<sub>2</sub>/kWh] By region  
 Technology restrictions: No new nuclear and no CCS  
 Only 550-ppm pathways



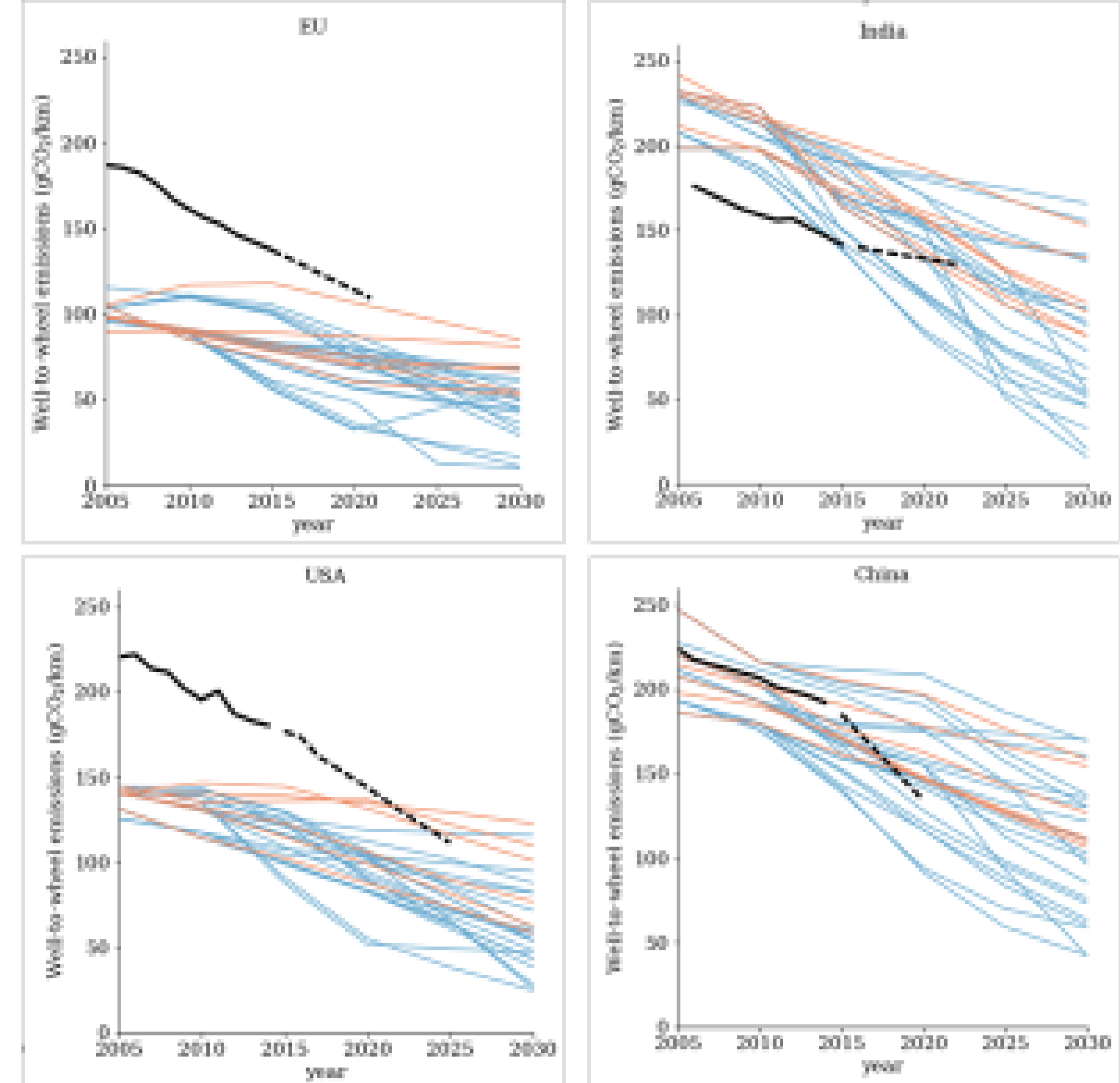
Full decarbonization of electricity even happens...

- in regions with currently high carbon-intensity.
- in regions with strong economic growth over the 21st century.
- under less ambitious climate policy.
- if some clean technologies are not available.

Source: AMPERE and IPCC AR5 scenario database

### 4 Electrification of road transport as means to decarbonize must be timed carefully

Well-to-wheel emissions of (electric) vehicles, 2000-2100 [gCO<sub>2</sub>/km] Electric car - 450ppm technology-optimistic  
 Electric car - 550ppm technology-pessimistic  
 Historic cars  
 Enacted norms



Electrification of road transport as means to decarbonize must be timed carefully

- in some regions carbon-intensity of electricity generation low enough to beat even future vehicle emission standards
- in other regions coal-heavy power generation outweighs benefits of reduced vehicle emissions in electrified road transport

Source: AMPERE and IPCC AR5 scenario database; Yang & Bandivdekar (2017), US EPA