

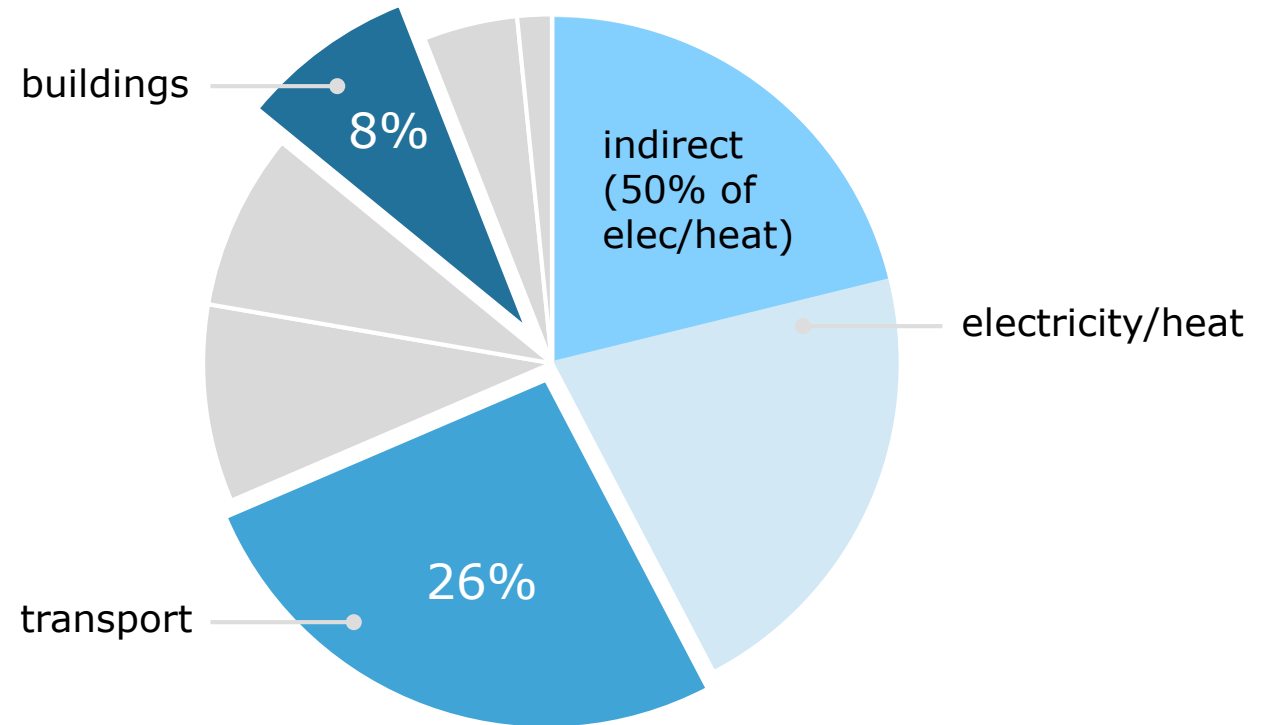
The role of demand-side measures in climate mitigation pathways

Rik van Heerden; Oreane Edelenbosch; Luiz Bernardo Baptista; Alice Di Bella; Vassilis Daioglou; Francesco Pietro Coelli; Johannes Emmerling; Panagiotis Fragkos; Thomas Le Gallic; Robin Hasse; Johanna Hoppe; Paul Kishimoto; Florian Leblanc; Julien Lefèvre; Gunnar Luderer; Giacomo Marangoni; Alessio Mastrucci; Robert Pietzcker; Pedro Rochedo; Bas van Ruijven; Roberto Schaeffer; Sonia Yeh; Detlef van Vuuren



Introduction

- **Energy-related GHG emissions** in *buildings* and *transport*:
- IPCC: sectoral GHG emission reductions possible by 2050 of **40-70%**
 - but large uncertainty






Sources (2019 data): ClimateWatch, IEA

Objective

Explore the emission reduction potentials of demand-side measures in transport and buildings from a system-perspective

→ What is the most optimal strategy?

Scenarios

		Strategy		
		activity reduction/shift	technological improvements	electrification / fuel shift
Sectors	 buildings	<ul style="list-style-type: none"> - Flexible use of buildings (e.g. co-housing, co-working) - Limited floorspace per capita - Multi-family housing - Change in setpoint temperatures 	<ul style="list-style-type: none"> - Building codes/standards - Energy performance certification - More efficient heating, ventilation and air conditioning - Increased renovation rate 	<ul style="list-style-type: none"> - Adoption of heat pumps - Electrification of space/water heating - Phase out non-clean heating fuels - Ban on <i>new</i> natural gas connections - Building-integrated renewables
	 land-based transport	<ul style="list-style-type: none"> - Less private vehicles - Improved road freight logistics - Bike lanes + pedestrian zones - Improved PT infrastructure - Car-sharing/pooling 	<ul style="list-style-type: none"> - Efficiency standards for passenger vehicles and trucks 	<ul style="list-style-type: none"> - Electrification of passenger vehicles and light-duty trucks (BEV/FCEV) - Phase out of diesel engines for heavy-duty vehicles
	 international transport	<ul style="list-style-type: none"> - Fuel tax for aviation - Increased virtual connectivity - Local manufacturing and storage - Slow steaming shipping - Phase out short-haul air traffic 	<ul style="list-style-type: none"> - Efficiency standards for new aircrafts and ships - Environmental certification (air)ports 	<ul style="list-style-type: none"> - Electric short-haul planes - Electrification of ports and zero-emission berth (<i>cold ironing</i>) - Increased use of biofuels/electrofuels



Scenarios: methods

1. Scenario for each strategy
2. Two climate ambitions:
 1. National Policies implemented (**NPI**)
 2. Limit global warming to **1.5 °C**



COFFEE



IMAGE



MESSAGE



REMIND



IMACLIM-R

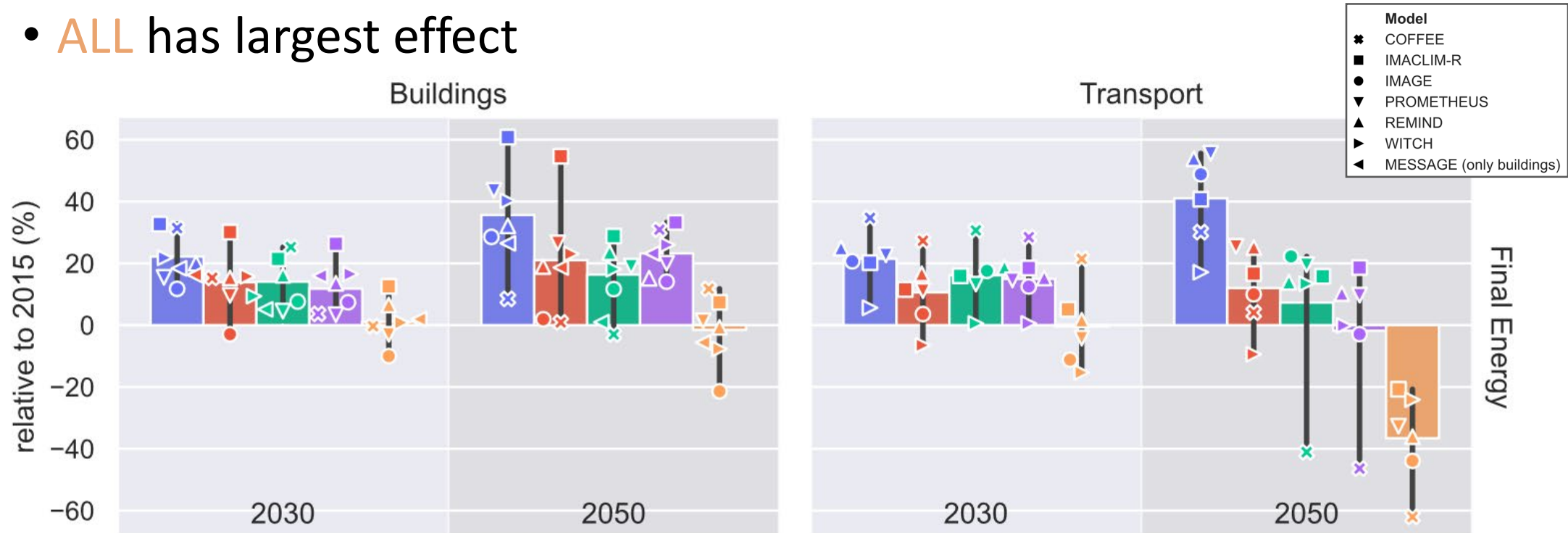


PROMETHEUS

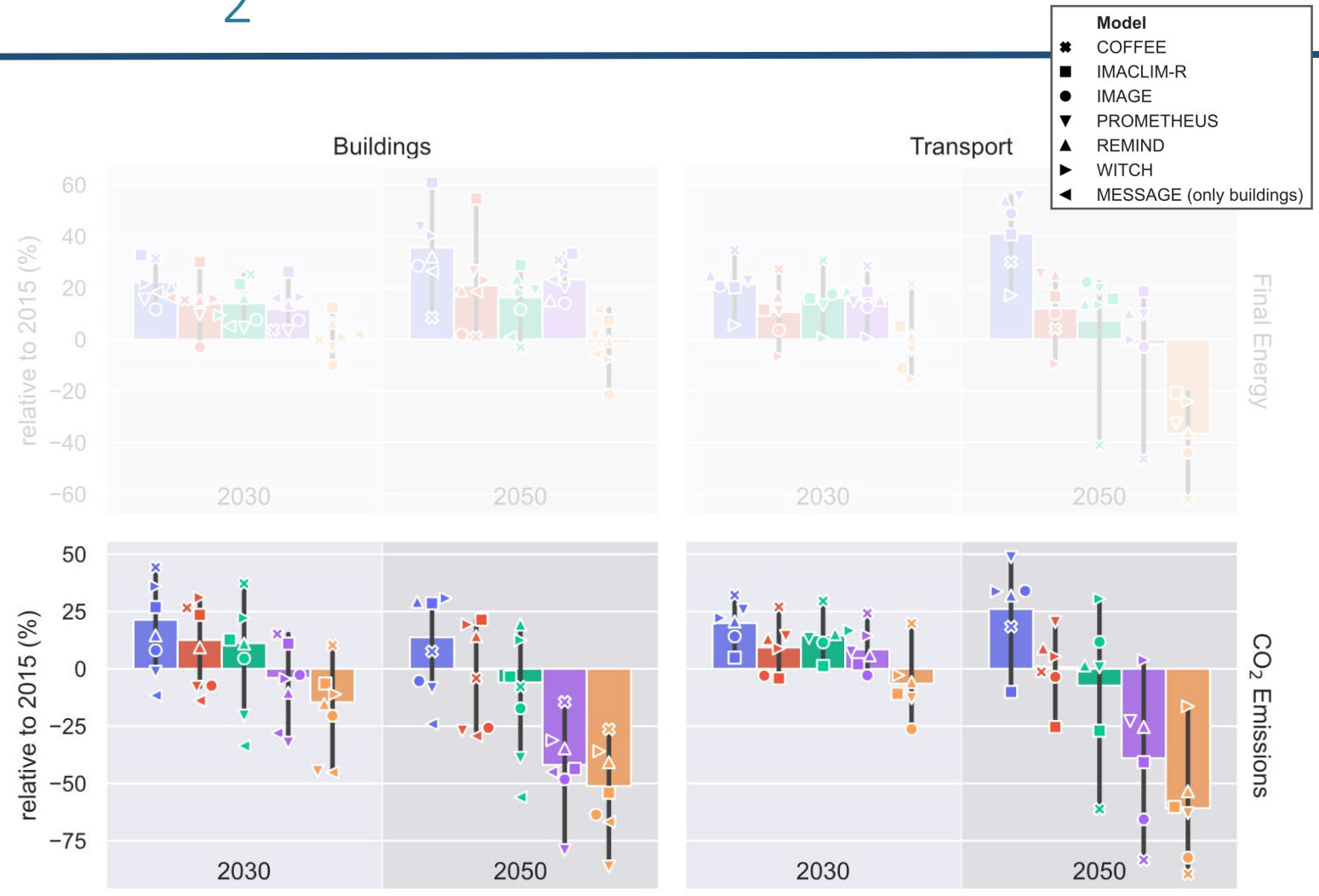


WITCH

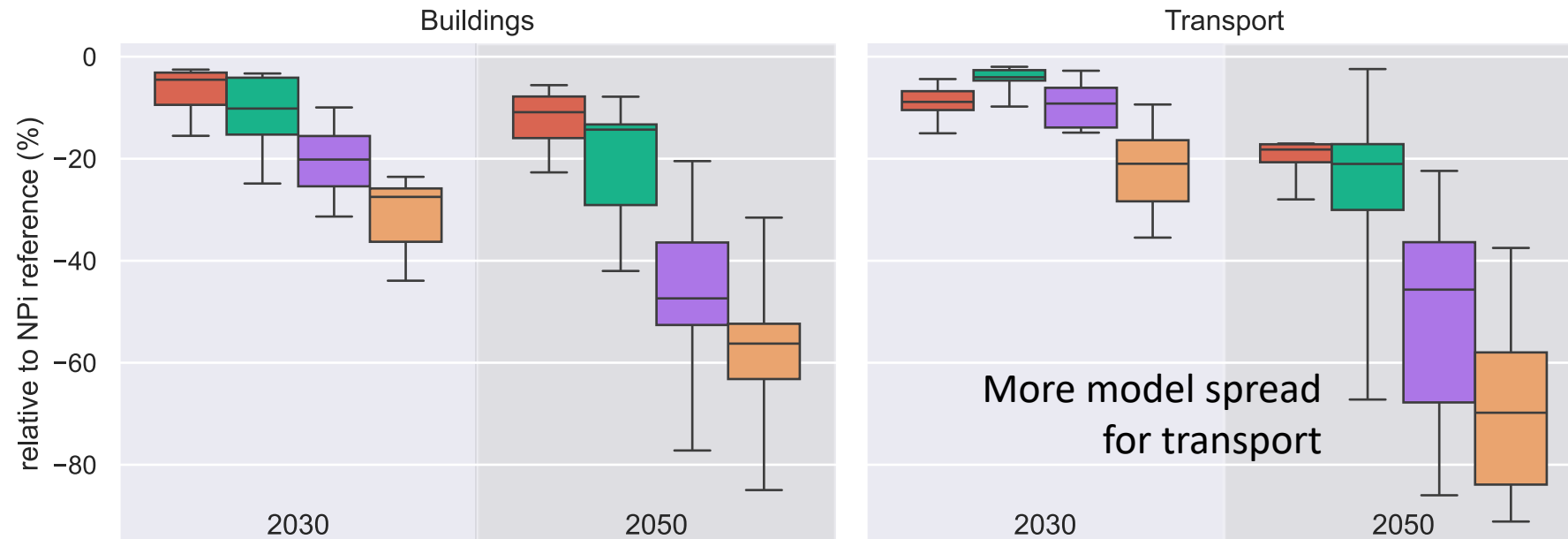
- **ACT**, **TEC**, and **ELE** reduce energy demand compared to reference
 - But increase with respect to 2015
- **ALL** has largest effect



- All strategies reduce emissions
- Largest reduction by **ELE**
 - particularly in 2050
- Similar patterns for buildings and transport

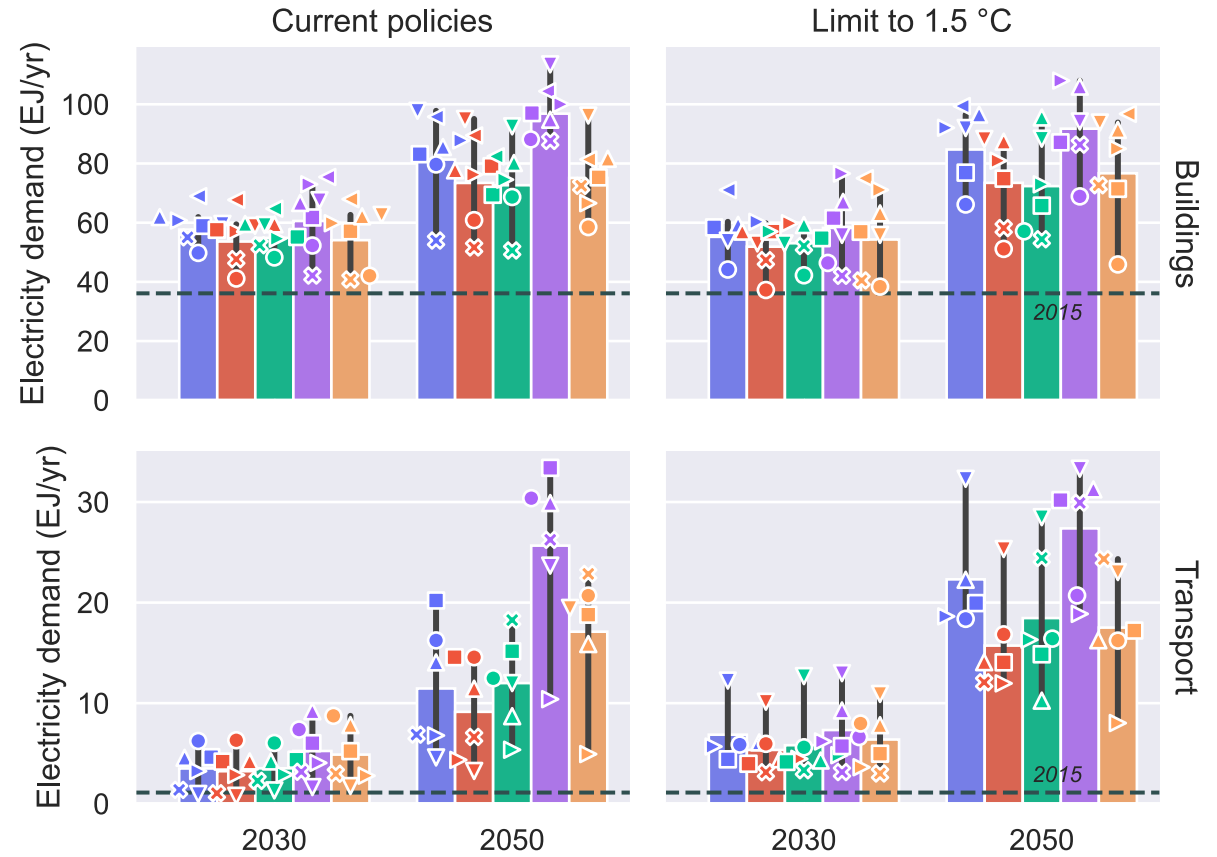


- Largest reduction by **ELE**
 - particularly in 2050



Model	
✱	COFFEE
■	IMACLIM-R
●	IMAGE
▼	PROMETHEUS
▲	REMIND
▶	WITCH
◀	MESSAGE (only buildings)

- Large overall increase
 - Requires increased generation, storage, grids, etc.
- ACT and TEC have slightly lower electricity demand
- Sharp increase in electricity demand for ELE
 - ALL helps to mitigate



Conclusions

- Demand-side measures can reduce direct emissions by 60% (buildings) and 70% (transport) in 2050
- No single ideal strategy
 - Electrification has the largest impact on emissions
 - But increases stress on electricity supply
 - Combining different approaches
 - Further reduces emissions
 - Alleviates stress on supply-side

Thank you!

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