Energy Modeling Forum+ Climate Policy Analysis Study Updates - 2021

Joint Schwarzenegger Institute-Energy Modeling Forum Symposium
on Climate Change Policy in California #3

June 3, 2021

Outline

- Integrated Assessment Modeling Consortium (IAMC)
- Energy Modeling Forum Studies 34-37 (finish year)
  - EMF 34 - North American Energy Integration (2021)
  - EMF 35 - Scenarios for Long-Term Climate Change Mitigation in Japan (2021)
  - EMF 36 - Climate Policies after Paris: Pledge, Trade, and Recycle (2021)
  - EMF 37 - High Electrification Scenarios for North America (2023)
- European Commission Sponsored IAMing Studies
  - AMPERE & CD-LINKS & ENGAGE (Policy & Stakeholder Oriented)
  - ADVANCE & NAVIGATE (Improving the State of the Art Oriented)
- EDITS Project – Aggressive Energy Demand Reduction Scenarios
- US Modeling Work - Obama to Trump to Biden
  - INDCs/NDCs/Global Stocktake
  - Mid-Century Strategy Report
  - SCC & Clean Power Plan to SCC+?
  - Americas Climate Pledge Reports

IAMC13
DECEMBER 1-4, 2020

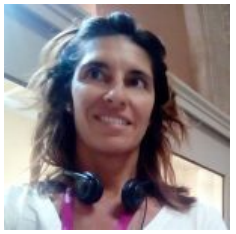
Aims of the IAMC

IAMC
Integrated Assessment Modeling Consortium
Founded 2007

- The Integrated Assessment Modeling Consortium (IAMC) exists to facilitate and foster the development of integrated assessment models (IAMs), peer interaction and vetting, and the conduct of research employing IAMs, including model diagnosis, inter-comparison, and coordinated studies.
- The IAMC also exists to facilitate and coordinate IAM research with research conducted in both the Climate Modeling (CM) and the Impact, Adaptation, and Vulnerability (IAV) research communities.
- The IAMC also exists to provide a point of contact with other institutions and organizations interacting with the IAM community, e.g. the IPCC.

IAMC Progress

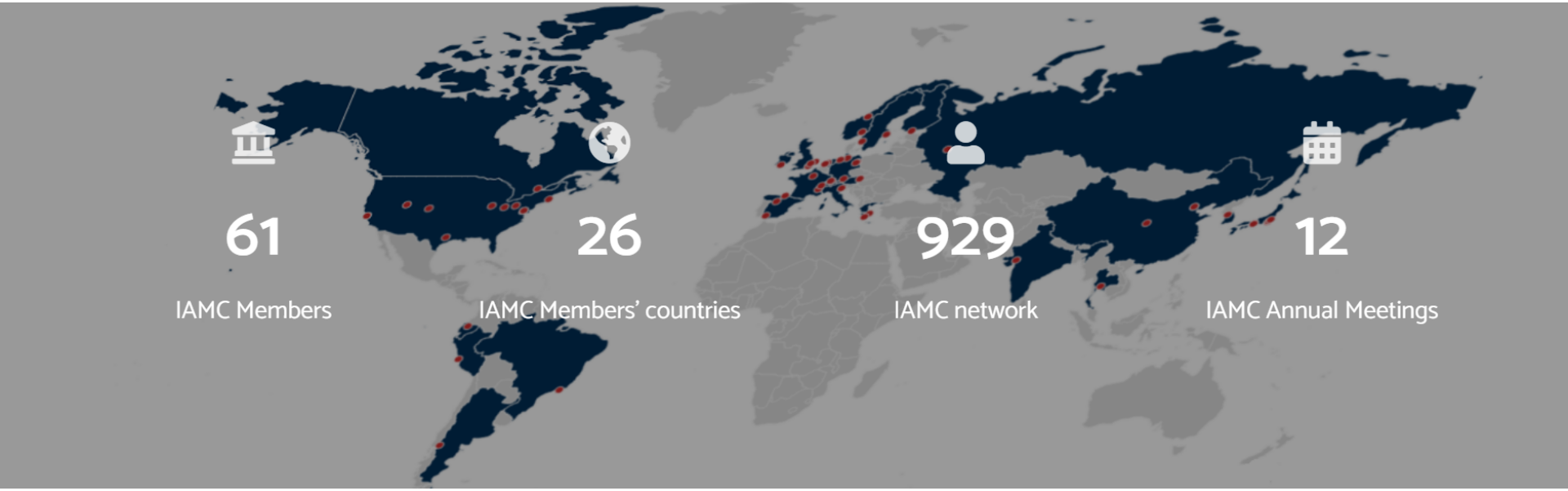
IAMC
Integrated Assessment Modeling Consortium
Founded 2007



- This was a busy year for the IAMC Secretariat
  Lead by Monica Eberle & Silvia Bertolin (CMCC)
  - (1) web site upgrade (www.iamconsortium.org),
  - (2) new communications strategy (inc. video pills, scenario explorer, social media - Twitter),
  - (3) first on-line annual meeting
- This is the thirteenth annual meeting
- Cooperative agreements with IPCC WGs, IIASA, etc.
- Scenario data warehouse for IPCC AR5, SR1.5, SRLULUC and beyond

IAMC
Integrated Assessment Modeling Consortium
Founded 2007

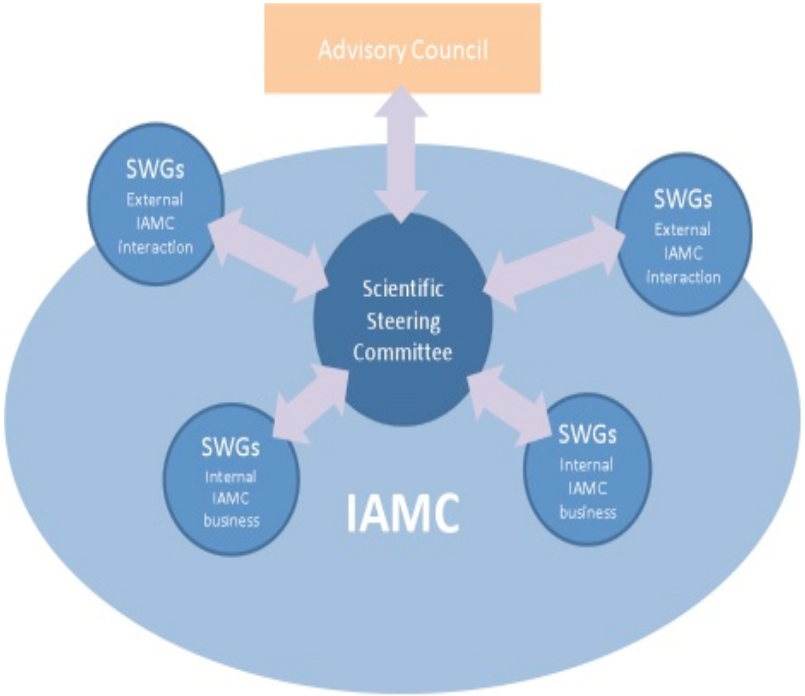
IAMC Outreach and New Member Institution Recruiting



Governance

IAMC
Integrated Assessment Modeling Consortium
Founded 2007

- The IAMC Organization
  - Scientific Steering Committee (SSCs)
  - Advisory Council
- Conduct of IAMC work
  - The work of the IAMC is conducted through Scientific Working Groups (SWGs) chartered by the SSC and
  - Community research programs undertaken by IAMC member organizations
  - Collaborations with other organizations



Advisory Council

IAMC
Integrated Assessment Modeling Consortium
Founded 2007

Laura COZZI

Chief Energy Modeller
International Energy Agency
(France)

Zhou DADI

Vice chairman of the State Expert Advisory Committee to the National Energy Leading Group of China, member of the National Expert Team of China for Climate Change, and vice president of the China Institute of Geo-politics and Energy Strategy
(China)

Valérie MASSON-DELMOTTE

IPCC Co-Chair Working Group I and Laboratoire des Sciences du Climate et de l'Environment
(France)

Allen FAWCETT

Chief, Climate Economics Branch, United States Environmental Protection Agency (USA)

Surabi MENON

Senior Director, Advisory & Research, ClimateWorks Foundation
(USA)

Dirk MESSNER

President of the German Federal Environment Agency
(Germany)

Debra ROBERTS

IPCC Co-Chair of Working Group II and Head of the Sustainable and Resilient City Initiatives Unit in eThekwini Municipality in Durban
(South Africa)

Jim SKEA

IPCC Co-Chair Working Group III and Center for Environmental Policy at Imperial College London
(UK)

Tom VAN IERLAND

Head of Unit Clima C1 Strategy and Economoc Assessment, European Commission – Directorate General Climate Action
(Belgium)

IAMC Scientific Working Groups

IAMC
Integrated Assessment Modeling Consortium
Founded 2007

The IAMC Scientific Steering Committee has chartered four Scientific Working Groups (SWGs).

Working Group on Data Protocols and Management

Co-chairs:

Volker Krey (IIASA)

Kate Calvin (PNNL)

Working Group on Evaluation and Diagnostics

Co-chairs:

Jae Edmonds (PNNL)

Shinichiro Fujimori (NIES)

Elmar Kriegler (PIK)

Working Group on Scenarios

Co-chairs:

Keywan Riahi (IIASA)

Detlef van Vuuren (PBL)

Working Group on Scenarios for Climate-related Financial Analysis

Co-chairs:

Elmar Kriegler (PIK)

Jae Edmonds (PNNL)

IAMC
Integrated Assessment Modeling Consortium
Founded 2007

For IAMC Membership and Annual Meeting Info.
See IAMC WWW Site: www.iamconsortium.org

2021 Annual Meeting: On Line – Nov. 29-Dec. 3

Energy Modeling Forum Studies 34-37

- EMF 34: North American Energy Integration (2021)
- EMF 35: Scenarios for Long-Term Climate Change Mitigation in Japan (2021)
- EMF 36 - Climate Policies after Paris: Pledge, Trade, and Recycle (2021)
- EMF 37 - High Electrification Scenarios for North America (2023)

EMF 37 – Dimensions of Scenario Matrix: GHG targets, Electrication assumptions, and Other key sensitivies

Example Alternate Dimensions							Degree of Electrification			No Target	Net 0 by 2050	Net 0 by 2060	Net 0 by 2080
		Carbon	*Low Carb.*			*Comp.*				*Endog.*	*-47%*	*-40%*	*-33%*
EE	*Behavior*	*Mgmt.*	*Power*	*Fuels*	*H_2*	*Policies*	*Trans.*	*Buildings*	*Industry*	*Endog.*	*-100%*	*-80%*	*-60%*
Case a	Case a	Case a	Case a	Case a	Case a	Case a	Ref	Ref	Ref	***NT.Ref***	***0by50.Ref***	***0by60.Ref***	***0by80.Ref***
Case a	Case a	Case a	Case a	Case a	Case a	Case a	Adv	Adv	Adv	***NT.All-a***	***0by50.All-a***	***0by60.All***	***0by80.All***
Case a	Case a	Case a	Case a	Case a	Case a	Case a	Adv	Ref	Ref	***NT.Trans-a***	***0by50.Trans-a***		
Case a	Case a	Case a	Case a	Case a	Case a	Case a	Ref	Adv	Ref	***NT.Bldg-a***	***0by50.Bldg-a***		
Case a	Case a	Case a	Case a	Case a	Case a	Case a	Ref	Ref	Adv	***NT.Ind-a***	***0by50.Ind-a***		
Case b	Case a	Case a	Case a	Case a	Case a	Case a	Adv	Adv	Adv	*NT.All-a.EE-b*	*0by50.All-a.EE-b*		
Case a	Case b	Case a	Case a	Case a	Case a	Case a	Adv	Adv	Adv	*NT.All-a.Bhv-b*	*0by50.All-a.Bhv-b*		
Case a	Case a	Case b	Case a	Case a	Case a	Case a	Adv	Adv	Adv	*NT.All-a.CDR-b*	*0by50.All-a.CDR-b*		
Case a	Case a	Case a	Case b	Case a	Case a	Case a	Adv	Adv	Adv	*NT.All-a.Pwr-b*	*0by50.All-a.Pwr-b*		
Case a	Case a	Case a	Case a	Case b	Case a	Case a	Adv	Adv	Adv	*NT.All-a.LCF-b*	*0by50.All-a.LCF-b*		
Case a	Case a	Case a	Case a	Case a	Case b	Case a	Adv	Adv	Adv	*NT.All-a.H2-b*	*0by50.All-a.H2-b*		
Case a	Case a	Case a	Case a	Case a	Case a	Case b	Adv	Adv	Adv	*NT.All-a.CmPl-b*	*0by50.All-a.CmPl-b*		
Case b	Case b	Case b	Case b	Case b	Case b	Case b	Adv	Adv	Adv	*NT.All-a.AllAlts-b*	*0by50.All-a.AllAlts-b*		

European Commission Sponsored IAMing Studies

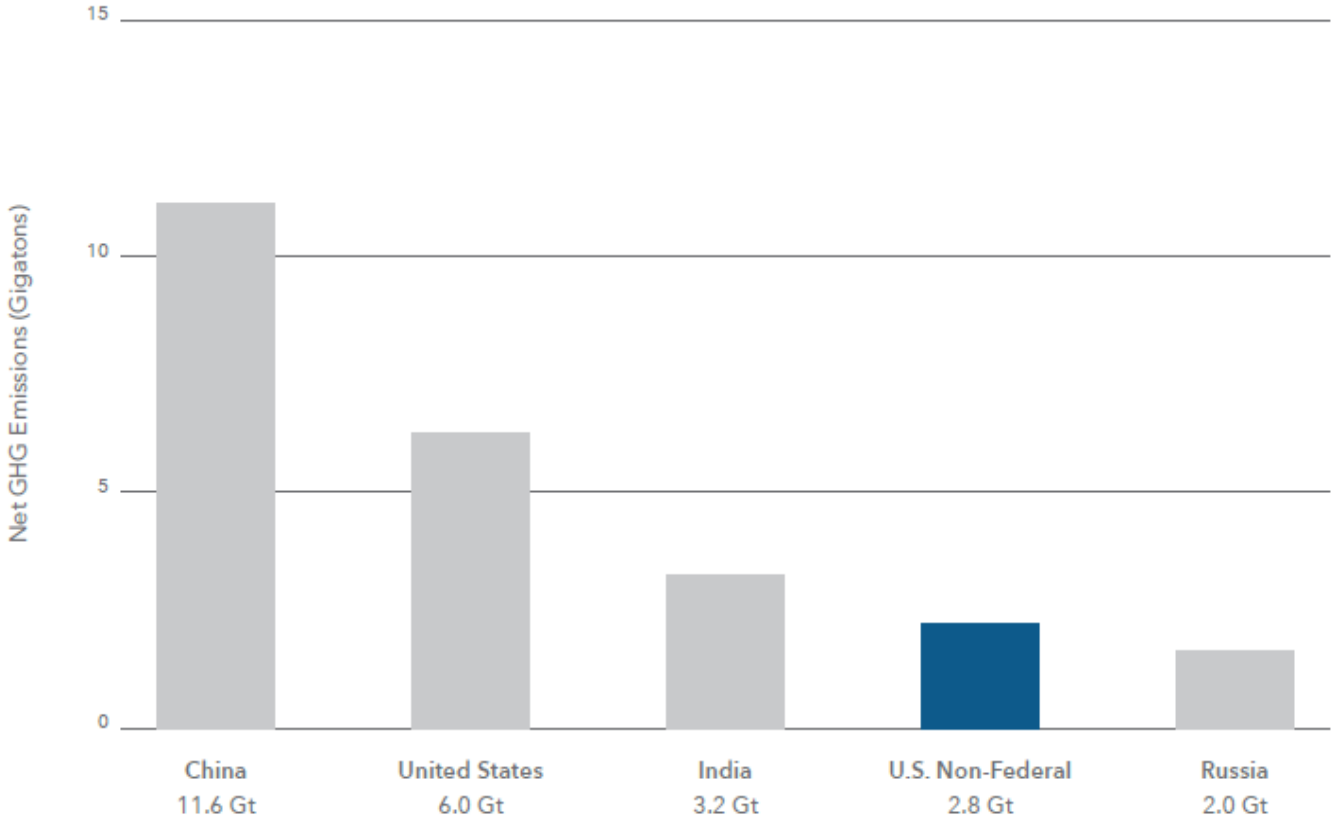
- AMPERE & CD-LINKS & ENGAGE (Policy & Stakeholder Oriented)
- ADVANCE & NAVIGATE (Improving the State of the Art Oriented)

US Modeling Work
Obama to Trump to Biden

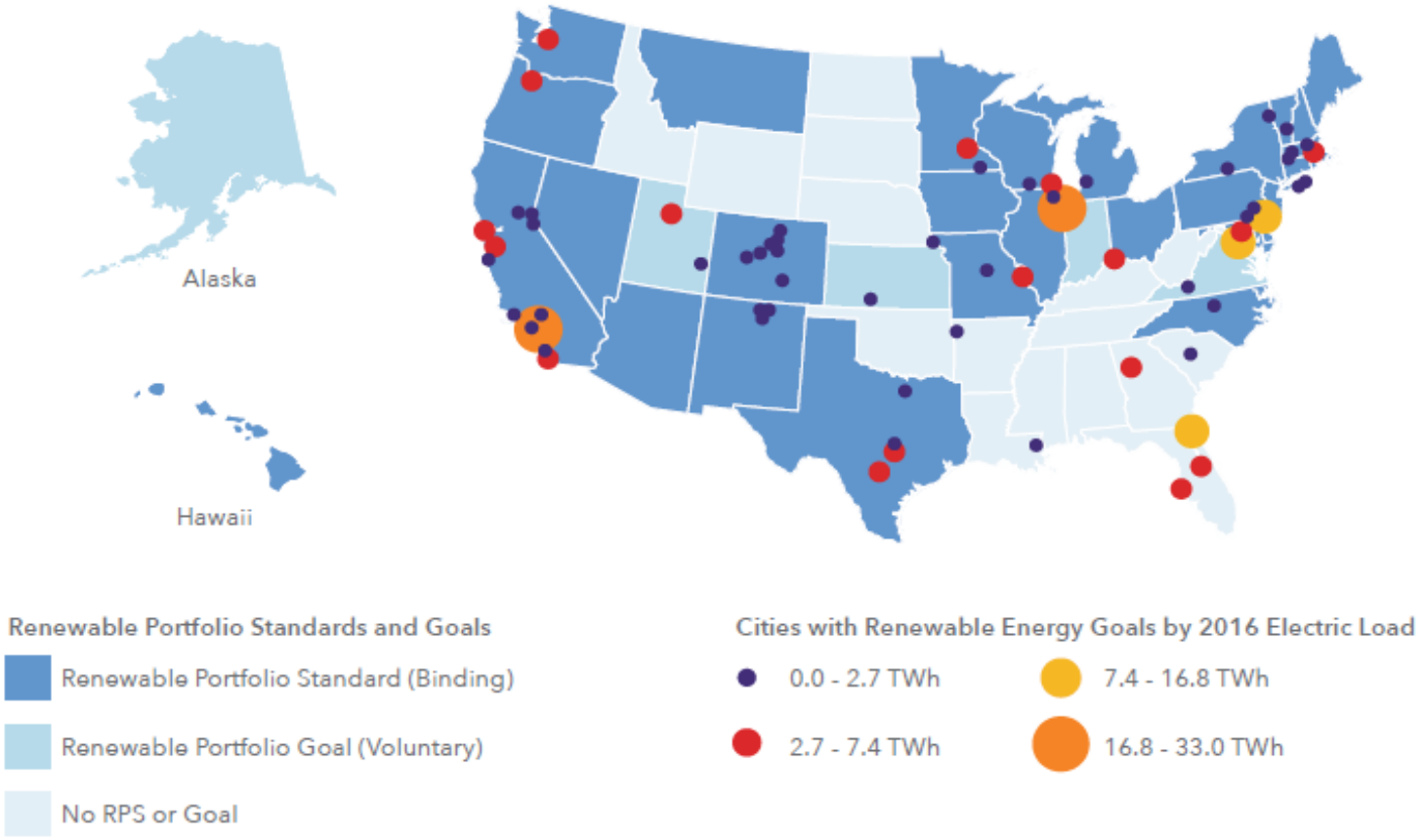
- INDCs/NDCs/Global Stock Take (2023)
- Mid-Century Strategy Reports
- SCC & Clean Power Plan to SCC+?
- Americas Climate Pledge Reports

Americas Climate Pledge Report

States, Cities, and Businesses Accounting for 40 Percent of U.S. GHGs Have Set Reduction Targets

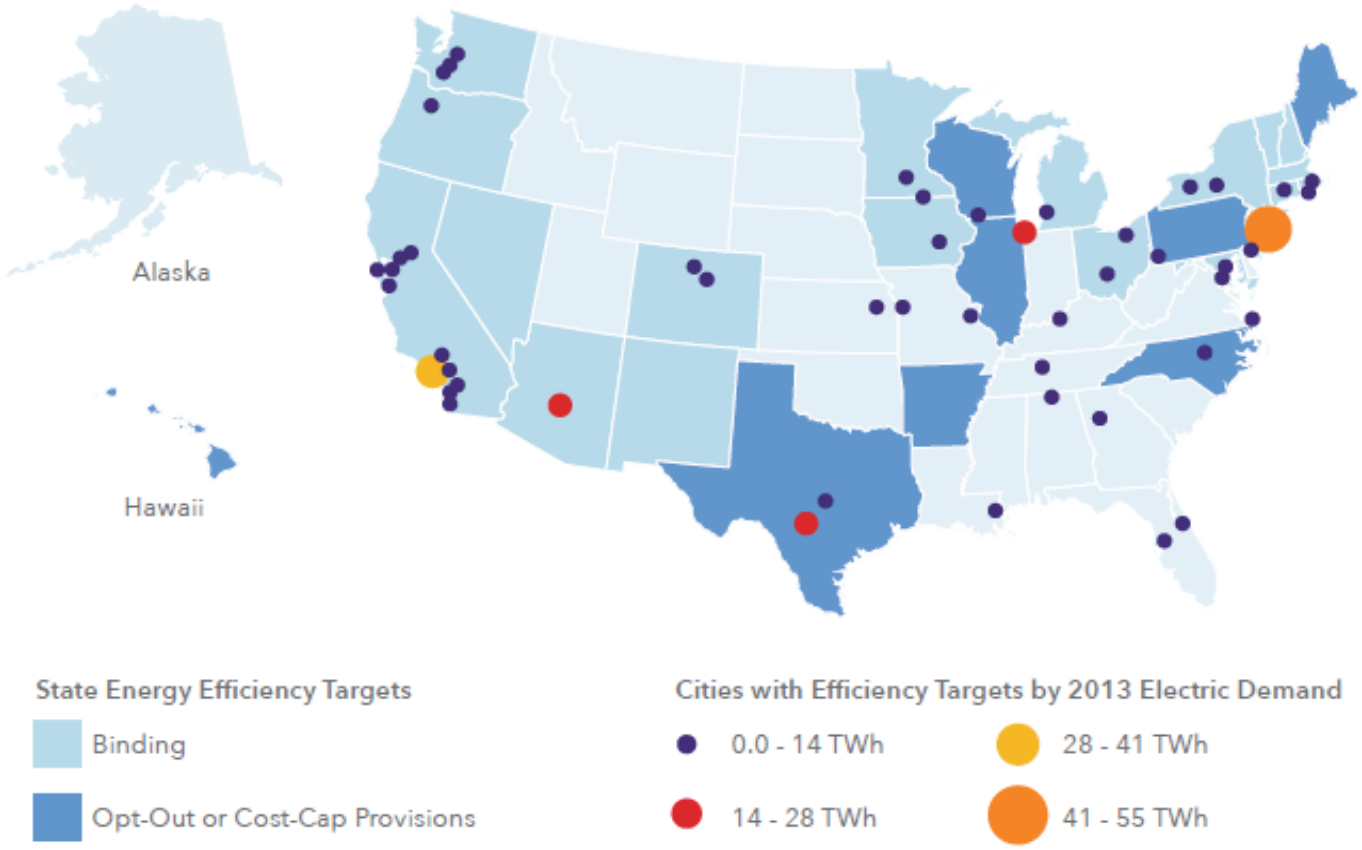


States and Cities across the U.S. Have Adopted Clean Energy Targets and Goals



Source: American Council for an Energy-Efficient Economy; Lawrence Berkeley National Laboratory; World Resources Institute

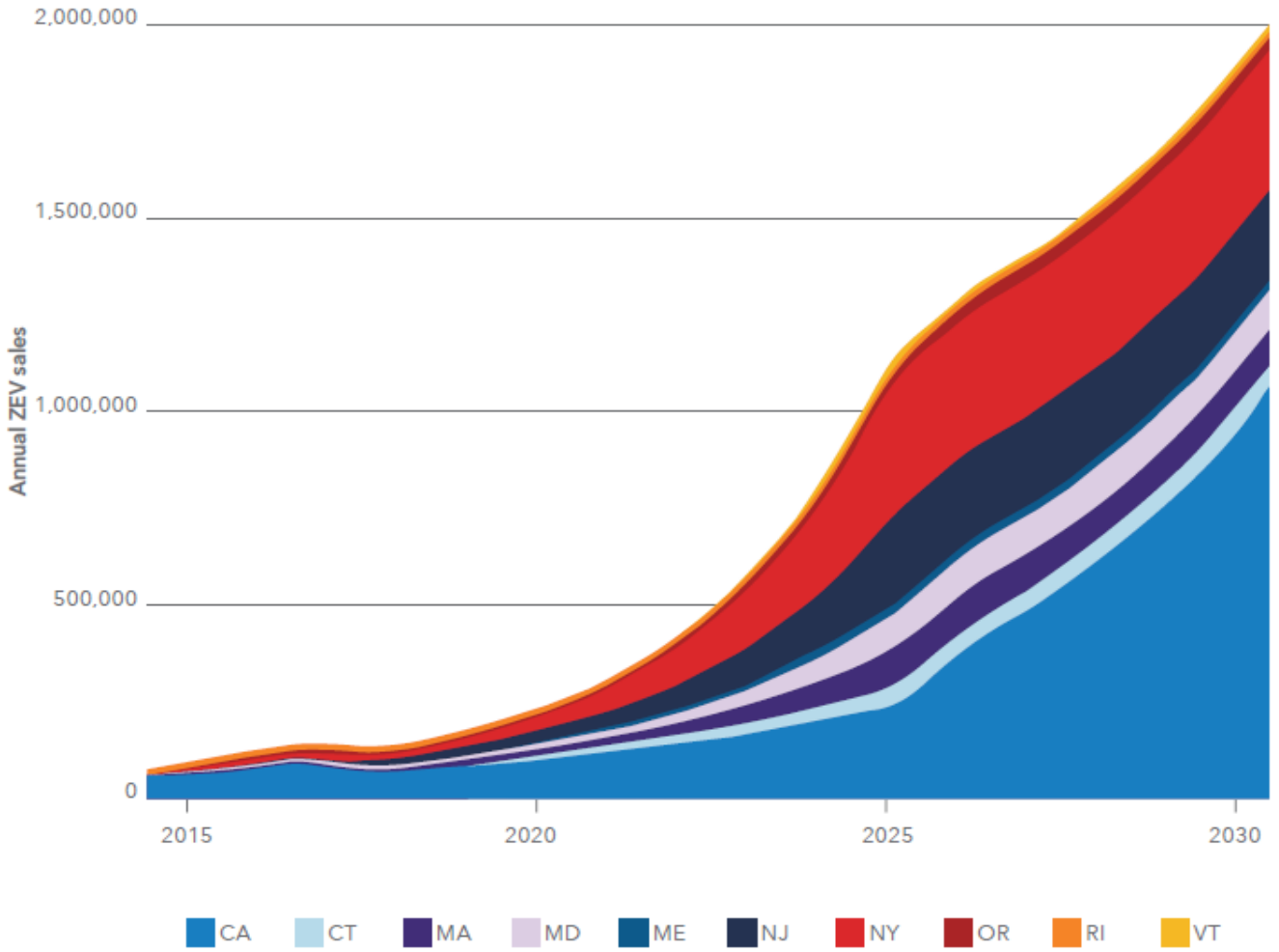
26 States and 56 of the Largest Cities in the U.S. have set Energy Efficiency Targets



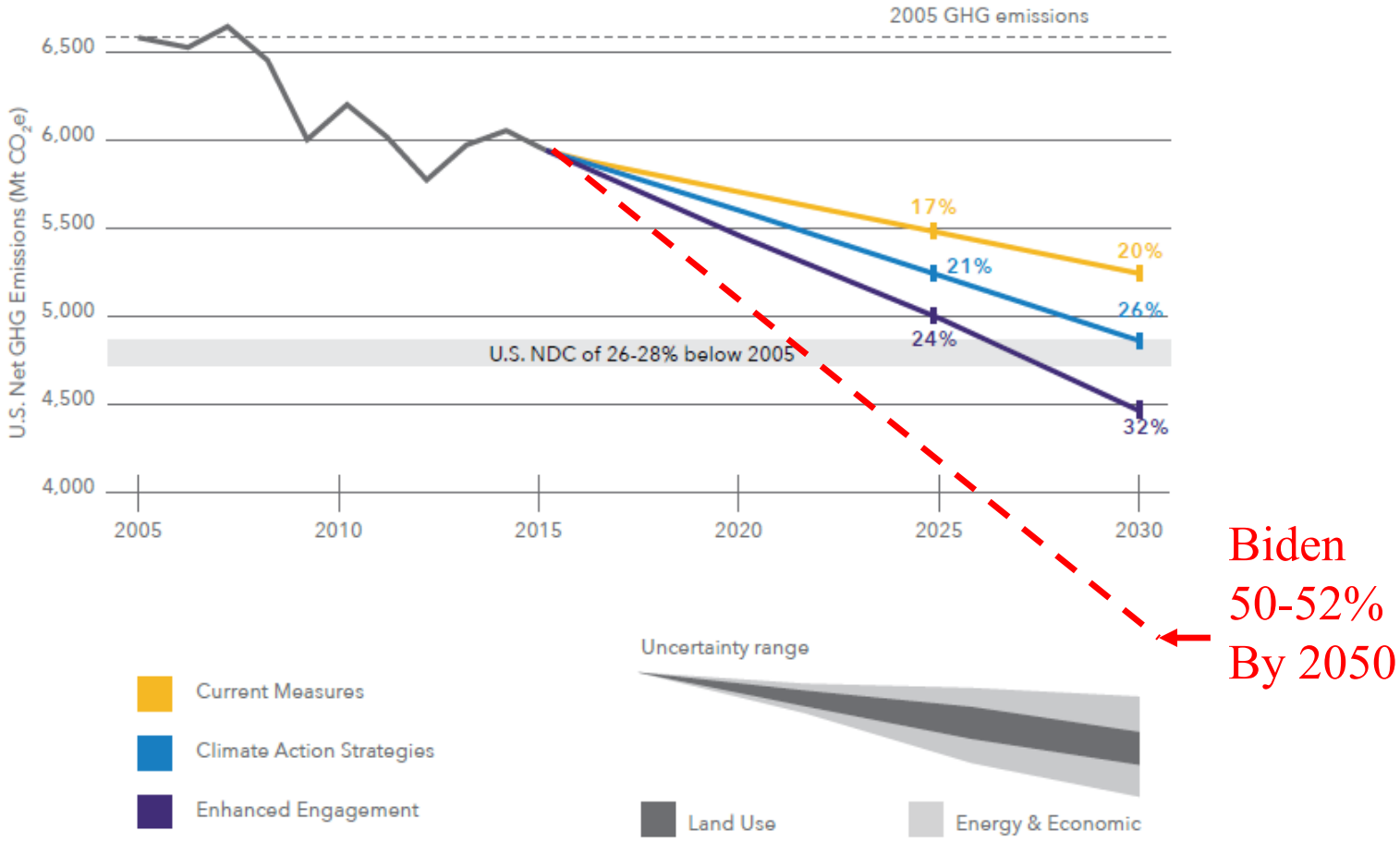
Sources: American Council for an Energy-Efficient Economy and World Resources Institute

Note: This includes Seattle and New York which do not have specific energy efficiency targets but have GHG targets that will include energy efficiency measures

State ZEVR Targets Increase Steadily with Annual EV Sales Reaching a Projected 1.2 Million Vehicles in 2025 and Growing to 2 Million by 2030

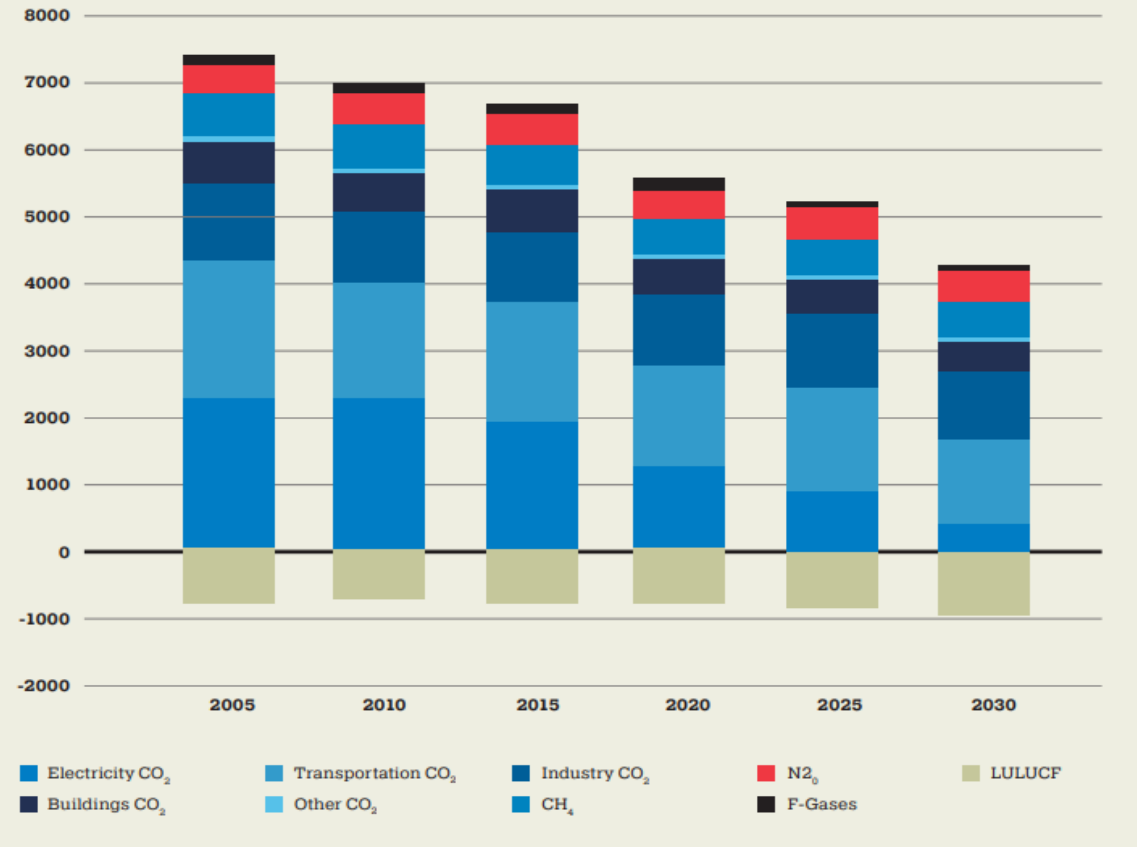


Progress toward Near- and Long-term Climate Goals Varies Across the Three Scenarios (Mt CO2e)



Source: America's Pledge modeling results

“America is All in” Policy Brief
April 21, 2021

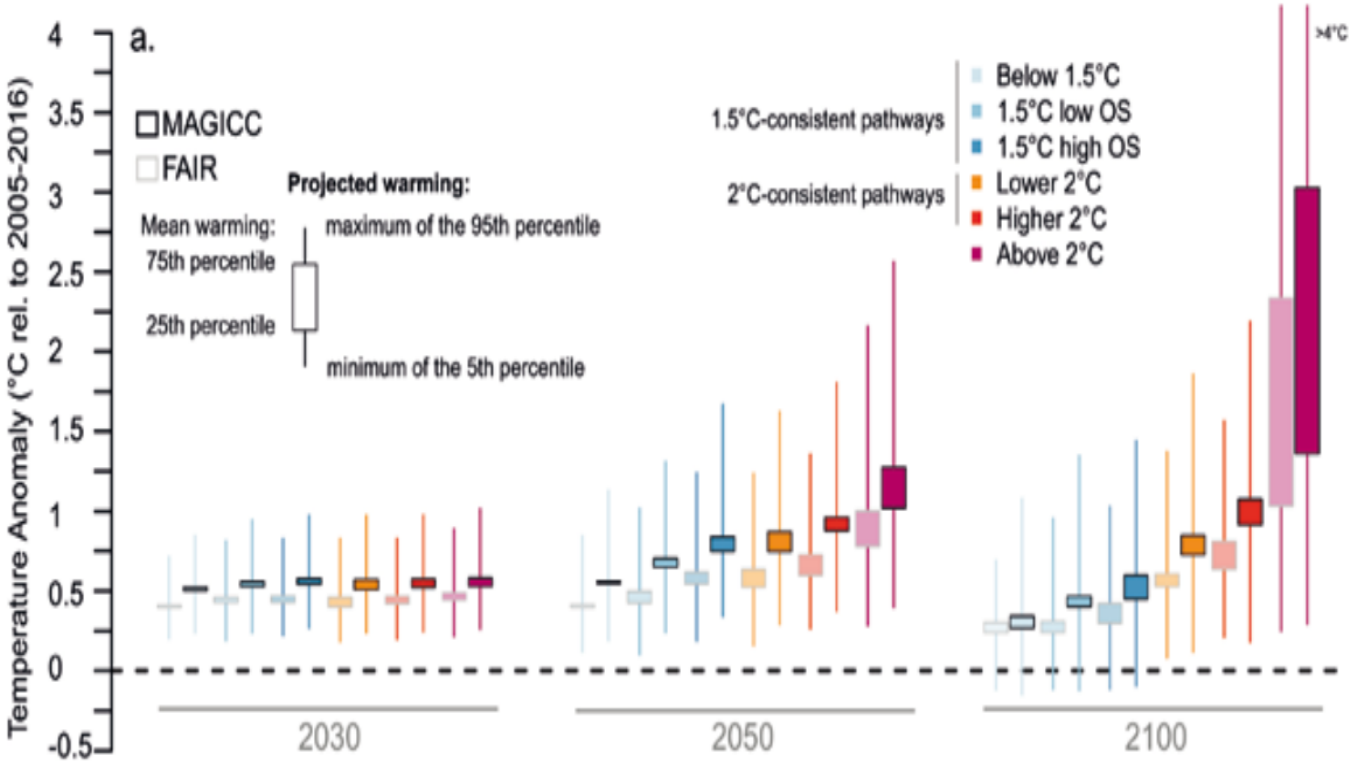


Working Paper: An All-In climate strategy can cut U.S. emissions by 50% by 2030
Author Team: Nate Hultman, Kevin Kennedy, Leon Clarke, Haewon McJeon, Tom Cyrs, John O’Neill,Alicia Zhao, Jenna Behrendt, Wendy Jaglom, Todd McGarvey, John Feldmann,Ryna Cui, Kowan O’Keefe

The End
Thank You

IPCC Special Report on 1.5 Degree C Scenarios

Average Global Mean Temperature Increase Relative to 2010 as Projected by FAIR and MAGICC in 2030, 2050 and 2100

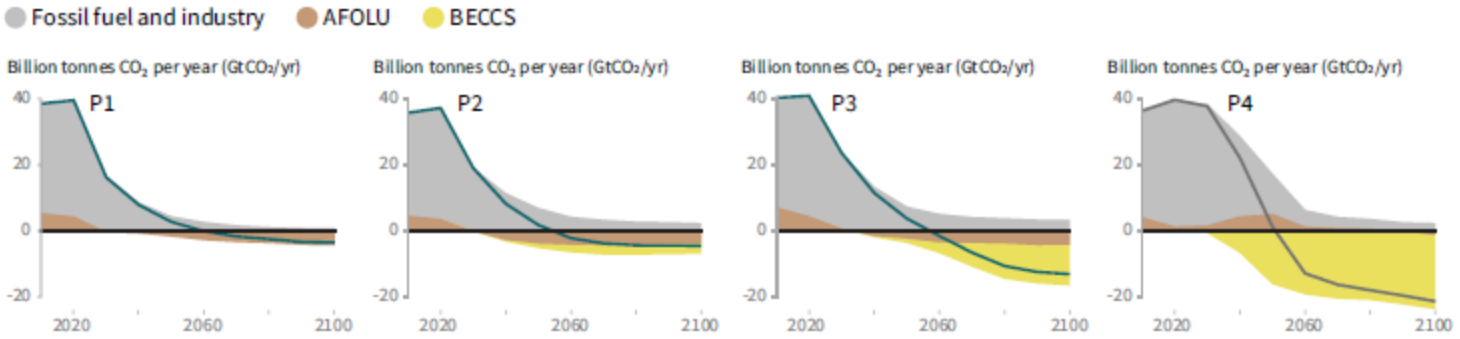


Shared Socio-Economic Pathways Scenarios (SSPs)

Characteristics of Four Illustrative Model Pathways

Different mitigation strategies can achieve the net emissions reductions that would be required to follow a pathway that limits global warming to 1.5°C with no or limited overshoot. All pathways use Carbon Dioxide Removal (CDR), but the amount varies across pathways, as do the relative contributions of Bioenergy with Carbon Capture and Storage (BECCS) and removals in the Agriculture, Forestry and Other Land Use (AFOLU) sector. This has implications for emissions and several other pathway characteristics.

Breakdown of contributions to global net CO_2 emissions in four illustrative model pathways



P1: A scenario in which social, business and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A downsized energy system enables rapid decarbonization of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.

P2: A scenario with a broad focus on sustainability including energy intensity, human development, economic convergence and international cooperation, as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems with limited societal acceptability for BECCS.

P3: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.

P4: A resource- and energy-intensive scenario in which economic growth and globalization lead to widespread adoption of greenhouse-gas-intensive lifestyles, including high demand for transportation fuels and livestock products. Emissions reductions are mainly achieved through technological means, making strong use of CDR through the deployment of BECCS.

Global indicators	P1	P2	P3	P4	**Interquartile range**
Pathway classification	No or limited overshoot	No or limited overshoot	No or limited overshoot	Higher overshoot	No or limited overshoot
CO_2 emission change in 2030 (% rel to 2010)	-58	-47	-41	4	(-58,-40)
↳ in 2050 (% rel to 2010)	-93	-95	-91	-97	(-107,-94)

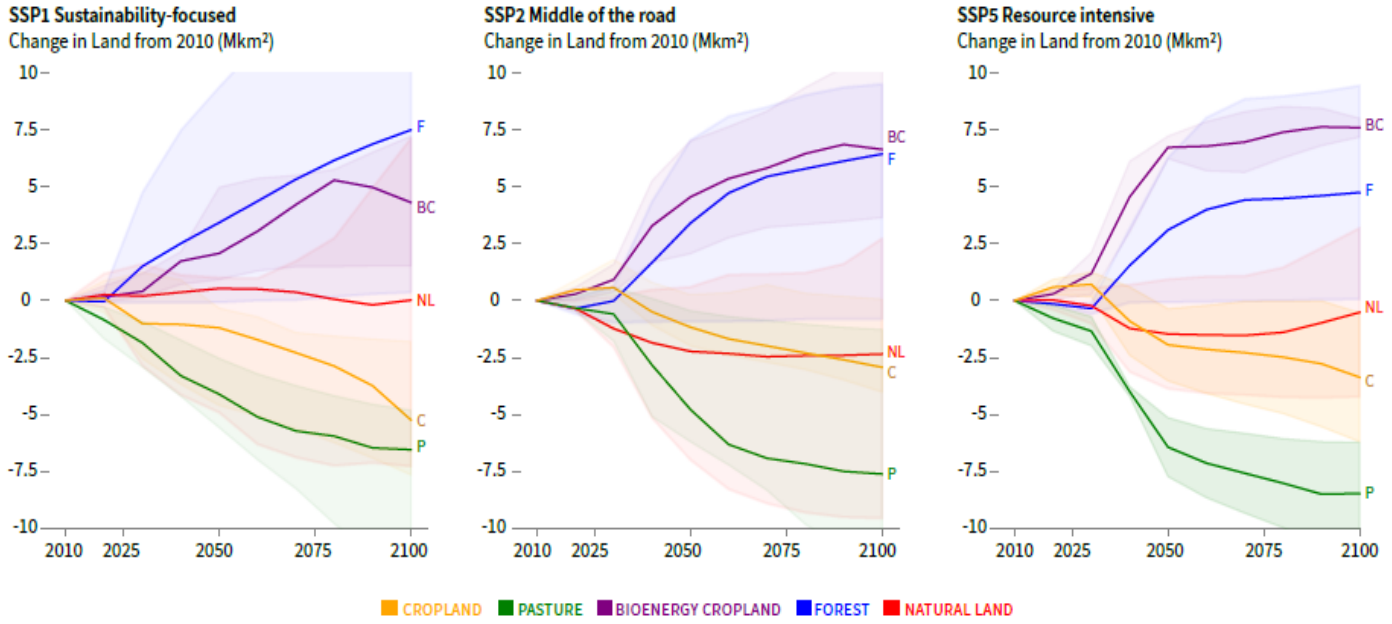
IPCC Special Report on Climate Change and Land Use

Pathways Linking Socioeconomic Development, Mitigation Responses and Land

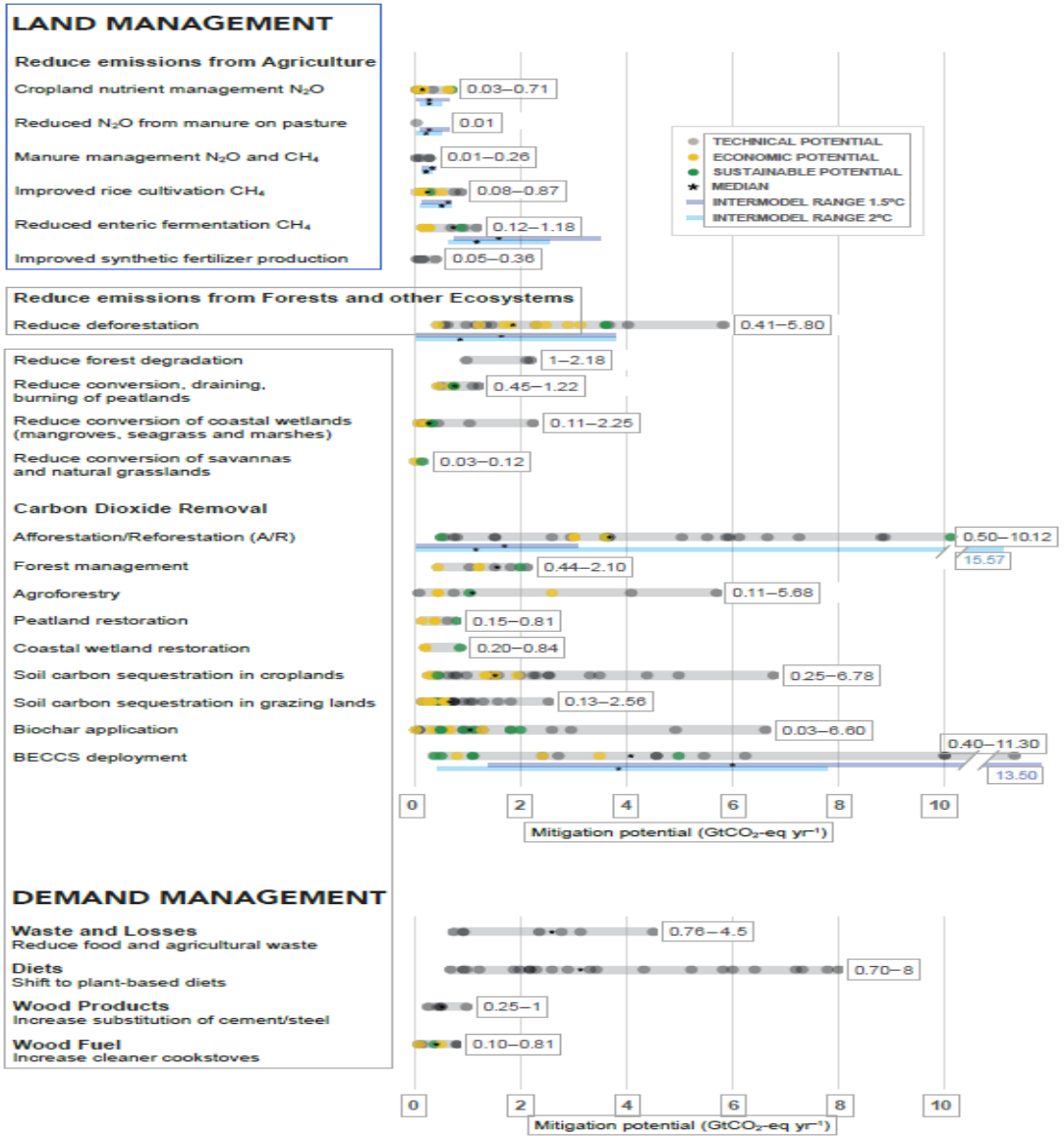
A. Sustainability-focused (SSP1)
Sustainability in land management, agricultural intensification, production and consumption patterns result in reduced need for agricultural land, despite increases in per capita food consumption. This land can instead be used for reforestation, afforestation, and bioenergy.

B. Middle of the road (SSP2)
Societal as well as technological development follows historical patterns. Increased demand for land mitigation options such as bioenergy, reduced deforestation or afforestation decreases availability of agricultural land for food, feed and fibre.

C. Resource intensive (SSP5)
Resource-intensive production and consumption patterns, results in high baseline emissions. Mitigation focuses on technological solutions including substantial bioenergy and BECCS . Intensification and competing land uses contribute to declines in agricultural land.

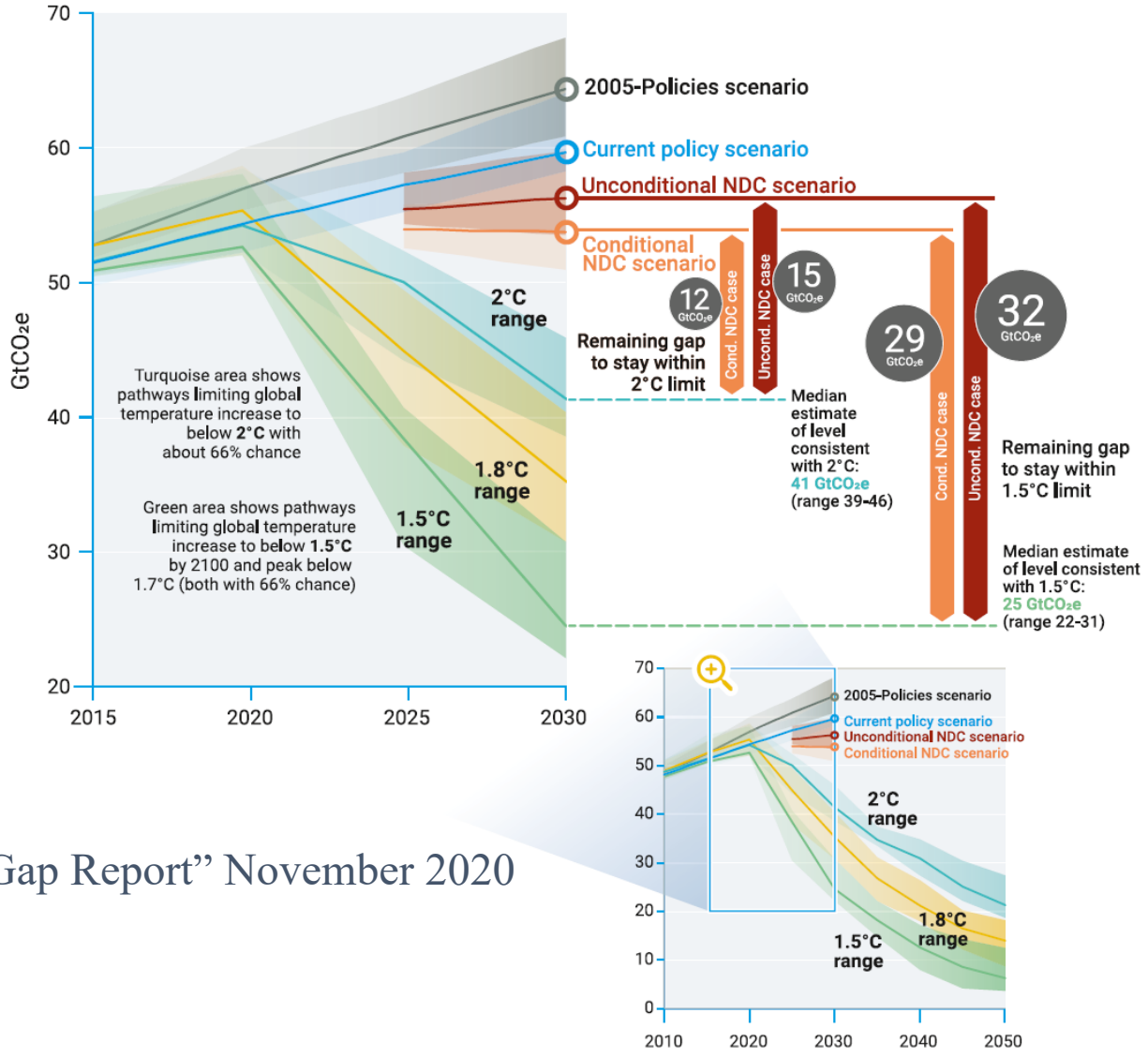


Mitigation Potential of Response Options in 2020–2050, Measured in GtCO2-eq/yr (Adapted From Roe et al., 2017)



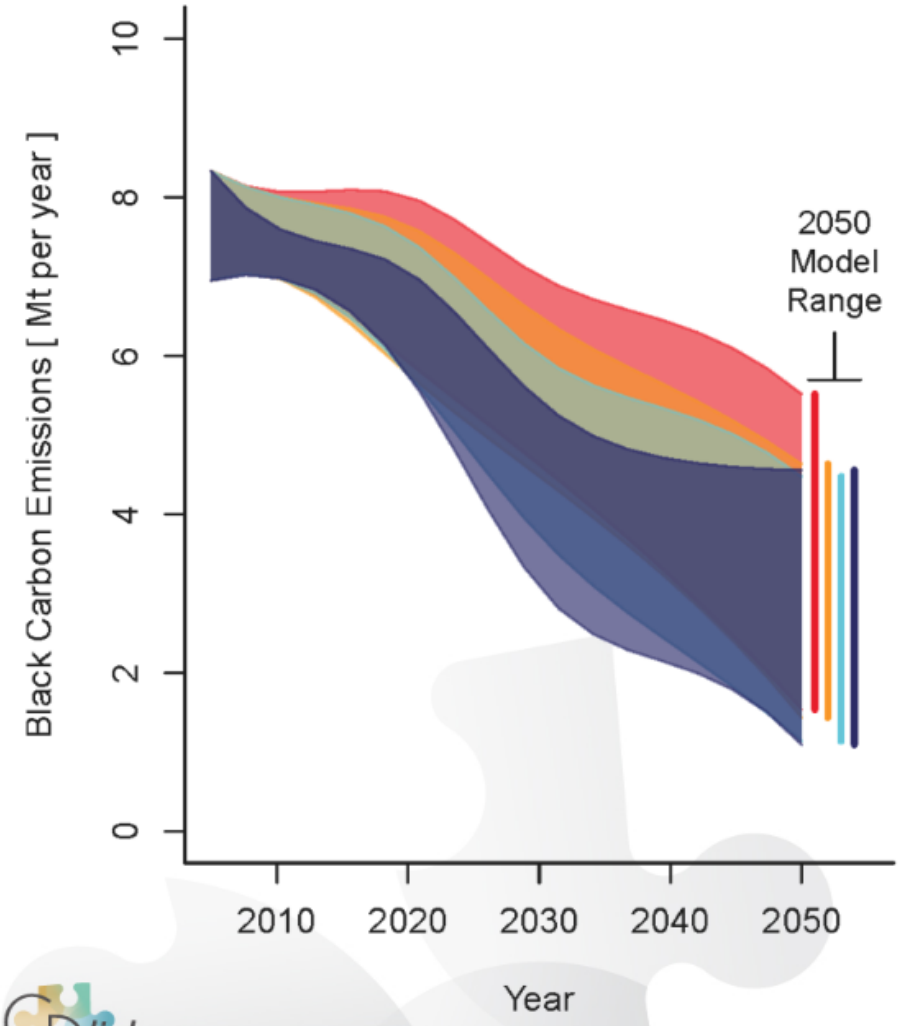
UNEP Gap Report 2020

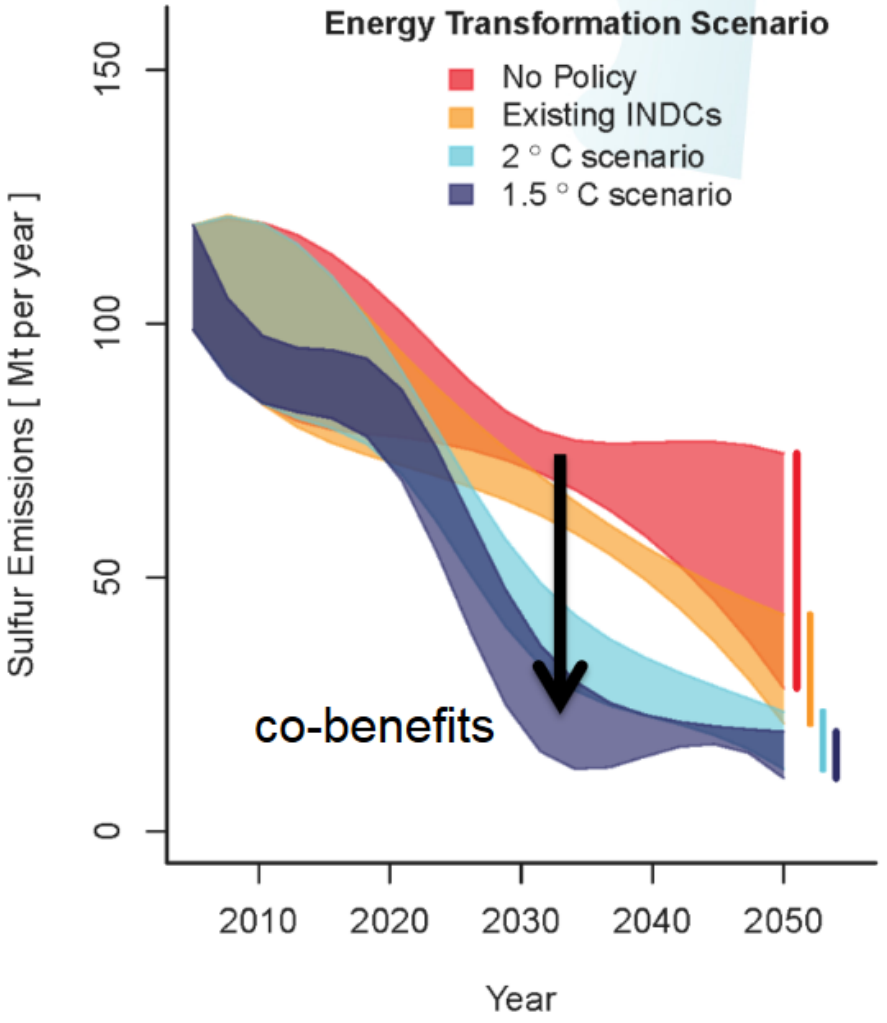
Global greenhouse gas emissions under different scenarios and the emissions gap in 2030 (median estimate and 10th to 90th percentile range).



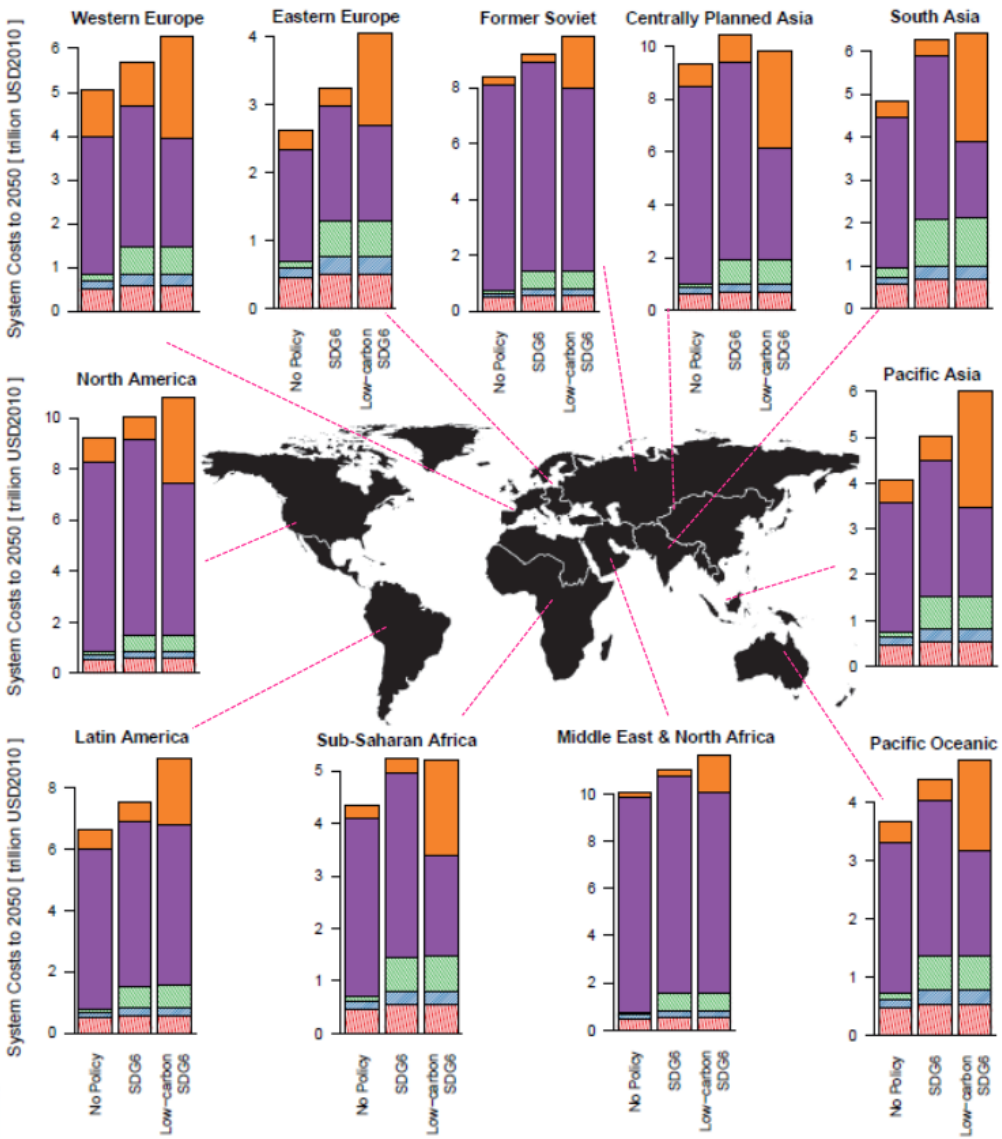
Source: UNEP "Gap Report" November 2020

CD-LINKS





Rafaj et al, under prep

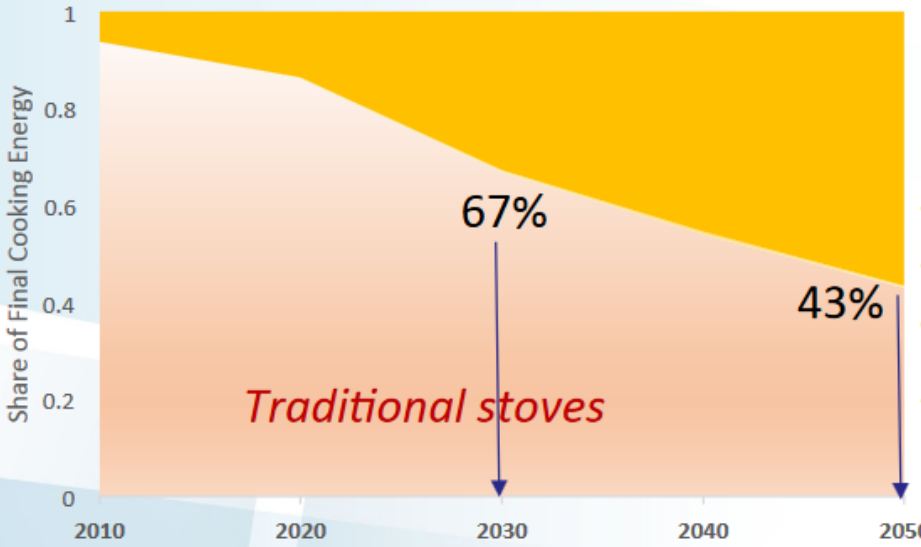


Impacts of water & climate objective or costs to 2050 - SSP2

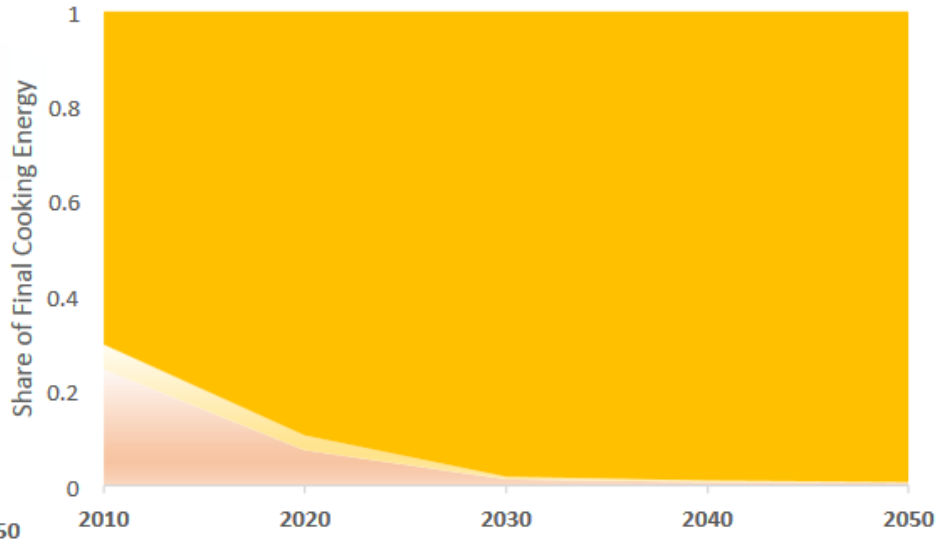
Preliminary Results

Parkinson et al, forthcoming

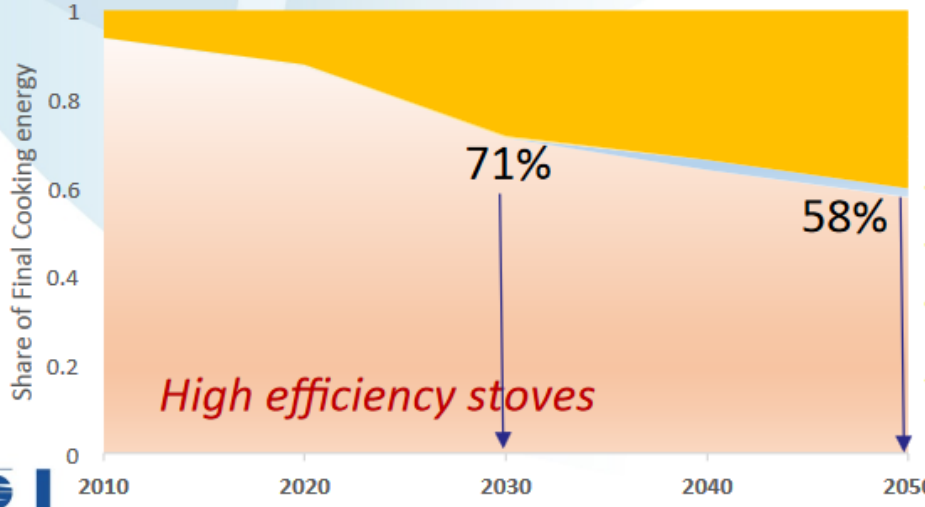
SSP2-Rural



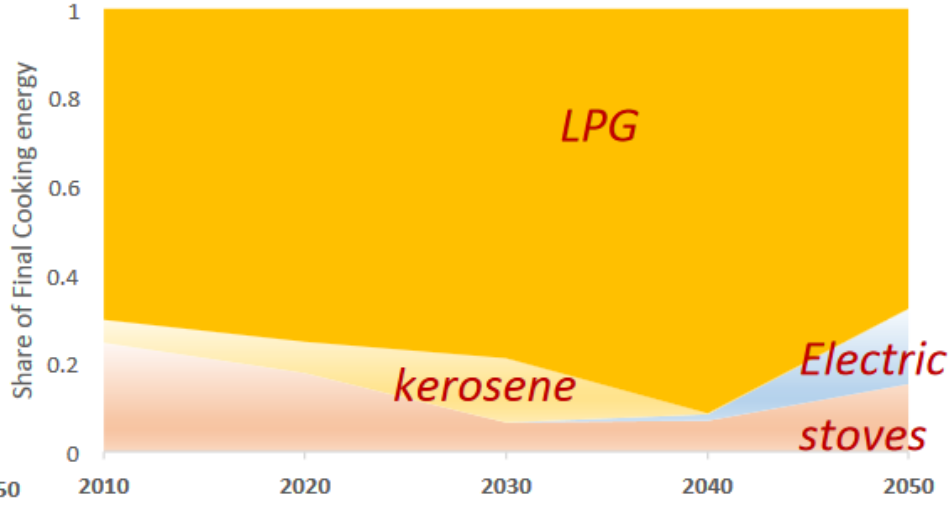
SSP2 - Urban



SSP2+ INDC/2◦C Rural



SSP2+INDC/2◦C Urban



EDITS Project – RITE with IIASA

Aggressive Energy Demand Reduction Scenarios