

Challenges

- Three billion people worldwide burn solid fuels such as firewood, charcoal, coal, dung, and crop residues in open fires and traditional stoves, leading to 4.3 million premature deaths each year (1.7 million in South Asia alone).
- Addressing the widespread lack of access to basic, clean energy services (e.g. non-solid fuels like LPG or electricity) is a pressing development challenge that may conflict with larger climate mitigation goals.
- The vast majority of scenarios assessed in the IPCC Fifth Assessment Report fail to analyze potential tradeoffs between addressing climate change mitigation and meeting energy access and other basic development goals.
- Existing integrated assessment models are limited in their ability to assess the distributional consequences of potential policy changes – e.g. how particular mitigation or energy access policies will impact households in poverty.

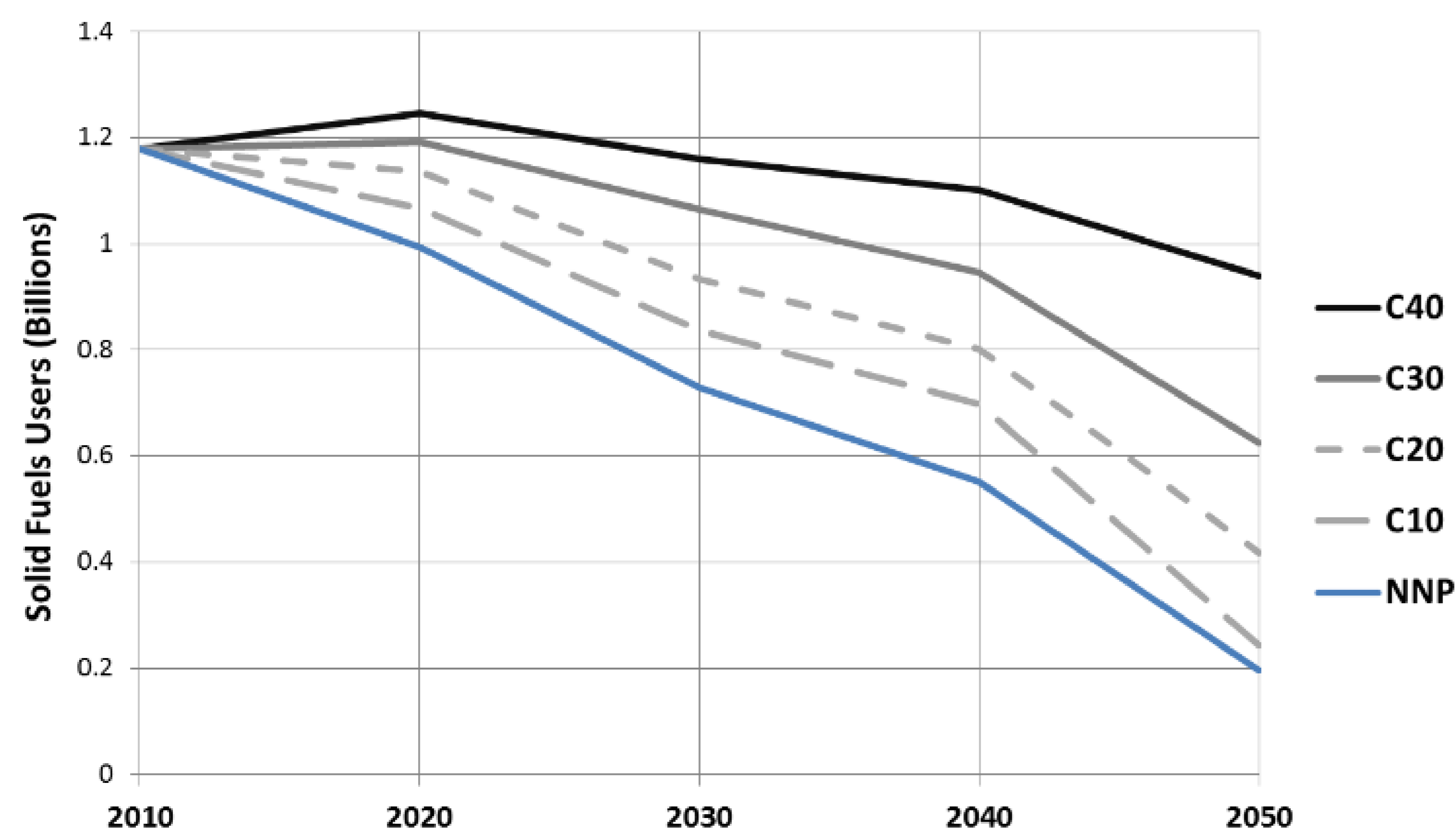
Analysis – Methods and Model

- We use an integrated assessment modeling framework consisting of the MESSAGE energy system model coupled with a residential cooking fuel choice model for South Asia. The resulting MESSAGE-Access model is used to assess the impact of climate mitigation on the feasibility and cost of achieving a clean cooking target by 2030.
- Changes to fuel demand in the residential sector can have macro level effects on market fuel prices. The macro-level impacts and subsequent fuel price feedbacks are captured through an iterative linking of MESSAGE with the fuel choice model.
- The Global Energy Assessment's Mix scenario (GEA-M) is used as a baseline scenario, referred to as the "no new policy" (NNP) scenario. We explore a range of GHG mitigation scenarios with increasing probability of limiting warming to below 2°C relative to preindustrial levels. The mitigation scenarios are consistent with a per ton CO₂ equiv. value of \$10-\$40 (C10-C40) in year 2020.
- We also model a range of price support policies on clean cooking fuels (0%-75% subsidy) and stoves (0%-100% subsidy) (i.e. "energy access policies").
- The residential fuel choice model consists of a combination of an 'energy ladder' preference structure combined with fuel-specific demand curves for different population groups, grouped by location (urban/rural) and income. These preference characteristics were derived from national household survey data for India. The population groupings enable the incorporation of heterogeneity in affordability criteria and the analysis of distributional effects of alternative scenarios and policies.

Results

- Our analysis shows that current demographic and economic growth trends (the NNP scenario) will enable a transition to cleaner fuels and stoves, but could still leave 728 million people (35% of the South Asian population) reliant on solid cooking fuels in 2030 (Fig.1).
- Holding warming to below 2°C in our most stringent C40 climate policy scenario could make clean cooking unaffordable for up to an additional 433 million South Asians in 2030 (Fig. 1), with varying impacts across the population (Fig. 2).

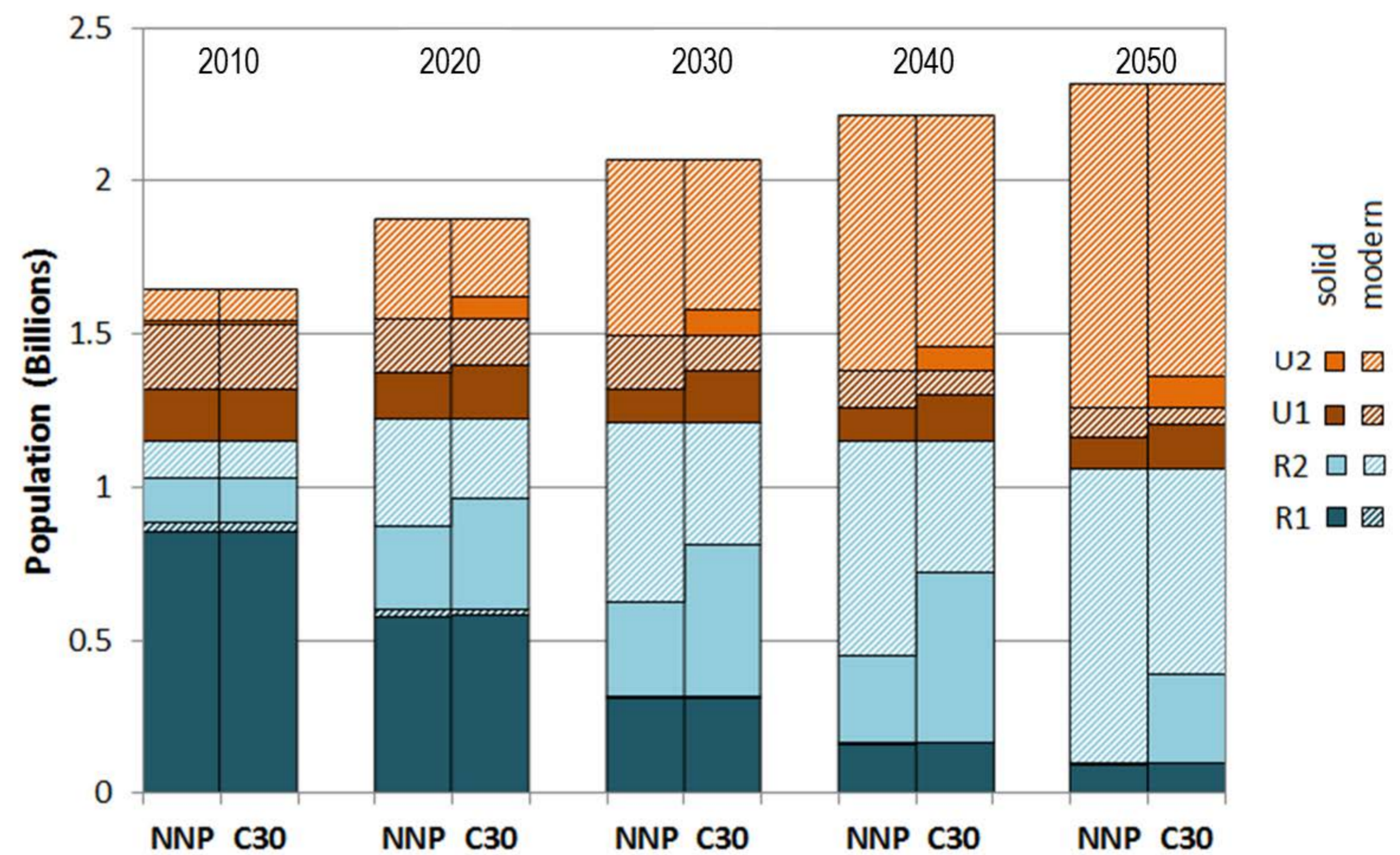
Fig. 1: Change in number of solid fuel users in South Asia across different climate policy scenarios (NNP: no new policies)



Results (continued)

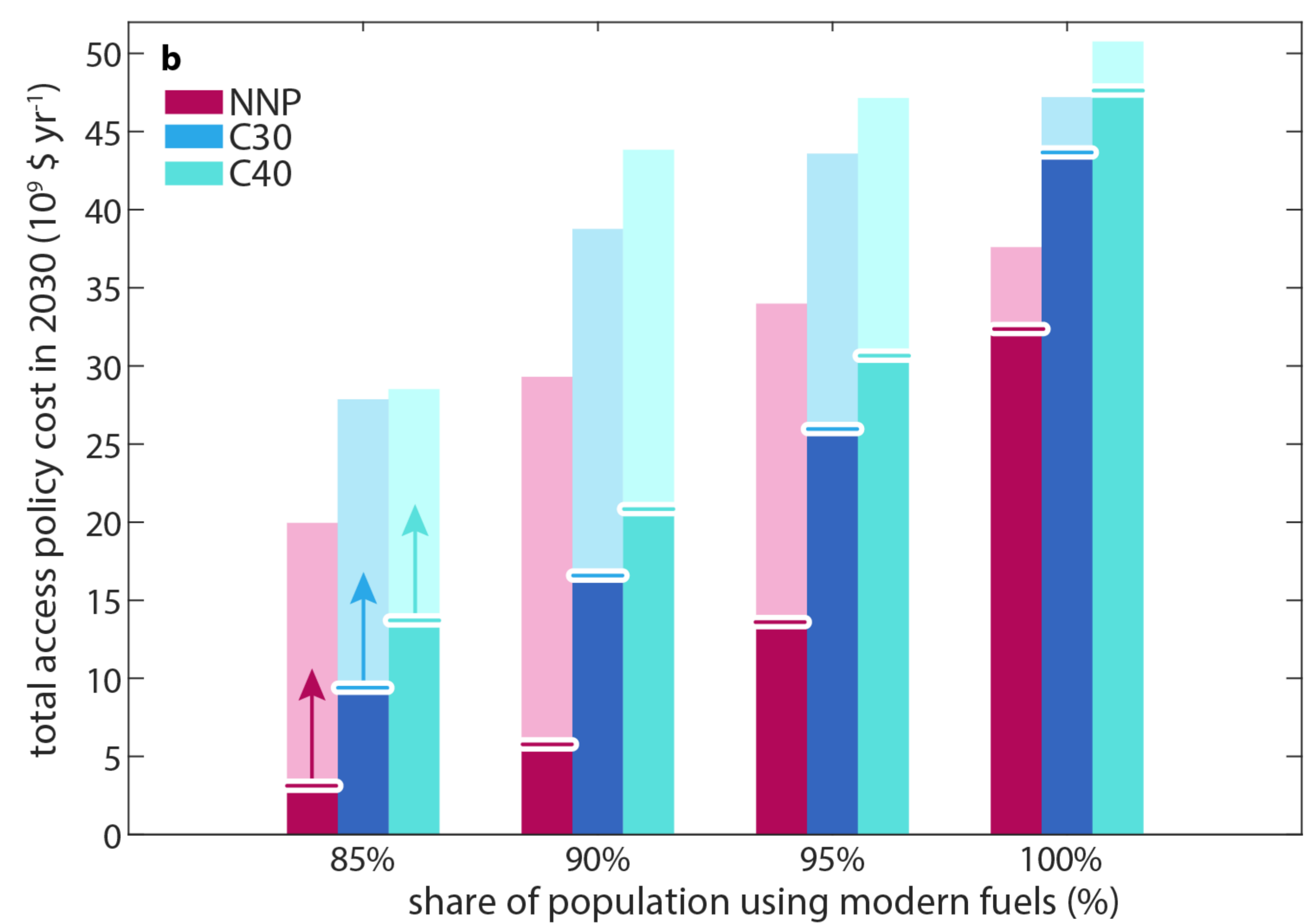
- Climate policy affects fuel choice most strongly in moderate income households (population groups R2 and U1, Fig. 2), but these households are also the most responsive to compensatory access policies.
- The poorest households (group R1) are relatively unaffected by climate policy, since they would not be able to utilize clean cooking fuel even in the NNP scenario.

Fig. 2: Impact of climate policy on clean cooking fuel adoption in South Asia
U1: Richest urban households; U2: poorer urban; R2: Richer rural; R1: poorer rural



- Achieving universal clean cooking by 2030 in South Asia will require concerted policy efforts and substantial costs even in a world without climate policies, but costs could be up to 44% higher under stringent climate mitigation (Fig. 3).
- We find the incremental access policy costs associated with stringent mitigation fall well within the range of uncertainty in policy costs from inefficient access support policies.

Fig. 3: Range of policy costs needed to achieve South Asia clean cooking targets in 2030



Conclusions

- We examine the effect of climate mitigation policy on achieving universal clean cooking access goals in South Asia. We find that significant upscaling of intervention efforts will be needed beyond the policies in place today to achieve a target of universal clean cooking by 2030, even in the absence of climate policy.
- Stringent climate mitigation policy could intensify this need, but the size (funding level) and efficiency (mechanism and targeting) of energy access policies will have a greater impact on clean energy adoption than the stringency of global mitigation efforts.
- Any additional costs due to climate policy are well within the range of potential financial transfers to South Asia that may result from international climate agreements.