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**PARIS REINFORCE (PR) input to the first global
stocktake**

SYR (f)

Barriers and challenges, including finance, technology and capacity-
building gaps, faced by developing countries

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Key Points:

- Increasing the sustainable output of biomass can reduce emissions by 10% in eastern Africa. An optimised energy technology subsidy portfolio increases emissions saving by a further 10%, decreases air pollution mortality by 20%, and improves energy access by 15% (van de Ven et al., 2019).
- Comprehensive green fiscal reforms can stimulate economic growth by 14.5%, increase trade performance, and alleviate external constraints on economic development in Brazil (Gramkow and Anger-Kraavi, 2019).
- Broadening the scope of Emissions Trading Systems decreases welfare losses (Li et al., 2021). This effect is stronger when carbon dioxide removal (CDR) options are available (Babonneau et al., 2021).
- Key barriers to a green transition in China include investment risks, difficulties in policy enforcement and monitoring, weak and unstable institutions, and monopoly businesses (Song et al., 2020).

About the project

PARIS REINFORCE (PR) is an EU Horizon 2020 funded project, with a consortium of thirteen European and five international partners. PR's fundamental aim is to enhance and improve climate policymaking. To do so, the consortium has access to a range of sophisticated climate-economic scientific models and brings together a wide range of knowledge and expertise to produce interdisciplinary analyses and reports. PR has been working on a number of additional Deliverables which will prove relevant to the GST. However, analyses are unfinished and thus remain to be published. PR will update our inputs with our latest results once they are complete.

Summary of the relevant work

van de Ven et al. (2019) utilised an integrated assessment model to simulate the impact of land policies and technology subsidies, as well as the interaction of both, on greenhouse gas (GHG) emissions, exposure to air pollution and energy access in eastern Africa. A lack of access to modern energy sources can lead to dependence on unsustainable biomass – a major cause of both GHG emissions and premature mortality (Mohammed et al., 2015).

Land policies that focus on increasing the sustainable output of biomass can reduce GHG emissions by ~10%; however, this also delays progress in health and energy access goals. An optimised portfolio of energy technology subsidies – consistent with a global Green Climate Fund budget of \$30–35 billion – can create an additional 10% of savings in GHG emissions, while decreasing air pollution related mortality by 20% and improving energy access by up to 15%. It is worth noting that such land and technology subsidisation policies become less effective after 2030 and are much more dependent on the development path of the region in question.

Analyses indicated that: biogas technology should be prioritised and subsidised in the short- and long-term; financing liquefied petroleum gas and ethanol technologies has synergistic benefits on energy access, health, and climate mitigation; financing PV technologies holds the most relevance for improving energy access; and charcoal is pertinent to curb GHG emissions should its finance be linked to land policies.

Gramkow and Anger-Kraavi (2019) use the Brazilian manufacturing industry as an example to explore the transformation of a developing economy whilst contributing to the PA, investigating what realistic mitigation measures and policies could be implemented in developing countries' manufacturing sectors that reduce GHG



emissions whilst simultaneously enhancing the country's socioeconomic performance.

Projections contest the perception that mitigation policies generate net macroeconomic losses, instead showing that comprehensive green fiscal reforms (GFR) targeted at greening manufacturing industries can deliver higher economy-wide GHG growth (up to 0.42% compared to baseline), reduce CO₂ emissions across the entire economy (by up to 14.5% compared to baseline), increase investments, and strengthen overall trade performance. Critically, GFRs can alleviate the external constraints on long-term economic development.

GFRs can be achieved at low carbon tax rates. A rate of up to 7.4 EUR/tCO₂ would be sufficient to finance fiscal stimulus (via tax exemptions and concessional finance) for all mitigation technologies. However, more research is required to map climate policies that produce more benefits than losses in macroeconomic terms, as well as to identify policies that do not conflict with socioeconomic development.

Li et al. (2021) quantified the effects of the welfare effects of integrating the EU and Chinese ETSs, finding that integrating these trading markets benefits both the EU and China, due to reduced welfare costs of climate abatement. This effect was most pronounced on countries in the EU with a high quantity of energy-intensive industry. Analysis showed that by limiting quotas to 40%, the EU can capture the greatest welfare gains coming from CO₂ trading, whereas China's welfare was linearly correlated to the trade limit. The majority of countries faced lower welfare costs when compared to a non-integrated market scenario, illustrating that ETSs hold the potential to be an effective mechanism to facilitate the multilateral coordination of global climate mitigation effort and reduce the welfare costs of mitigation.

Babonneau et al. (2021) have assessed the role of CDR under an international ETS as a way to alleviate welfare losses associated with climate mitigation, focusing on oil- and gas-producing countries – particularly the Gulf Cooperation Council (GCC) member states. Whilst not all members of the GCC are currently developing countries (i.e., UAE and Kuwait), the majority of GCC members are developing (i.e., Saudi Arabia, Qatar, Bahrain and Oman).

Assuming no CDR options are available, analysis showed that a market-based approach resulted in welfare losses of approximately 3.8% - translating to an equalised welfare loss of \$5 trillion in discounted GDP. Should CDR options be available, the welfare loss is reduced by 26% to \$3.7 trillion, with an associated equalised welfare loss of 2.8%.

Direct air capture (DAC) was the most important CDR option. The introduction of DAC reduces the quantity of unburned oil, thus reduces the loss of revenue for energy exporting countries. DAC is therefore essential to the development of a fair climate agreement. Similarly to the effects of an integrated ETS between the EU and China, the establishment of an international ETS and a fair burden sharing system would allow GCC countries to claim up to 8.8% of the emissions rights from a global safety cumulative emissions budget of 1170 Gt CO₂, and ensure that relative welfare losses are equal among all coalitions.

Vielle (2020) has evaluated the European Commissions' (EC) Effort Sharing Regulation (ESR) proposal, which aims to reflect the economic capacity of each Member State (MS) on the basis of its relative wealth in respect to fairness and cost-effectiveness, analysing the economic impacts of each flexibility option proposed by the EC.

Vielle's analysis revealed that flexibility mechanisms that allow "inter-Member state flexibility" constitute the most efficient option, tending to equalise CO₂ taxes, reduce compliance costs for MSs, whilst simultaneously increasing fairness between low-income MSs and high-income MSs. Simulations showed that a 10% limit can significantly reduce EU mitigation costs, whilst capturing most of the gain from allowance trading. Capitalising on seemingly smaller opportunities to increase cost-effectiveness and fairness can both boost support and cooperation, whilst reducing the burden of abatement on developing countries.



Song et al. (2020) have explored the development of a green transition in China, collecting stakeholder perspectives of implementation and consequential risks that may hinder the transition of the Chinese building sector. Key insights and general policy strategies aimed at promoting the transition include:

- Investment risks and difficulties in policy enforcement and monitoring, which could be overcome through rapid technological developments, growing competitive markets and stable regulation.
- Weak and unstable institutions/monopoly business interventions will require more detailed policy mechanisms to promote technological innovation and investment in low-carbon development.

Rapid technological development with different socioeconomic and political conditions can impact a low-carbon transition, thus green technology transition should be considered in combination with other factors (e.g., social norms, governance, perception) to avoid potential rebound effects.



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