Interlinkages, Incentives, Institutions – Energy for the 21st century

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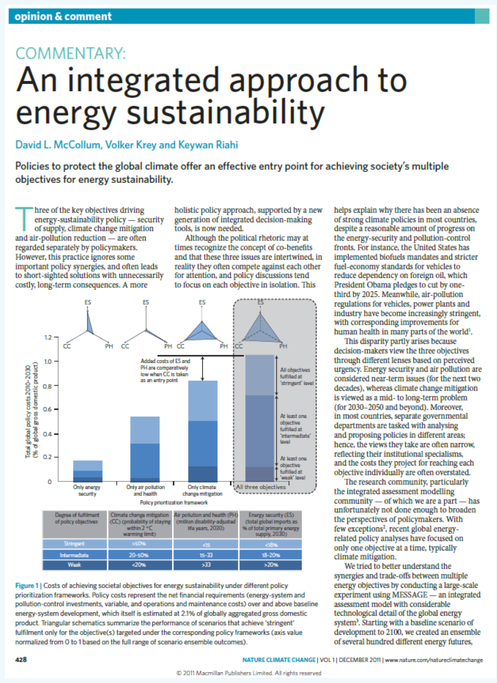
Multiple objectives and co-benefits

Policies to protect the global climate offer an effective entry point for achieving society's multiple objectives for energy sustainability.

Three of the key objectives driving energy-sustainability policy — security of supply, climate change mitigation and air-pollution reduction — are often regarded separately by policymakers. However, this practice ignores some important policy synergies, and often leads to short-sighted solutions with unnecessarily costly, long-term consequences.


opinion & comment

COMMENTARY:

An integrated approach to energy sustainability

David L. McCollum, Volker Krey and Keywan Riahi

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Three of the key objectives driving energy-sustainability policy — security of supply, climate change mitigation and air-pollution reduction — are often regarded separately by policymakers. However, this practice ignores some important policy synergies, and often leads to short-sighted solutions with unnecessarily costly, long-term consequences. A more holistic policy approach, supported by a new generation of integrated decision-making tools, is now needed.

Although the political rhetoric may at times recognize the concept of co-benefits and that these three issues are intertwined, in reality they often compete against each other for attention, and policy discussions tend to focus on each objective in isolation. This helps explain why there has been an absence of strong climate policies in most countries, despite a reasonable amount of progress on the energy-security and pollution-control fronts. For instance, the United States has implemented biofuels mandates and stricter fuel-economy standards for vehicles to reduce dependency on foreign oil, which President Obama pledges to cut by one-third by 2025. Meanwhile, air-pollution regulations for vehicles, power plants and industry have become increasingly stringent, with corresponding improvements for human health in many parts of the world[1].

This disparity partly arises because decision-makers view the three objectives through different lenses based on perceived urgency. Energy security and air pollution are considered near-term issues (for the next two decades), whereas climate change mitigation is viewed as a mid- to long-term problem (for 2030–2050 and beyond). Moreover, in most countries, separate governmental departments are tasked with analysing and proposing policies in different areas; hence, the views they take are often narrow, reflecting their institutional specialisms, and the costs they project for reaching each objective individually are often overstated.

The research community, particularly the integrated assessment modelling community — of which we are a part — has unfortunately not done enough to broaden the perspectives of policymakers. With few exceptions[2], recent global energy-related policy analyses have focused on only one objective at a time, typically climate mitigation.

We tried to better understand the synergies and trade-offs between multiple energy objectives by conducting a large-scale experiment using MESSAGE — an integrated assessment model with considerable technological detail of the global energy system[3]. Starting with a baseline scenario of development to 2100, we created an ensemble of several hundred different energy futures.

Figure 1 | Costs of achieving societal objectives for energy sustainability under different policy prioritization frameworks. Policy costs represent the net financial requirements (energy-system and pollution-control investments, variable, and operations and maintenance costs) over and above baseline energy-system development, which itself is estimated at 21% of globally aggregated gross domestic product. Triangular schematics summarize the performance of scenarios that achieve 'stringent' fulfilment only for the objective(s) targeted under the corresponding policy frameworks (axis value normalized from 0 to 1 based on the full range of scenario ensemble outcomes).

Degree of fulfilment of policy objectives	Climate change mitigation (CC): probability of staying within 2 °C warming limit	Air pollution and health (PH): million disability-adjusted life years, 2030)	Energy security (ES): Global global imports as % of total primary energy supply, 2030)
Stringent	>50%	<15	<5%
Intermediate	20–50%	15–33	18–20%
Weak	<20%	>33	>20%

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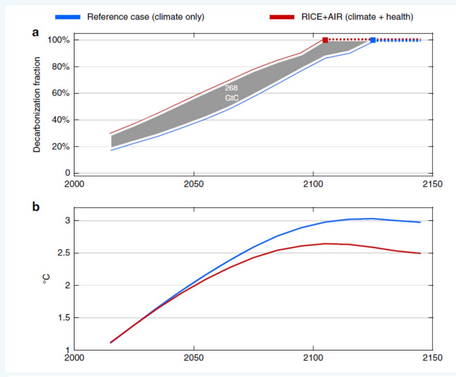
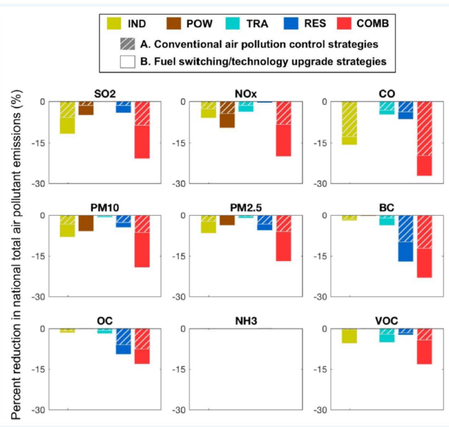
Air quality co-benefits

GHG mitigation and air quality control support each other.

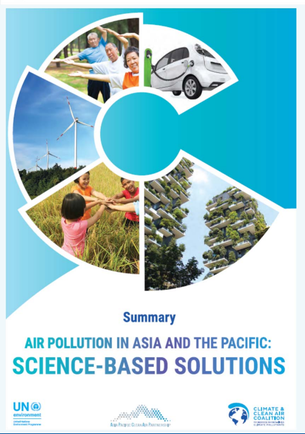




Local and short-term air quality co-benefits offer strong incentives for GHG mitigation, especially in the energy sector.

Many million of life-years could be saved locally by bold GHG mitigation.

In addition, through GHG mitigation billions of investment in air pollution control technologies could be saved that otherwise would be demanded to reach WHO air quality standards.



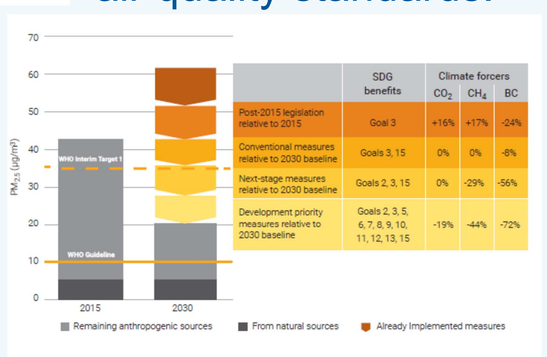


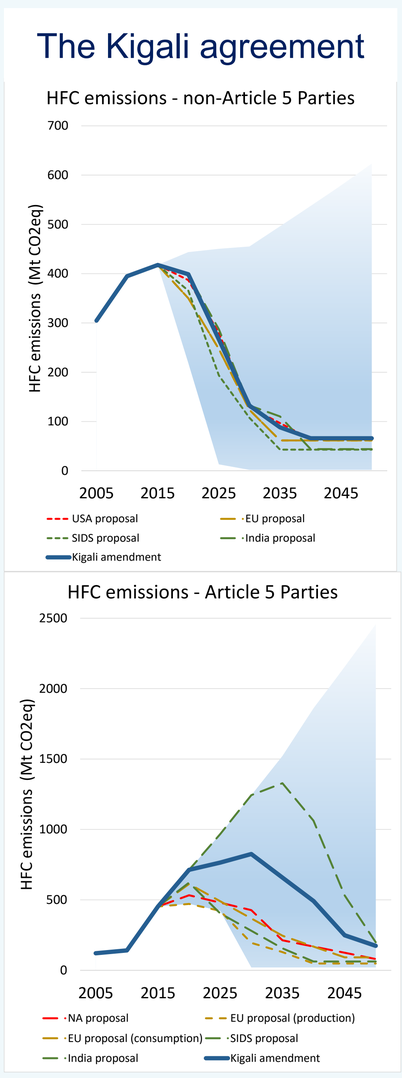
FIGURE 2.10: IMPACT OF THE TOP 25 CLEAN AIR MEASURES IN REDUCING POPULATION EXPOSURE TO $PM_{2.5}$, AND BENEFITS FOR CLIMATE AND THE SUSTAINABLE DEVELOPMENT GOALS

Non-CO_2 gases

Mitigation potentials for non-CO_2 gases are not well understood in the context of the 1.5℃ climate target

While the current climate targets imply negative GHG emissions, deep reductions of non-CO_2 emissions (CH_4, N_2O, F-gases) face technical limitations.

Behavioral changes (e.g., diets), less food waste and improved agricultural practices could offer additional mitigation potential, which would then lessen the need for negative CO_2 emissions.



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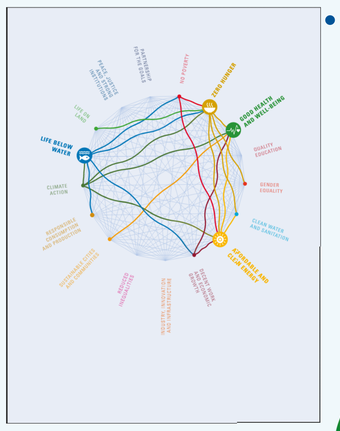
Sustainable Development Goals

A Guide to SDG Interactions



- Report brought together scientists from various fields to come up with SDG-specific insights for world leaders to follow.
- Studied how different goals and targets relate to one another and developed an independent analytical framework to systematically evaluate the nature and strength of SDG interactions.
- Conclusion: some SDGs have reinforcing relationships, whereas others may be in conflict. Context-dependencies will shape these inter-linkages.

COP21 · CMP11
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