

# How can research serve international policymaking towards the low-carbon development path? Looking forward

Low carbon research aims to delineate climate policies in line with global sustainable development goals. IPCC reports offer birds-eye view on aggregate themes and issues. Low carbon research requires being specific, practical and granular, besides being holistic and integrative with the development agenda that vary across spatial and temporal scales. Given the complexity and speed of shifting global dynamics, low carbon research demands durable political cooperation, collaboration among stakeholders and persistent interface between scientists and policy makers. Looking forward, this paper argues to: rethink the current research perspective; make research cooperative and community-driven; orientate research to deliver the insights as well as numbers with end-to-end solutions.

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## Introduction

Climate change is an extreme case of externality in both temporal and spatial dimensions. Low carbon development policies have to be framed keeping in view the spatial diversity (e.g. among the countries in terms of natural as well as socio-economic conditions) and multiple transitions (e.g. industrialization, urbanization), which the nations would go through during the long time span over which climate change would unfold.

International policymaking towards low carbon development path aims to discover development pathways that generate low greenhouse gas (GHG) emissions footprint, long into the future, and delineate solutions and means to deal with, and adapt to, residual climate change. Understanding the climate change phenomenon and its impacts, and assessing the policies to deal with it, requires

**IPCC SAR:** The balance of evidence suggests a **discernible** human influence on global climate

**IPCC TAR:** “There is **new and stronger evidence** that most of the warming observed over the last 50 years is attributable to human activities”.

**IPCC AR4:** Anthropogenic warming of the climate system is **widespread** and can be detected in temperature observations taken at the surface, in the free atmosphere and in the oceans. Evidence of the effect of external influences, both anthropogenic and natural, on the climate system has continued to accumulate since the TAR

**IPCC AR5:** it is “**extremely likely**” that human influence was the dominant cause of global warming between 1951 and 2010.

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knowledge from numerous disciplines belonging to natural as well as social sciences. A formal avenue for policy-relevant research is the assessment by the Intergovernmental Panel on Climate

Change (IPCC), which draws on the contemporary pool of research literature generated by scientific community. Such global level literature is pertinent to address important overall questions like confirming the causality between GHG emissions and climate change (Box 1), timing for peaking emissions to achieve desired stabilization targets, etc. But this beyond, policymakers seek answers to questions that are relevant to their own domains. The research on low carbon development policy and their implementation should be specific, and practical, and simultaneously holistic and integrative, so as to align with policies that deliver other development goals.

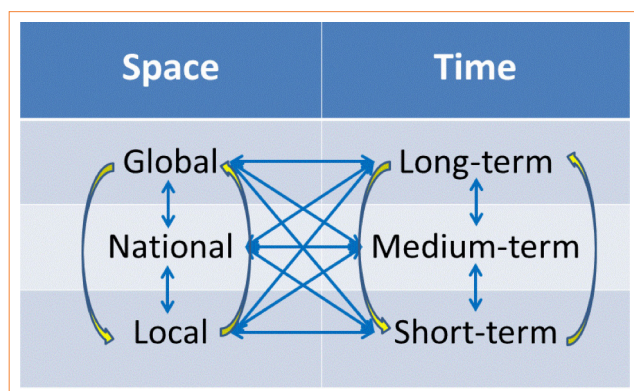


FIGURE 1 Policy-Science Nexus: Space/Time

### Elements of the science-policy nexus

A basic element of the science-policy nexus is the “holistic and integrative perspective”. The holistic vision is inclusive, i.e. it includes (Figure 1) upfront the context (what), space (where), time (when), how (method) and who (agent).

Integration is the hallmark of multidisciplinary sciences; it integrates information across disciplines, innovates and uses methods and tools (Fig. 2) that exchange information across scientific domains and find insights and answers to the specific policy-relevant questions.

The key idea is to make science policy relevant; i.e. aiming research to inform policy by addressing the key questions occupying policymakers’ minds and use avenues such as policy forums as outreach platforms for research.

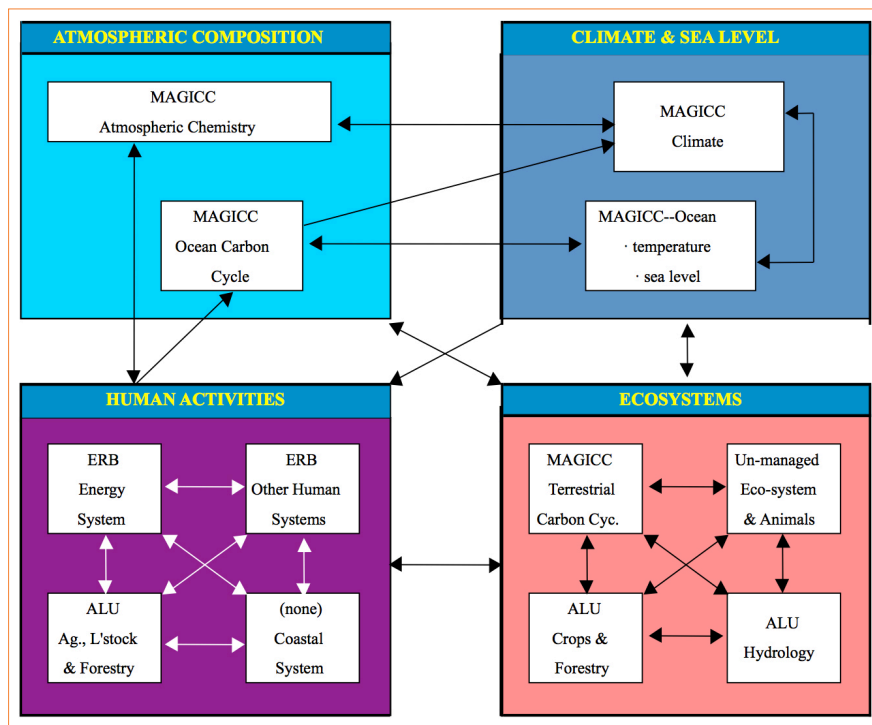


FIGURE 2 Integrated Science-Policy Framework

### “Big win-win” into “low carbon resilient development”

In the integrated approach, whereas natural sciences



discover numerous insights and multiple solutions, the social sciences show, among these, which are “big win-win” options for society. For instance, integrated assessment modelling research shows a different mix of technologies to mitigate GHG emissions in case of delayed mitigation; but the economic results also show that the delayed mitigation would impose significantly higher costs and risks to reach the desired (e.g. 2 °C) stabilization target.

Integrated science-policy research also provides very important information, such as the large co-benefits of GHG mitigation policies on health and other societal goals through improved air quality, especially in developing countries.

## Looking forward

Looking forward, to begin with, the policy-science nexus should be viewed as an unending chain having policy and science as successive “Policy - Science - Policy” links. In specific, we propose the following to strengthen these linkages to make low carbon development research purposive and practical.

### *Rethinking research perspective*

Conventional low carbon development research needs reorientation on the following counts:

- a) The research paradigm and methods should follow a “horses for courses” approach, i.e. devise and apply scientific methods to the specific aspects of policy question.
- b) Align the goals of low carbon scientific research with the development goals.
- c) Look beyond the obvious (or conventional) options since low carbon development research has to discover out-of-box solutions.
- d) Conventionally, the methods and models used by economists seek “efficient” solutions that result from competitive equilibrium. The development models should also consider “cooperation” among agents which lower transaction costs and risks, besides competition for the market efficiency.
- e) Most research on policy instruments have been limited to conventional market instruments such as carbon tax and emissions trading. The climate issue

is global. The countries are at very different stages of socio-economic development; in many developing countries, market institutions are weak and a sizable fraction of their economies operates through informal markets. Given the diversity, it is important to discover new policy instruments and also use multiple instruments in tandem to get best results.

### *Cooperative and community-driven research*

There is plethora of research on the low carbon development pathway, yet it is fragmented and “non- inclusive”, especially in terms of developed versus developing country perspective, emphasis, and participation. Future research can benefit from cooperative research, with teams of researchers from diverse countries. The scientific and political communities need to facilitate such research.

There are examples of successful community research and capacity building, such as the Japanese Government initiative over the past two decades, which is led by Japan’s National Institute of Environment Studies (NIES), Tsukuba. This program, under the banner of “Asia-Pacific Integrated Model – AIM” [5], has created a sizable network of experts in Asia who are engaged in local (e.g. cities) as well as global studies [6] on low carbon development research [7].

### **Discovering “insights and numbers” with end-to-end solutions**

Policy research contributes to understanding the process dynamics and related implications as well as to make targeted decisions. Since climate research is multidisciplinary and spans wide spatial and temporal scales, the policy hierarchy needs to be connected across the scales to propose end-to-end solutions. Insights are essential to link the processes across the scales and numbers are essential for delineating the activity levels at different scales. Looking forward, the low carbon development research can benefit from:

- α) Research framing that delivers qualitative “insights” as well as quantified results, such as risks from different “levels” of climate change, investments needed to adapt or mitigate, etc.

- β) Reframing research to address dynamics at “specific” spatial and temporal levels, and propose “end-to-end” solutions.
- χ) Re-examining assumptions, e.g. economic models assume existence of “free” market competition that delivers economic efficiency; but for such markets to exist, the perfect “rule of law” institutions are needed. This assumption does not hold in developing countries and even in the case of global energy markets. Besides, the global context of the climate change phenomenon and the diversity of nations need to explicitly consider “cooperation”, and not only competition, as part of the socio-economic framing.
- δ) Greater stakeholder engagement which would cross-check to ensure recognition of “real” as opposed to “ideal” world dynamics. This is vital to minimize “transaction costs and risks” during implementation.
- ε) Shared and inclusive vision, that is vital to propose and implement “end-to-end” solutions.

## Conclusions

Low carbon development research has made eminent contributions to climate policymaking. Science has advanced to declare [3] that it is “extremely likely” that human influence was the dominant cause of global warming between 1951 and 2010. The

emissions profiles of nations have altered since the negotiations of the Kyoto protocol in 1997, bringing into question the classification of countries under the original “annex” dichotomy. Issues like “peaking” of emissions, which looked not far in the future, have acquired urgency as the future emissions budget is shrinking. Whereas excluding the developing countries from carbon mitigation was earlier viewed as the necessity, e.g. in the Kyoto Protocol [8], this is no longer considered valid. Instead, facilitating developing countries to engage in low carbon development is now viewed as immediate priority, albeit with the necessary finance and technology support, to prevent long-term “lock-ins”.

Going forward, the research context and questions to craft low carbon development pathways are shifting, as global dynamics continue to alter. The low carbon research now needs greater global engagement and local attention as well as long-term perspective and immediate actions. The altering low carbon research paradigm needs to be more sharing, caring and daring. Policymakers have shown keen interest in low carbon policy research and would support knowledge networks so long as research remains purposive, inclusive, practical, and adaptable to rapidly shifting contexts.

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