

Low Carbon Society in Asia: Activities in India

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Summary of the Presentation

Presentation Agenda (Slides 2)

The presentation focuses on the Low Carbon Society (LCS) modeling and applications in India as well as LCS activities carried out by the India team as a part of the Asia-Pacific Integrated Modeling (AIM) network. The agenda of the presentation is organized in five themes: i) Low Carbon Society Framing and Modeling, ii) Indian National Assessments, iii) India in the Global Modeling Exercises, iv) Capacity Building, Publications, Dissemination, and v) Year 2012-13: Way Forward. (Slides 1)

i) Low Carbon Society Framing and Modeling (Slides 3-4)

The framing of LCS examines two key questions:

- i) What is the low carbon society?
- ii) How to achieve the low carbon society?

In recent times, the low carbon society definition is anchored with the concept of 'green growth'. In simple terms UNEP defines green growth as economic development which is inclusive and low carbon. The green growth orients actions to be compatible with the principles of sustainable development so as to ensure that the development needs of all sections of society are met while ensuring transformation through the global effort to stabilize the atmospheric concentration of greenhouse gases at a level that will avoid

dangerous climate change. The LCS assessment therefore should focus on mapping long-term socio-economic transitions and align the policies to achieve the socio-economic transformation through co-operation, so as to gain co-benefits while ensuring fair competition. The LCS framing thus proposes policies in several dimensions such as technologies, pricing (including carbon pricing) through market oriented institutions and finance to sustain inclusive growth. (Slide 3)

The global agreements under the UNFCCC have accepted the stabilization at 2°C as the target. The LCS assessments therefore aim at finding GHG emissions pathways that are consistent with the 2°C stabilization target while ensuring the green growth. The models are the tools to assess low carbon transitions. In case of India, the model system called SLIM (Soft-Linked Integrated Models) which include multiple soft-linked models is used. This system has advantages of using sets of interfaced or soft-linked models to address specific questions posed in a policy assessment study. In 2011-12, the SLIM system for India was augmented by a transportation model to assess the low carbon transport solutions as an integral part of LCS study for India. (Slide 4)

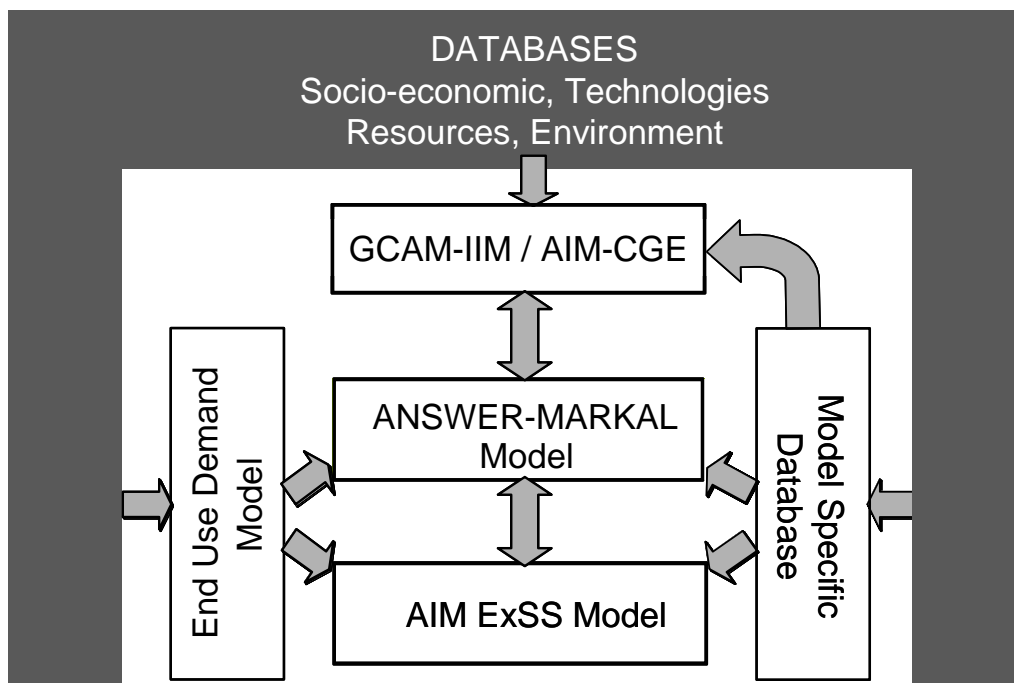
ii) Indian National Assessments (Slides 5 to 17)

Different national level exercises for low carbon society development in India were carried out to answer specific policy questions. The exercises used the SLIM system using the models which are best suited to answer specific policy questions. This presentation reports two specific modeling exercises, the *first* using the ANSWER-MARKAL model and the *second* using the GCAM-IIM model.

The national level assessment was done using the energy system partial equilibrium model ANSWER-MARKAL which is a component model of the SLIM system. This assessed the national scenarios which were developed for the period up to the year 2050. The analysis included India's announced climate action plan and various development policies, programs and measures in the present and the near future which have vital bearing on the long-term carbon emissions pathway. The low carbon society scenarios then visualize social, economic and technological transitions through which India can respond to global GHG stabilization goal. The Indian scenarios included the India multiple transitions in income (low to medium), demographic (growth and age profile), rural to urban and agrarian to industrial.

Conventionally such transitions witness rapid rise in energy demand and emissions of local air pollutants and greenhouse gases. The national level assessment included three economic growth scenarios and the transition of the scenarios to a low carbon emissions path. (Slides 6-7)

Soft-linked Integrated Modeling (SLIM) System



The transport sector was a key sector for which the low carbon assessment was carried out. The modeling assessment for the business-as-usual scenario showed rapidly rising energy demand for the transport sector from period 2010-2050. The assessment was done following two different low carbon scenario paradigms – conventional and sustainable. The assessment showed considerable scope for carbon emissions mitigation from the transport sector through fuel-mix change and efficiency improvements. The sustainability scenario showed considerable opportunities for co-benefits in the sector through aligning mitigation actions for carbon with local air pollutants and by avoiding infrastructure lock-ins by early transitions to technologies like dedicated freight corridors. The transport sector assessment showed the merits of using the detailed framework to assess co-benefits by measuring numerous indicators belonging to multiple domains like social, economic, technical and environment. The low carbon transport exercises also delineated the key indicators and decisions for making transition to low carbon transport. (Slides 8-11)

The national level assessment using the ANSWER-MARKAL model included a study of sensitivity of the nuclear sector to the increased cost of nuclear following the Fukushima nuclear incident. The assessment showed that inclusion of external costs of nuclear technology would have significant effect on the selection of nuclear energy if external costs are high, i.e. adding more than 50% of capital costs equivalent. (Slides 12-14)

iii) India in the Global Modeling Exercises (Slides 15-24)

The Indian team participated in several global modeling exercises - in several cases together with the AIM teams from other countries, notably Japan and China. A notable participation was in the Asia Modeling Exercise (AME). In the AME, the AIM team contributed to the development of framing and modeling of the global Low Carbon Society Assessments as well as preparing an overview the LCS modeling results for several key Asian countries. (Slides 15-16)

The Indian team worked with the Japanese AIM team to develop Low Carbon Society scenarios for India using the AIM/CGE model. Three different low carbon scenarios were developed targeting different levels of global stabilization targets. The scenarios showed the extent of technology transitions and the use of low to no carbon technologies, e.g. renewable and CCS. The food versus fuel security implication of high biomass energy use was examined by taking into account the diversion of land and water resources for the production of biomass energy in India. The analysis included the comparison of Kaya identity elements for different scenarios. (Slides 17-20)

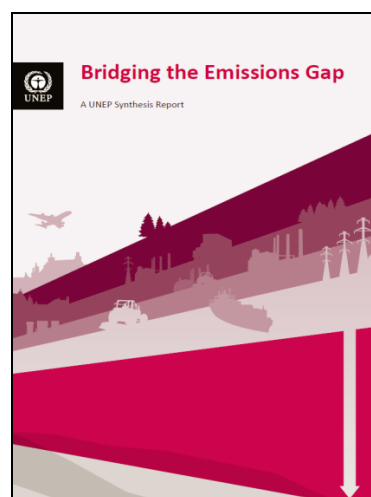
The global integrated assessment model GCAM is used for macro-economic assessment for India in the global and long-term (till year 2100) contexts. GCAM-IIM model is used to assess the implications of targeted technology capacity approach for achieving low carbon transition in India. In GCAM-IIM which is an adaptation of the GCAM for the India national assessment, the database and assessment framework is revised to suit the India specific scenarios and policy contexts. The GCAM-IIM endogenously generates global parameters (e.g. carbon price path to achieve a stabilization target) as well as macro-economic outputs (e.g. GDP loss in stabilization scenarios over BAU; MAC curve). The model was used for long-term assessment up to the year 2095. The assessment showed that the future penetration of nuclear technology is sensitive to the carbon price and the capital cost of nuclear power

technologies. This also confirmed the assessment done using the ANSWER-MARKAL model about the future penetration of nuclear power in India. The specific analysis from the model includes assessment of sensitivity of nuclear technology to the capital cost and also the assessment of CCS technology, including the combination of CCS with biomass to make deep cuts in carbon dioxide emissions such as in case of 1.5 to 2 degree C stabilization targets. (Slides 21-24)

iv) 2011-12: Capacity Building, Publications, Dissemination Activities (Slides 25-27)

There were significant contributions by the Indian team in various capacity building, publications, and dissemination activities. This included participation and presentations in the LCS-RNet Workshop (Paris), International Energy Workshop: IEW (Stanford), National Workshops on Low Carbon Transport (Delhi), meetings of Integrated Assessment Modeling Consortium (IAMC) and IPCC Scenario Workshops. Presentations were also made at three side-events at Durban COP17. (Slide 26)

In the year 2011-12, some important research papers were developed on the low carbon society theme. These included an overview paper on LCS modeling and assessment for the Asia Modeling Exercise and a paper on the IPCC RCP 6.0 W/m². Significant contribution was also made towards the prestigious international reports. These included the participation in the UNEP Bridging the Emissions Gap Report, IPCC AR5 and UNEP Foresight Report. The ‘UNEP Bridging the Emissions Gap’ Report, which was released at Durban during the COP17 was a key document informing the policy makes about the options and costs of low carbon transition in the period till 2020. (Slides 27)



v) Year 2012-13: Way Forward (Slides 28-31)

India is undertaking many policy actions such as coal tax, energy efficiency certificates trading, renewable energy certificate trading and various missions such as on key themes like 'solar energy', 'sustainable habitat' and 'Green India'. Besides the progress in global climate negotiations under UNFCCC are bringing in new policy instruments, initiatives and mandates. The newly initiated Durban Platform is expected to rake forward the global policy dialogue. The key focus of our LCS assessments will be align the national development policies with the global climate policies to gain multiple co-benefits and mitigate the risks from the future climate change. The targeted technology and infrastructure push policies for national development, if aligned with goals such as local air quality, energy security and employment and global climate policies would deliver multiple co-benefits and thereby reduce the social value of carbon for the nation. Going forward, in 2012-13, Indian teams activities shall continue to inform the national and global policy-makers on low carbon and climate-friendly national and global transitions. (Slide 29)

Cities are major emitters of greenhouse gases. Going forward, in 2012-13, Indian activities also aim to target low carbon mobility plans for three cities. Presently, three cities (Ludhiana, Rajkot and Vishakhapatnam) having populations in the range of 1.5 million and expected to have populations in the year 2020 close to 2 million are expected to be covered under the LCS mobility plan activities. To sum-up, in 2012-13, Indian activities will remain focused: i) LCS Modeling & Methodology Developments, ii) LCS Roadmap Assessments, iii) Science and Policy Contributions, iv) Capacity Building and Dissemination. (Slide 30-31)