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Peer Review of the 4th Phase

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The review day consisted of 4 presentations undertaken during the 4th Phase of the Economic Analysis Team of IGES. This review report is structured according to those 4 presentations, and concludes with an overall outlook.

1) Regional implications of Japan Low Carbon Strategy (LCS) scenarios by Satoshi Kojima

- The topic is an important one, and the application to a real large-scale policy strategy is intriguing.
- The work could do with an assessment of uncertainty and variability. At present one cannot judge what the statistic significance of the results is.
- The use of CGE modeling for future projections of up to 20 years is debatable. Projecting this far into the future is less hazardous with simple models operating with only a few parameters, but CGE is not such a simple model. This means that one has to assume the validity of all parametrisations for up to 20 years into the future.
- It is suggested that coping with parameter uncertainty and variability could be carried out in a stochastic way using Monte-Carlo techniques. Such an approach would require only minimal adjustments to the REPA framework. A large number of runs could be carried out with parameters stochastically perturbed, and the variation of results could be plotted against the results themselves. The results would be significant if variations were less than a certain threshold determined for example through a Student's *t* test.
- The study for the LCS in the 4th Phase is timely, and has interesting environmental policy implications for the Japanese government. By using the REPA model, the EA team tries to estimate policy impacts from 12 options which are selected by the government.
  Besides these policy options, they have investigated some more policy measures such as carbon tax, and cap and trade in the regional model in order to estimate LCS scenarios. Endogenously calculated carbon tax such as 64 $/T-CO2 looks reasonable, too. However, in future research, they need to think about the following:

a) Make some simple assumption for the household sector energy demand and try a sensitivity analysis
b) Adjust the projection period from 2020 to 2015 and obtain more macroeconomic data
c) Try out dynamic approaches by using REPA if possible
d) Show separate result using a) basic assumptions and b) a carbon tax imposition assumption.
e) Provide concrete arguments for the effect of LCS-2 why the real GDP increases.

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2) Assessment of carbon emissions embodied in international trade by Xin Zhou

- The topic of this work has recently increased in political relevance with comments made by the Chinese Chief negotiator and the UK Environment Minister. This relevance could be explicitly stated in publications of this work in order to demonstrate its relevance to readers.
- The assessment of uncertainty is a welcome addition.
- The combination of the MRIO framework with a Linear Programming Model is novel as far as we are aware and should lead to an interesting article in the international literature.
- Perhaps one future direction of this work could be how the sharing parameters could be determined. One idea that is hinted at in the 4th Phase report is Game Theory. This is certainly an interesting avenue.
- It is interesting study to see different responsibility schemes for the reduction of CO2 emissions. Consumer and shared responsibility are logically justifiable and can show good results in the future even if the result is preliminary. However, there are some considerations for future work;
    a) Show strong evidence of the basic assumption such as "given consumer demand and import requirements" in the paper (page 24)
    b) Simplify the assumption of "same industry and different products and one product" within a 2-country MRIO – LP model (page 24)
    c) Try to obtain a more current regional I-O model.
    d) Give some strategy or ways for imposing non-participating countries' acceptance for the emission cap (page 41)
    e) Explain the limitations of the results, and further work of the research

3) Impact of cross-border energy infrastructure investment on regional environment, society and climate change by Anindya Bhattacharya

- In theory, the exploration of this issue is worthwhile, and if governments could overcome their various concerns and mutual hostilities, this idea would have significant potential. One qualification of this work is however whether such cross-border infrastructure settings, albeit economically beneficial, are politically feasible. The European gas crisis triggered by the dispute between Russia and Belarus is one example. Similar doubts have been voiced regarding the Desertec project that is aimed at providing Europe with solar-thermal power sourced in the Maghreb.
- It is noted that a large part of the new energy infrastructure would be hydroelectric dams. The significant ecological and social side-effects of such hydroelectric projects are not taken into account in this work. Amongst renewable, hydroelectricity has one of the lowest future potentials (about a doubling of current global capacity), partly because of adverse ecological effects such as silting, barrier to fish migration, etc, and social effects such as (partly forced) migration.

- The quantitative results from the two case studies are relatively minute in scale, and perhaps even insignificant. This may be compounded by the use of a model (REPA) without variability and uncertainty assessment, combined with the small magnitude of the results.
- The research has carried out good surveys of the related regional energy cooperation. The themes of grid interconnection project have been studied for many years, but not showing the benefits and cost as well as future cross-border power projects in Asia as a whole as in Tables 4-8. However, some issues need attention in the future;

a) Explain why poverty is increasing when the CBEI project is introduced in a case study
b) Find various feasible options of financial source and risk management
c) Carry out multiregional cross-border impact assessment
d) Consider political factor and energy independent risk in the mode by using dummy variables
e) Suggest limitations of the work and future tasks in more detail

4) Impact of integrated watershed projects on sustainable development in India: A quantitative approach by Anindya Bhattacharya

- The topic is very interesting, partly because of its concrete nature and small-scale direct applicability.
- The collection of data through local surveys as a basis of the model is laudable.
- Quantitative results should be quoted with less significant figures.
- The sensitivity analysis is very informative because it puts the results in perspective.
- The study for the watershed management for sustainable management is unique and local specific research. The basic approach is a theoretical and hypothetical one. However,

a) The agricultural production function needs adjusting, since increasing returns to scale are unrealistic, and combine with DRS (decreasing return to scale) or CRS (constant return to scale) in the model
b) Try to have more country-specific policy measures in the model
c) Use factors other than land and labor, such as government direct subsidy to poor farmers

Overall comments

- Two of the studies used uncertainty and sensitivity/variability analysis, and the remaining two don't. The reviewer team believes that information about the uncertainty and/or variability of results under parametrical variation is as important as the results themselves. There is spectacular evidence for this in the large-scale, 10-year ExternE project conducted by the European Commission and the US Department of Energy. Whilst the ExternE project set out to quantify the external cost of electricity-generating technologies, researcher had to conclude after 10 years of work that the results were

associated with uncertainties that were so high, that they precluded decision-making. Even though researchers had learned a lot about impact pathways etc, the final results of the project were not suitable for use in policy making. The researchers stressed the fact that research work should not just deliver one number to the commissioning agency, but should put that number in perspective by giving ranges, so that decision-makers could explicitly take this information in consideration, and make decisions under uncertainty.

- All four pieces of work could be accompanied with an intuitive and convincing account of their practical, real-life implications. It is always good to see when research work has led to actual change in the world, apart from having appeared in report X and journal Y. This ties in with the broader discussion that emerged from the review meeting around the questions “Is our modeling leading to change in the world?”, “Doesn’t the problem really lie somewhere else, ie in the behaviour of people?”, “Don’t we have enough knowledge to act?”, and “Aren’t we even acting against our knowledge?” Certainly, there are case studies that clearly show that more knowledge doesn’t lead to more environmentally aware behaviour, but rather to the opposite. And there are studies that show that – along with increasing economic development – personal aspirations and affluence have also increased, and that so far, technology and policy have tried in vain to outpace the adverse effects on the environment of such run-away consumerism. It is here where the Economic Analysis Team or IGES in general could try and tackle the really fundamental, hard-to-solve underlying issues of the symptomatic problems that their current research addresses.
- Having delivered our criticisms, we finish by saying that all four topics address important issues, and with the work of the Economic Analysis Team, IGES has certainly one “finger on the pulse” of international policy issues.