Accentuating the Negatives: The IPCC Working Group II Summary for Policymakers (SPM)

Although the SPM has some useful and apt things to say about the need for adaptation, it is flawed by the fact that it:

- Overstates negative impacts and understates positive impacts of climate change.
- Overstates the level of confidence that should be attached to the impacts on both human systems as well as "natural" systems (because the latter are also affected by human actions).
- Fails to examine the impacts of climate change in the wider context of other stresses affecting humanity and the rest of nature, which would allow us to gauge the importance of climate change relative to other stresses.
- Fails to examine the relationship between climate change and sustainable economic development more fully, which could mislead policymakers into opting for policies that would divert scarce resources from dealing with today's urgent problems in favor of policies to pursue longer term, and more uncertain, problems.

Among the several problems regarding the SPM are the following:

1. Once one gets past the opaque verbiage of the SPM, it is clear that most of the negative impacts listed in the SPM are overstated, while the positive impacts are understated. This is particularly true for impacts that human beings can directly or indirectly alleviate through adaptation. The SPM implicitly acknowledges this by stating in the captions for Tables SPM-1 and SPM-2 (which cover pp. 15-17) that they do not account for adaptation and "changes or developments in adaptive capacity". This is also generally true for the impacts listed on pp. 7 through 14, as is implied by the sentence in the preamble to Section C that states, "The magnitude and timing of impacts will vary with the amount and timing of climate change and, in some cases, the capacity to adapt." Note that Part C, which includes the abovementioned tables, covers virtually all the material in the SPM that speaks to future impacts.

2. Overstatement of negative impacts and understatement of positive impacts occurs because the methodologies generally used in the impact studies do not account fully, if at all, for increases in "adaptive capacity" (i.e., the ability to adapt) that should occur if the world gets wealthier, as is assumed by the IPCC's emission scenarios. An increase in adaptive capacity would translate into greater "autonomous" (or "automatic") adaptation that would occur in the absence of explicit policies, because under a "business as usual" world, i.e., in the normal course of things, humans (as well as other species) will take steps to reduce harm to themselves, take advantage of any new opportunities that may come along, or both, regardless of whether anyone gives them the green light that it's OK to adapt.

3. A corollary of this methodological oversight is that most of these impacts studies are inconsistent with the level of economic development assumed by the IPCC's emission scenarios and, therefore, with their estimates of climate change. So we have the curious situation where high economic growth drives large emission estimates but the same level of

economic growth is overlooked in estimating impacts. All the IPCC emission estimates assume that the world will become significantly wealthier between 1990 and 2100. Under the poorest scenario (the A2 scenario), the average GDP per capita in developing countries will be nine times higher in 2100 than in 1990 (in real dollars), while under the richest-but-warmest" scenario (the A1FI scenario), it will be 70 times higher than that for the average inhabitant of developed countries in 1990, i.e., she would be wealthier than her U.S. and Luxembourg counterpart in 1990). This means developing countries should have much greater access to available technologies to cope with climate change than they have today. Equally important, technology would have advanced – existing technologies would be replaced by new and improved technologies and they will also be cheaper (in real dollars). But generally these developments are not fully considered.

4. In the few cases where they consider that existing technologies will be adopted more widely because of increasing wealth, these studies don't generally allow for new technologies. This is the case for some of the studies of agricultural production and hunger, for example. These studies estimate impacts for 2085 using technologies from the 1990s or earlier. This is like estimating today's food production and levels of hunger using technologies from the 1910s! You are bound to underestimate food production and overestimate hunger. In developing countries prevalence of chronic hunger declined from 37% to 17% between 1970 and 2001, despite an 83% increase in population, in substantial part because of new technologies. These improvements would not be captured using the above methodologies had they been applied in, say, the 1960s to estimate hunger in the 2000s. [This view -- that adaptive capacities and technologies are static -- was exactly why Paul Ehrlich's predictions in the *Population Bomb*, for example, bombed in reality.] Not allowing for secular technological change or for technologies developed specifically to alleviate any impacts of climatic changes does not reflect "business-as usual" as the IPCC scenarios claim to do. One should expect the greater the potential food shortfall, the greater the adaptive response. It means that net negative impacts for the future are overstated.

   Similarly, human health impacts are often estimated assuming that adaptive capacities are fixed as of the start date of the analysis. Under such a methodology the mortality and morbidity rates from water related diseases in the U.S., for example, would be the same in 2000 as in 1900. But in fact, these rates have declined by 99% or more during the 20th century for disease such as typhoid, paratyphoid, dysentery, malaria, etc. (Goklany 2007c). This indicates that because of such methodologies, the potential for error is very large indeed especially for analyses that span several decades.

5. Because increases in adaptive capacity with increasing wealth and technological development have been largely ignored, the confidence levels attached to numerical estimates of the impacts on human-affected systems are exaggerated.

6. Ignoring adaptation overstates impact estimates not only for so-called human systems (e.g., food production, hunger, water resource management, human health, etc.), it also overstates the adverse impacts on the "rest of nature." This is because the most important current-day threats to ecosystems and species are loss of habitat, and overexploitation of biological resources. Consider terrestrial ecosystems and species. The most significant threat for them is conversion of land for agriculture and timber. But if we produce more food or timber per acre of land that means we can reduce or relieve these threats on ecosystems and biodiversity. And, in fact, over the past century, we have been producing more food per acre. Today worldwide we feed almost twice as many people on an acre of land as we did in 1900, and we feed them better (as witnessed by the drop in chronic hunger, see above). This is a trend that should continue unless we reject technologies, such as bioengineered crops, that will help produce more food on less land and with fewer chemical inputs such as fertilizers and pesticides. Moreover, some studies indicate that global requirements for cropland may indeed decline in the future (at least through the 2100) because of a combination of technological change, carbon fertilization and climatic changes. But less cropland means more land for the rest of nature. None of this is accounted for in the estimates of species extinction, as far as one can tell. Thus, those estimates should be viewed with suspicion on that basis alone, and the notion that we know the effects of climate change on species with "medium confidence" (p. 8) verges on the ludicrous.

7. In addition, as evidenced by the environmental initiatives that have been undertaken over the past decades not only in the US but also around the world (e.g., restoration of habitats, reductions in hunting and fishing quotas, reserving land for conservation purposes, agreement to manage or restrict fishing and hunting of various species etc.), other efforts will be made, even in the absence of climate change policy, to reduce pressures from non-climate change related threats to ecosystems and species which would, then, reduce the vulnerability of these systems to climate change. But none of these are factored into these analyses either.

8. There are additional reasons for skepticism regarding the level of confidence attached to estimates of impacts on ecosystems and species. First, impacts on species and ecosystems have to be based on local climatic changes. But the uncertainties in changes in temperature and precipitation increase as we go from the global to the regional to the local scales. Second, many of the estimates regarding shifts in ranges and species extinction are based on studies that employ the modeled association between current climates and present-day species distributions to predict future ranges and extinction risks under radically different climatic regimes where atmospheric CO_2 concentrations are much higher, and rates of plant growth, water use efficiency, energy requirements of species, predator-prey relationships and, possibly, species-area relationships would all be different from what they are today. Future outcomes may also be confounded by unanticipated evolutionary changes. There is also the possibility that species have broader climatic tolerances than indicated by their observed ranges would indicate. Moreover, with respect to vegetation in particular, species, once established, may not be easily moved or pushed aside.

9. Impacts assessments generally employ a series of models in which the uncertain output of each model provides the inputs for the next model. To compound matters, each model is itself based on uncertain assumptions and is necessarily a simplification of reality. Usually the series of models starts with assumptions of population growth, economic growth and technological development from 1990-2100 in order to generate emission scenarios. These emission scenarios then are used to generate atmospheric concentrations of the various greenhouse gases (ideally based on models of the global cycles involving each of the greenhouse gases). Next, these concentrations are used to calculate radiative forcing to estimate temporal and spatial changes in climatic variables. These variables are then fed into biophysical models to estimate location-specific biophysical changes (e.g., changes in the distribution of vegetation and species, sea level, timber and crop yields, etc.). Then depending on the system under consideration, these outputs may be used to drive socioeconomic models to estimate impacts on human beings, e.g., food production, hunger, etc. And, as noted previously, there are egregious oversimplifications and systematic errors in this step which overestimate net negative impacts. Thus, we have a system where uncertainties build on each other. Unfortunately, there are few, if any, analyses that show how these errors and uncertainties propagate through the system of models. Given this, the SPM's characterization of the level of confidence attached to impacts estimates is overstated. It's hard to see how one can with a straight face claim that we have anything other than low confidence in the estimates.

10. Although the SPM notes that vulnerability to climate change will be exacerbated by other stresses, it fails to note that by the same token relieving these other stresses will increase the resilience of systems to climate change itself. Examples of this are furnished in paragraphs 6 and 7.

11. Although the SPM notes that vulnerability to climate change will be exacerbated by other stresses, it neglects literature that shows that through much of the rest of this century the contribution of climate change to the combined stresses on various systems is smaller than the contribution of other factors. [Some of this literature is summarized in Goklany 2005, 2007a, 2007b]. Consequently, the SPM fails to inform policymakers that through the foreseeable future dealing with these other factors could be more important – and could provide greater benefits in terms of advancing human and environmental well-being (Goklany 2005, 2007a).

12. Likewise, it fails to inform policymakers that dealing with these other stresses that climate change would exacerbate could help society deal with the additional stresses caused by climate change more effectively and possibly at lower costs (Goklany 2007a, 2007b).

13. The SPM obfuscates on the relationship between climate change and sustainable development. It suggests that climate change could impede nations' abilities to achieve

sustainable development pathways. While this might be true in the longer term, over the foreseeable future it is lack of sustainable economic development that hinders their ability to cope with and alleviate the impacts of climate change. The failure to acknowledge that the lack of sustainable economic development constitutes a larger and more immediate problem than climate change (see paragraph 11) is potentially misleading in that policymakers may divert resources to solve longer term problems while ignoring current-day problems that are and will continue to be more urgent than climate change in the foreseeable future and which may actually be easier to solve (Goklany 2005, 2007a).

References

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