

A brief summary of the IPCC Expert Meeting on Human Settlements and Infrastructure March 22-24, Kolkata

Background

The 4th Assessment Report had no stand alone section on urban issues, despite the importance of cities as an economic force and the centre of population growth world-wide. It has been resolved that the 5th Report will focus more explicitly on settlements and the related issue of infrastructure, and also will attempt to bridge more satisfactorily the work of Working Group 2 (impacts and adaptation) and Working Group 3 (mitigation). It might be noted also that AR4 focused strongly on technology and efficiency as responses to climate change; here there is an opportunity to take a broader approach, and examine the systemic and structural influences on land use and energy consumption.

This meeting was a joint effort of Working Groups 2 and 3, and the co-chairs of both were present. There were approximately 50 participants, with a wide spread of disciplines (eg economists, geographers, political scientists and physical scientists). Most, but not all, are authors on the AR5. Notably, in the group there were also “practitioners”, local authority employees with responsibility for climate change mitigation and adaptation.

Aims

The purpose of this meeting in Kolkata was to consider four questions:

1. What are the key issues for the 5th Assessment Report (AR5), concerning cities and climate change?
2. What are new entry points to supporting mitigation and adaptation?
3. What advice can be given to the writing groups on the quantification of adaptation and mitigation, both benefits and costs?
4. What are the most important research gaps?

The setting

It was fitting to hold the meeting in India. A huge country, we were told there are officially 7800 cities, but interestingly it is the 0.6 million villages in India that are politically advantaged – a balance that goes back to 1948 and Nehru’s vision of the country as essentially rural. This means the majority of policy makers are elected in rural areas, but economic power is located in the cities. The cities hold 340 million people at present, but by 2030 it is expected they will house more than 600 million (twice the US population). The urban economy provides about 85% of tax revenues, although many inhabitants (perhaps half) are not included in the formal economy, and earnings are low (about 75% of urban citizens earn 2 USD or less per day). Kolkata, where we were meeting, has the highest population density in India, one

third of the population lives in slum areas, 20% do not have access to institutional water supply, and this coastal city has an average elevation above sea level of 5 metres. The climate change issues are huge!

Urban energy use

Urban infrastructure – bricks, mortar, pipes, trains and trams, parks and pools, to mention only the physical aspect – has a giant carbon price tag. A recent paper in *Science* (2010;329:1330) estimated the amount of global warming that is committed by the infrastructure now in place. The answer is 1.3 degrees C, and of course this does not account for the impacts of developments now underway in countries like China and India, that are for all intents and purposes unstoppable. But, it was pointed out, there is a bright side. World-wide, most of the urban infrastructure that will be in place in 2050 is yet to be built, so there are opportunities to embed low carbon approaches rather than rely on retrofitting, which is relatively expensive and disruptive.

More background is provided in the Global Energy Assessment. This IPCC-like undertaking will be reporting in June, and Arnulf Grubler, an author of the urbanization chapter, gave us a briefing. He said the essential points would be

1. A reminder that, from an energy perspective, the world is predominantly urban. Cities account for 75% of global energy consumption. Although only 3% of land area and 50% of population, cities chalk up 80% GDP and 60% of luminosity. Demographic growth will occur almost entirely in cities, mostly in small and medium size cities (that is <1 million).
2. It is commonly reported that city dwellers in developed countries consume less energy and have smaller carbon footprints than rural inhabitants. But these comparisons are not straightforward. There are ambiguities in system boundaries so accounting for flows is complicated. Economic structure (manufacturing v services) and density (via transport infrastructure) are the two commonest reasons for low C footprint and energy use. And in developing countries it is the other way round: city dwellers tend to consume more energy than rural populations. This is driven predominantly by differences in per capita income. Another complication is path dependency – energy use per capita in relation to income shows a different pattern in Chinese mega cities than in other parts of the world, for example, on account of very different planning trajectories. Taking account of embodied energy use muddies the waters further since direct consumption is only 20-60% of the total.
3. Settlement density brings particular sustainability challenges (and opportunities). For instance, pollution levels may be controlled moderately well (eg in some of the larger Chinese cities) but the health effects are still substantial when very large numbers of people are affected. Grubler argued that small-scale wind, hydro and solar will only work in rural areas; given the practical limitations in crowded cities, local renewables will generate, at best

only 1% of urban requirements. On the other hand, density and economies of scale can provide significant opportunities for energy efficiency improvements in cities.

UN Habitat Report

The UN Habitat Global Report on Human Settlements has been released recently, and the theme was cities and climate change. The report examined mitigation and adaptation measures that would support urban development in a sustainable fashion. Rafael Tufts, one of the authors of the Habitat report, was relatively upbeat, but he commented that “there are plenty of islands of innovation; but few extend to the national level”. He underlined the points others made, that the balance of new build and retrofit is very different in north and south; and co-benefits can be hugely important to persuading policy makers (for example, by pointing the way to economic growth at low carbon costs).

Tufts argued that downscaled climate data, which scientists generally see as the logical prerequisite for local action, can actually get in the way of urban planning. These analyses can be so complicated, and carry so much uncertainty, that all they do is add to confusion. He argued that risk assessments should, from the outset, demonstrate links with the broader green economy agenda (eg jobs, social development). He observed that in the experience of UN Habitat, the entry point for discussion with city authorities was naturally local vulnerabilities, but the mitigation dimension came up very quickly. In his experience, cities wanted to be part of the global solution (even if local emissions are relatively small).

I was intrigued by the metaphor of “social metabolism” that one speaker used, arguing the importance of both stocks and flows, in energy and materials. He put it this way: urbanization and industrialization essentially move resources from the ground into waste repositories on or near to the surface. As an example: roughly the same amount of iron is now above ground in the US as remains below the surface (raising the prospects of urban mining, especially as the quality of extractable ore is declining).

Health, climate change and cities

There was a session devoted to discussion of health, climate change and cities, for which I acted as rapporteur. Below is the summary I prepared for the meeting report.

<<The major climate change risks (food scarcity, diarrheal disease, weather extremes and vector-borne disease) all apply to cities. High income cities are not immune - dengue is a persisting problem in Singapore, for example; contamination of drinking water supplies following floods and storms has affected large numbers in cities in Europe and North America.

The effects of climate change on human health can be seen as risk multiplication – in most respects, the result is to aggravate problems that are already present. For this reason it is important to understand the “baseline”, the present distribution of disease and injury, and projections for the future. The present day and projected future health experiences of low and high-income populations are different, but the comparison is not straight-forward. Chronic diseases are emerging as the most common cause of mortality in many developing countries, despite persisting hot-spots of infectious diseases. Urban adaptation priorities may also be very different: securing the water supply is more commonly an issue in low-income cities, and intense rainfall and flooding also tends to be a larger problem in impoverished settlements.

There is limited understanding of variation in climate-related risks but it is clear many protective factors are not readily available to low income populations. In general, little is known about weather related risks in informal settlements but there is not a complete lack of data (useful work has been done on local factors that condition vulnerability to flooding, for example).

The causes of vulnerability operate at different levels of organization. Excess deaths due to heat, for instance, are related to characteristics of individuals (such as age, health status), households (air conditioning, building design and materials) and small areas (poverty, social functioning).

Issues of scale apply also to interventions. As an example, adaptation and mitigation may be pitched at the level of land use management or the design and operation of individual dwellings. (In this instance, and perhaps counter-intuitively, there may be greater gains achieved by working with individual dwellings, where quality of housing is uneven. In London, it appears that better air conditioning and insulation for individual dwellings will have a greater cooling effect than investment in green spaces to break up urban heat islands.)

Co-benefits: there are many opportunities to improve health at the same time as reducing carbon emissions. The Indian clean cook stove intervention, for example, would bring big health gains, though relatively modest savings in greenhouse emissions. There are complexities in these calculations (for example: improving household energy efficiency may have untoward effects, such as accumulation of radiation indoors).

Transport offers a variety of health promoting paths to low carbon development. As an example, moving 5% of short urban trips (<7 km) from motor vehicles to bicycles in New Zealand would save 22 million litres of fuel each year, and lead to about 100 fewer deaths annually as a result of increased physical activity, and reduced air pollution. Achieving these co-benefits is complicated by the policy landscape, where the costs fall in one place, and discretion and funding are located elsewhere. For instance, in most jurisdictions transport funding is allocated blind to the health consequences. In many cities in developing countries, the poor are most vulnerable

to damages caused by climate change, by orders of magnitude, but have little protection from municipal services.

New entry points – there are health topics, such as food security, that have been regarded as a rural issue, in the past, but in fact are equally a challenge for city dwellers. We should be aware of opportunities for public-private partnerships in mitigation and adaptation. It is relevant to note the history of cities – health risks were an important impetus for much of the early town planning in the 19th century. We should not overlook sensitivity of policy to health problems in other sectors – food and tourism, for example. One could speculate about building codes post-earthquakes in New Zealand (which may be influenced strongly by incidence of fatalities, even though numbers relatively small).

Other points that were made in this section: How much attention should be paid to uncertainties – when is close enough good enough? Also – when thinking about sources of resilience, we should not overlook the strengths of the social fabric and traditional knowledge in many settlements that are classed as impoverished by the usual metrics.>>

Examples of success

Often the discussion at these meetings is weighed down by the size of the problem and its complexity. The tone this time was rather different – I don't think anyone was inclined to underestimate the task, but there was enthusiasm to look out for and learn from success stories. Some examples include:

- Improvements in transport systems in a number of northern European cities. Freiburg for example, which increased cycling and walking to over 40% of all trips, through a combination of “pull” and “push” policies. Vienna is an interesting example of “supply side” transport planning. A long term decline in use of public transport was radically turned around by the opening of the city metro scheme.
- In Kampala, Uganda a private utility company has engaged community leaders as subcontractors and made money while improving services and reducing leakage. (But the same company, and others, have reported sanitation cannot make a profit!)
- Hong Kong is a model of innovative land financing, using proceeds of sales around transport hubs to fund rapid transit services
- Cape Town has a suite of promising programmes in the informal settlements, including solar water heaters, harvesting of landfill gas and solid waste management
- South America has produced a new generation of mayors in the last 20 years who have been responsible for creative initiatives in transport, water management, education and employment (Porto Alegre for example - <http://www.embarq.org/en/news/09/03/11/porto-alegre-revitalize-downtown-through-sustainable-transport>)

- Durban has linked climate resilience with local employment and business development, through reforestation, fire protection, control of invasive species and food production in the city
- Carbon pricing: Tokyo has introduced the first city-wide emission trading scheme

The city that received most attention at this meeting was London. Alex Nickson, the person responsible for climate change strategy in the Greater London Authority, gave several presentations. I have summarized the points he made here:

The challenges in London include

1. cities have little control over grid energy (although in London, the mayor has intervened personally to encourage suppliers to put a premium on renewables)
2. new building in the city is only 1% of all developments – have to focus on retrofitting (he commented that Victorian-era housing may be well adapted to the steamy 2050s with high studs and drafty window frames, but it is poorly adapted to the present)
3. split incentives: large majority of London homes are rented, meaning there is a mal-alignment of incentives for energy efficiencies
4. energy companies are inclined to put London in the “too hard” basket, because they can meet their energy targets more readily elsewhere
5. despite the rhetoric from government, there is no large scale financing for new developments (and the Mayor of London cannot raise funds himself – all he can do is “bang heads”)
6. government commitment is variable (eg the latest announcement is that feed in tariffs will be “rethought” in 2012)

On the positive side,

- London is a good example of the point that cities can be regarded as the laboratories of national policies, since they have the potential to go further, faster than national governments, if there is leadership
- retrofitting programmes are often energy dominated and delivered sector by sector, eg insulation, water, power, flood risk, but it doesn't need to be this way (London has a combined efficiency/resiliency programme planned)
- smart grids – London is committed to energy meters at the moment, although ideally, water should be considered at the same time (since a quarter of household energy is used to heat water)
- there may be ways around the problem that initial capital cost is the big barrier for household efficiency measures. London will provide a guarantee that efficiencies pay off in 5 years, at least, in the first instance, for public housing
- urban greening programmes. Alex observed that planting trees and daylighting rivers are two things that every mayor loves to do; the challenge is to turn one-off showpieces into systemic programmes. London is looking closely at ways of greening the city to improve drainage, given the increase in

extreme rainfall events. Alex argued that it is very important to monetise the benefits, building in the social outcomes, wherever possible. Grey infrastructure doesn't bring the same co-benefits, and this is only made plain to authorities when there are numbers attached.

The most interesting observation, to me, was to do with framing. In the Livingstone era, the focus was squarely on climate change, the risks to London, and policies for emission reduction and adaptation. Boris Johnson is committed to a 60% cut in the city's emissions by 2025, but is approaching the goal by another tack. The language now is resilience, energy security, green jobs, and economic competitiveness.

Provocations

A concluding session of the meeting was titled "Provocations", which I thought was a rather nice way of encouraging disagreement, in a productive way. Some of the questions that were debated were

- is it possible to upgrade low income, high density parts of cities, without gentrification? (Some argued this can be done, with evidence from places like Bangkok, where an area housing 400,000 people has been improved without displacement of the original inhabitants)
- is there really a continuous, inverse relation between population density and motorization? Some argued for thresholds. In this view, there undoubtedly is an energy penalty associated with very low population densities, but beyond about 50 people per hectare (the density of Zurich!) it wasn't altogether clear that increasing density is associated with less motor vehicle use
- is the science really the starting point? Some of the "practitioners" argued that the rate limiting factors are really political and institutional. Access to reliable, interpreted data is important, they reported, but by no means sufficient. From their point of view, there are important research gaps in communications, engagement and governance (what kinds of administration make the best use of what we already know about risks and responses, for example).
- Is it always true that poverty alleviation reduces vulnerability to climate change? Some argued that the two don't always travel together. Small payments to mothers for their children going to school have been a powerful anti-poverty measure in Latin America, for example, but have done nothing to affect climate change vulnerability. Getting a vote and micro-finance were also mentioned – worthwhile of course, but not closely linked to climate readiness, perhaps because these measures act at the individual level rather than the collective. At the very least, I think most were prepared to accept, some anti-poverty measures are more effective adaptations than others.
- What difference will it make when carbon is priced? And might this do more harm, in the short-term, than good, because those at greatest risk are unlikely to be protected from the "co-costs"? There was a range of views on

this, though no disagreement with the need to include externalities in accounting for energy use.

Conclusions

It was a stimulating meeting, well-organized, and I think the networking and conversations will enrich the reports from both working groups. Formal outputs from the meeting will include a guidance document for all AR5 chapters, a concise meeting report, and a detailed outline for WG3 chapter 11 (on cities).

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Alistair Woodward
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