Mark Swilling: Can we double the extent of the global built environment without urban dematerialization? If not, how will dematerialization on scale be achieved?

The wonderful discussion our group had on Tuesday morning at Endicott House reminded me of the preface of the book that Vaclav Smil published this year entitled *Making the Modern World: Materials and Dematerialization.* I strongly recommend it. Although his analysis is a-spatial and largely a-political, it is very easy to read his book about how we have assembled our modern material world by always keeping in mind that this happened in particular spaces. These spaces were, in turn, configured in very specific ways to facilitate particular modes of capital accumulation within specific contexts across various time periods. The beautifully phrased first paragraph of his Preface is worth quoting in full here (with inserts in square brackets to prompt our urban imaginaries):

"The story of humanity – evolution of our species; prehistoric shift from foraging to permanent agriculture; rise and fall of antique, medieval, and early modern civilizations; economic advances of the past two centuries; mechanization of agriculture; diversification and automation of industrial protection; enormous increases in energy consumption; diffusion of new communication and information networks; and impressive gains in quality of life – would not have been possible without an expanding and increasingly intricate and complex use of materials [that were assembled into the built stocks and flows of urban modernity]. Human ingenuity has turned these materials first into simple clothes, tools, weapons, and shelters, later into more elaborate dwellings, religious and funerary structures, pure and alloyed metals, and in recent generations into extensive industrial and transportation infrastructures, megacities, synthetic and composite compounds, and into substrates and enablers of a new electronic world."[1]

Smil ends his book by pondering under what conditions it will be possible to achieve "relative dematerialization" in the rich world while at the same time ensuring that those who do not have enough manage to assemble more substantial material environments to improve quality of life. What he fails to recognize is that this is a fundamentally urban challenge. He is also profoundly a- political: he simply fails to recognize that a particular set of political and economic systems were needed to deliver the highly unequal material world that currently allows some to live over- materialized lives at the expense of the under-materialization of others. He does recognize, however, that further material expansion poses a fundamental threat to the biosphere and natural resource base. Although he thinks resource depletion is not the real threat, it is the environmental consequences of the energy-intensive mode of extracting and using these resources that poses the real threat to the biosphere that we depend on.

Using this deliberation on Smil's useful synthesis as a point of entry, the core idea that our Endicott discussion left me with was the following: we have political and economic systems that have successfully delivered an unequal, resource-intensive and environmentally destructive material world organized into the urban form that is now facing a major crisis. This material crisis of our present and future urban world as expressed across a diversity of contexts needs to be described, elaborated and made explicit in a way that makes it clear that by implication the current political and economic systems are inappropriately configured to deliver viable solutions to   this crisis. Nor will experts be able to deliver technocratic solutions that bypass democratic processes. Instead, we will need to recognize (again, something Smil does not) that the agglomerations of resources, wealth, people, institutions, information flows, creativity and physical structures in our cities provides the complex

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[1] Vaclav Smil, *Making the Modern World: Materials and Dematerialization* (Wiley, 2013) Kindle edition.

spaces of creative friction that spurs communities to innovate. Cities are, in short, the spatial expressions of the crisis of our material world, and the spatial concentrations of potential that need to be recognized and unleashed.

If we can agree that this captures the essence of our storyline, then much else can follow. Building on our discussion, another idea that really struck me was this notion of a global citizenship based on accountability for our material footprint. The great contribution that urban metabolic flow analysis makes to this discussion is that we can now, for the first time, track the material histories of the resources that get embodied in the built environment and everyday consumables, and quantify in tons what citizens in different cities consume per annum. This sets up an extra-ordinary picture of the embeddedness of our urban system within a globally interconnected set of regional ecosystems and natural resource deposits.

My final thought is about future urbanization and re-urbanization. Once we have calculated the resource requirements of future urbanization and re-urbanization (including the environmental implications of securing these resources, e.g. emissions, toxicity, etc), we will end up with a set of numbers that will have significant 'shock and awe' value. The next step will have to be a realistic assessment of how we can dematerialize this urban future using a given set of technologies. This raises three issues:

- What are these technologies? How do we compile the most viable and impactful set of technological interventions? I believe that our group has a unique mix of skills and experience to brainstorm this. Imagine we could meet for a day, throw out as many we can think of (ranging from specific triple zero building systems to circular city-wide urban systems), and then narrow down to what we would regard as our 'best guess' (based on what we now know) of the technologies of a sustainable/dematerialized urban future. We could then draw on life-cycle analysis literature to determine the resource savings and impacts, and using these numbers run an alternative scenario to Business-As-Usual (BAU). This will have a significant impact.

- Will we limit our focus to dematerialization/resource efficiency? i.e. 'doing more with less'. Or will we also attempt to bring in some aspect of 'cradle-to-cradle' thinking, i.e. not only focusing on 'minimizing damage', but also on the re-embedding of urban material cycles within the wider (bioregional?) sustainable socio-technical and ecological cycles. Is this an alternative way of telling the story to the first bullet point above, or must it be incorporated? I have a suspicion that if one started with the first, the details will drag us into the 'cradle-to-cradle'-type thinking. Or is this a question of phasing the transition?

- What are the institutional and governance implications of the alternative scenario? If the existing institutions are there to replicate BAU, what will need to change to enable the alternative?

One final comment about my own context, i.e. 'Africa rising'. Africa is only just starting to properly think about the plan for its future urban development. The first handful of countries have recently completed their national urban development policy frameworks, something that will obviously guide future investments. I have a very specific agenda: I want to make sure that African does not make the mistake of assuming that they must do what the Chinese have done, i.e. build contrived replicas of a Western form of urban modernity that will not only be aesthetically disastrous, but resource- and energy-intensive and, therefore, only available to the enclaves that can afford it. By making it clear that Western urban modernity is in crisis, this will help to influence the African debate in the right direction.

Google Earth image of GPS coordinates of 380 iShacks with energy systems.

Trained community installer at work.

**Summary by Vivian Loftness:** **Re-materalization: the future of material use in building**

$$\frac{M^3 dM^3 Q}{we*re*xe*T} \quad <<< 1$$

The building community must purchase, use and reuse materials with a far greater awareness of reducing harm and maximizing benefits. The 1st Holcim Roundtable on de-materialization revealed a clear set of harms and benefits that can be both quantified and qualified to help the building community achieve truly sustainable material decisions. Whether the country is poor or rich, the setting urban or rural, the climates and cultures diverse, every material and assembly has a story that should be told:

1. Reduce harm (make the numerator small)

M^3 – the source of materials matter

Triple top line economics (^{3}) have to be pursued in the selection of materials, capturing the economic, environmental and human cost-benefits of the extraction and production of materials and assemblies. While the first bottom line, profit, typically takes care of itself, the quantification of *who* gets the profit should be included in the human bottom line. Do the workers have a safe and healthy work environment, living wages, and health care? Then, the environmental bottom line (an LCA at the factory) celebrates: non-toxic materials; abundant materials that will not be depleted; and materials that are extracted or produced without environmental devastation, in a way that *regenerates* the resource itself, the land, the water, and the air.
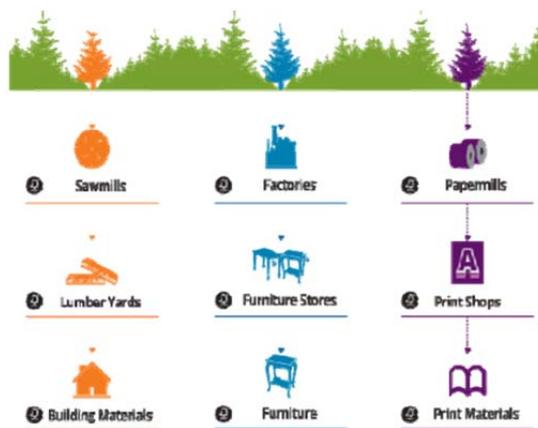
The source of materials matter - even if wood is good, the **chain of custody** ensures humanitarian practices and environmental content from source to use.