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Nexus: New approaches
to resourcing cities

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Caren Levy and Barbara Lipietz
London, June 2014

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Abstract

Cities are abjectly dependent on a wider world for resources to sustain them – traditionally from their immediate hinterland but today supplied from all around the world. They then have to confront the problems of dealing with the residues of their consumption as to where these go and what happens to them. This paper looks first at how these dimensions of urban life were dealt with in the more distant past and what happened in the course of modern development to deal with growing and compexifying cities. In the face of the modern environmental movement and the fears concerning the sustainability of cities, new initiatives began to be taken that, at least in cities in the

South, fell far short of creating efficient and pleasant urban environmental conditions. Now a new wave of initiatives is starting under the title of ‘the Nexus of water, energy and food security’, based on a ‘paradigm change’ that sees the need to find more effective ways, particularly of adequately resourcing (southern) cities that, it is hoped, will at the same time ameliorate festering environmental problems. Officially this is seen as opening the door to improved economic growth. We might, however, see these initiatives as the first steps towards a recognition that the future will not be ‘onwards and upwards’ but, rather, be a return to conditions prior to the emergence of modernity.

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1. A brief historical perspective

If we look back over the history of cities, somehow things were relatively simple. There were half a dozen reasons why cities came into being including the emergence of centralised government and the empires that came to be centred on these, then the religious centres that sanctioned these arrangements and in some cases became the *raison d'être* of cities. Cities also grew around commerce and trade and as centres of learning. With the industrial revolution some cities grew predominantly as centres of mining and manufacturing and eventually with the blossoming of leisure classes, 'taking the waters' and thence tourism.

Today matters have become increasingly complex and fragmented and easy analysis has turned into a vast array of academic literature that attempts to make sense of what cities are and what they are there for, not only to fulfil functions but as the centre of modern life from where the world is viewed and organised but which extends out to a point where cities have no boundaries: cities are everywhere and lifestyles hardly distinguish between the differentiated parts of cities that fulfil the many functions mentioned above and many more besides, and the functions that are ostensibly not urban but where urban people spend time and are in their heads still urban. And rural populations commute and also in their heads become urban in a form of culture that transcends – or as we shall see tries to transcend – the realities of cityness¹.

But somewhere below the surface, cities have to be provided with physical structures and resources to support the entertainment and consumerist haze, the struggles over 'rights' and eventually the survival of the poor and marginalised. There need to be (decent?) places to live and work and also social support, there need to be means to facilitate moving over ever more extended distances between the places people need or want to go and perhaps relief from the eventually oppressive hardness of city surfaces and life. More seriously, the means and methods need to come from somewhere to provide water, energy and food and insofar as these are metabolised and end in 'materials we don't want', means found to 'dispose of waste'.

In focusing on the history of how cities are resourced and 'cleaned', we find a vast array of ingenious solutions that emerged under different circumstances and necessarily evolved as and where cities outgrew their supply chains and means of dealing with the unwanted residues. Clearly

in the first instance resources were generated where people found themselves. The first cities emerged, then with the concentration of food production – above all through elaborate irrigation systems of Mesopotamia, the Nile and the Yellow River Valleys - that supported the existence of significant populations that were not themselves involved in food production. And once clustered in urban areas, means had to be found to bring the food to the city, to bring also water and fuel and building materials and then to remove the residues that were not wanted.

The ruins of some of the earliest cities, including Mohenjo-Daro in modern Pakistan (2,600 BCE)² and the ancient Greek city of Mycenae (1,400 BCE) (George, 2008: 131) already reveal sophisticated means of delivering water and removing 'waste' and ancient solid waste dump sites in Egypt have become gold mines for archaeologists investigating how the Egyptians lived.

The Romans are famous for the infrastructure technologies and supply systems they developed and deployed in the construction of towns and cities across their empire. Not a-typically, the supply of water to Carthage two thousand years ago for instance, leaves us even today with much of the ninety kilometres of aqueduct still plodding across the countryside and through the suburbs of Tunis as a serendipitous archaeological reminder of the efforts that become necessary to resource cities. And the remains of lead water pipes unearthed from under Roman cities has been speculated upon as a possible source of mass mental disease amongst the urban populations, indicating that 'solutions' may not always turn out for the best. The Cloaca Maxima originally built from the city towards the sea to obviate flooding eventually became the world's first sewer main for the city's human waste.

Meanwhile, Rome had become, towards the end of empire, highly dependent on imports of huge quantities of grain from North Africa such that the exhaustion of the soils of that territory has been speculated upon as one of the reasons for the collapse of the city from the mid-fifth century (Ponting, 2007) – that was, perhaps, more the consequence of the collapse of trade in grain with the invasion of North Africa by the Vandals and the inability to source sufficient food again from the countryside surrounding Rome (Ward-Perkins, 2010). By way of another well-researched case, archaeological evidence reveals how over a relatively short period the Mayan cities collapsed mainly as a consequence

of the impoverishment of the soils that resulted in the inability to support urban populations (Ponting, 2007, pp.78-82).

At their best – but very few cases in history - infrastructures intended to service the needs of urban populations have been designed as an important basis for the structuring of cities and their quality of life. So, for instance, the city of Kathmandu was, until recent times, highly structured regarding who lived where and how, in this case, water was provided. The remains of a complex system of underground watercourses – progressively destroyed by the overlay of supposedly superior modern systems³ - are still evidenced by ‘tanks’ with washing facilities and access to household water that also provide ‘air conditioning’ of the city in summer as places of repose.

The re-emergence of towns gradually turning into cities in Europe following the Dark Ages shows, however, very little imagination or technological prowess in the satisfaction of the basic resource needs and disposal of the unwanted residues. Water came from dug wells or nearby water bodies, fuel and food came from the fields and orchards adjacent to settlements and offered in the marketplaces. Waste was quite generally discarded through the door or window, occasionally into pits – famously pots were emptied from upstairs windows following a shouted warning that it was about to come, allowing people to jump out of the way to avoid the contents landing on their head. The streets were thus strewn with waste that decayed, to be washed away by the rain or pounded into the street dust. It would seem small amounts were interesting for farmers to collect and use as manure, a practice that was widely known and in some cities – notably Paris but also German cities, relatively consistently applied (George, 2008, Ch.1).

It was the growth of coal exploitation in England, starting already in the 16th Century with the exploitation of ‘sea coal’ on the Northumbrian coast and thence increasingly deep mining, once the means had been found to pump out the water that otherwise constantly flooded the mines, that gave the impetus to the processes of industrialisation and urbanisation. E.A. Wrigley (2010) provides us with a brilliant analysis of the role played by the expansion of coal use in bringing on both the industrial revolution and urbanisation, complete with the role played by the ‘agricultural revolution’ to supply the urbanising population. Without the spiralling consumption of fossil energy, ‘modernity’ could not have happened or advanced but as it did, so invention was both the basis for the upward spiral and, at the same time, forced by events.

The burning of coal to fuel the production and metabolism of the complexifying cities produced appalling air pollution, and with it a constant high level of bronchial ailments, that was only mitigated in the London case in the middle years of the 20th Century. This, however,

eased the increasingly problematic demand for biofuels from the surrounding countryside. British local authorities, and elsewhere as cities grew, became aggressive in extending their exploitation of water resources in far off parts of the country, using improved steam pumps to propel water to the cities. Meanwhile, already in 1846, the ‘Repeal of the Corn Laws’ that protected British farming but meant relatively high food prices, led to a rapid growth in the importation of grain and after the invention of the refrigerated ships and rail cars, the importation also of meat. So local food production was no longer an issue and relatively low food prices translating into lower incomes to the working classes facilitated the lowering of the price of British goods, flooding foreign markets and turning the ideology of a global free market into a reality.

The Achilles Heel of the resulting growth in towns and cities was the increasing concentration of human waste, contaminating water supplies and triggering cholera epidemics⁴ and generally a high death rate amongst children. It took a while to discover the link between contaminated water and cholera but this dawned at the same time as the stench from the wastes of London ending up in the Thames was making work at the Houses of Parliament unbearable (Wohl, 1983).

Draconian measures were called for and without deeper thought on the relative efficacy of different possible solutions to the problem, a crash programme was introduced to ‘wash the problem away’ through a massive construction programme of sewerage and, with a revolution in urban management based on substantial health legislation, a halting improvement also in the removal of solid waste. Emulated in Paris and thence spread across the rest of the UK and Europe, the answer to pollution became dilution and the washing away of the stink and the dangers of disease. Continuously extended, today, West London alone has 37,000 miles of sewers and the UK as a whole some 186,000 miles (George, Ch.1). Together with the sewage treatment plants this represents an enormous sunk investment in a particular ways of dealing with ‘human waste’ to which has to be added the considerable cost of running the systems.

The use of human waste for agriculture did not end there, however. The fact that this could fetch an income meant that inventors continued even in London until into the 20th century to devise systems to recuperate ‘night soil’, as human waste is termed when used as fertiliser, and sell this to farmers. Elsewhere across Europe this remained common practice until very recent times around many towns and smaller cities in north and central Europe. We should, however, be aware that this practice has been carried out for millennia right across Eurasia, especially in the Far East and can still be seen as an instituted practice throughout rural China (Lüthi et al, 2011, Ch.3). But the introduction of cheap artificial – mainly fossil hydrocar-

bon-based – agrochemicals rendered the trouble of processing and utilising urban organic wastes ‘uneconomic’ throughout the industrialised world.

Whilst London’s sewage was cast downstream into the Thames and this led to a general practice of discarding the waste into rivers or the sea, initially untreated, the abstraction of water for urban water supplied from the same rivers eventually forced improvements in treatment to avoid contamination of drinking water taken out of rivers downstream. Near the sea, however, it continued even until today, to be possible to deliver untreated waste from sewers into the sea and although EC regulations are pushing cities in Europe to treat their sewage, still the waste from very many cities is surreptitiously dumped untreated into the environment.

In some cities, especially in Germany, Scandinavia and even some cities in the United States, the waste from the sewers continued to be disgorged onto fields to irrigate and fertilise vegetables. Even into the 1960s, 10,000 hectares of land on the edge of Berlin was treated in this way, terminated only because the contents of the sewage was increasingly contaminated with complex chemical concoctions that, absorbed by the vegetables, could no longer be relied upon not to affect negatively the health of consumers. The problems, however, are still not solved even with massive investment in complex treatment plants as the sludge (solid residue) resulting from treatment still has to be disposed of. This is nowadays incinerated or dumped into the sea or dispersed on agricultural land with increasing, and justified, public outcry (George, 2008, Ch.7).

NOTES TO CHAPTER 1

1. For a short list of musings on the modern city at the centre of a vaste discourse that has altogether forgotten the resource-dependency of the modern metropolis, see: Lefebvre (2003[1970]), Hall, (1988), Gmelch and Zenner, (1996), Soja, (2000), Scott, (2001), Sassens (2003).

2. As Sir Mortimer Wheeler put it (cited in Morris (1994, 33): “the high quality of sanitary arrangements at Mohenjo-daro could well be envied in many parts of the world today.”

3. Where also the demise of the use of ‘human waste’ to fertilise fields surrounding the city is resulting in extremely insanitary open defecation in the streets and along the river banks of the city.

4. Cholera arrived in London from India in 1831 and killed around 20,000 people, spreading to other British cities. A repeated epidemic in 1848-49 killed a further 50,000 people in London alone.

2. Where we stand today

Nevertheless with a lot of effort, ingenuity and investment, the cities of the North have found ways and compromises to obtain the resources they need – and these days in the context of consumerism much more than a modest lifestyle would require – and to create convenient and healthy enough urban environments. The advent of the environmental movement and its threat of the ‘unsustainability of our lifestyle’ added pressure to improve on measures taken to keep the environment ‘clean and green’, with some, but not very serious, worries about the longer-term fate of resource flows, expressed in small efforts to implement ‘renewable energy’ technologies and the recycling of some portions of urban solid waste, seen rather self-righteously as a start down the path to maintaining our lifestyle in more frugal times.

The fact is that in the North ample water is supplied to the cities, often from great distances with massive efforts to pump the resource. Variegated food supplies to suit any palate are not a worry as these also travel ever further, trucked across continents and increasingly flown in from all corners of the world. In the middle years of the 20th Century – particularly in the UK with its policies of ‘Greenbelts’ and New Towns - there was some concern to contain urban expansion with one of the reasons being the maintenance of agriculture to supply neighbouring urban populations.

However, although some kind of ‘containment’ policies are to be found in some countries, nowadays ‘urban’ populations are scattering across countries until they meet the neighbouring city and the reality is that peri-urban produce is as likely to be exported as supplied to the nearest cities, whilst the cities are supplied from ever further afield with ever-lengthening ‘food miles’ and increasing energy expenditure per calorie on the dining room table (AEA Technology Environment, 2005).

We should not, however, overlook the fact of a contrary move that as yet isn’t slowing down the growth of total food miles but is nevertheless a significant movement worldwide to grow food organically (use organic ‘waste’ rather than artificial fertilisers) and close to where it is consumed. ‘Farmer’s Markets’ selling locally produced food are becoming a common feature in northern cities and ‘Community Supported Agriculture’ (CSA), a movement that actually started in Japan in the 1960s is also becoming common, where urban consumers band to-

gether and contract peri-urban farmers to supply them with at least some of their food year-round. This is generally referred to as urban and peri-urban agriculture (UPA) (Atkinson, 2013).

As far as energy supplies to northern cities is concerned, although this issue is recognised as a hot topic for political chatter (dependence on Middle East oil and Russian gas, whether to indulge in the dirty business of fracking, etc.), the continued availability at, for most people, reasonable prices allows life to continue as ‘normal’ without worries.

Of course all this is less the case in the South where efforts to emulate the North in the rush to flee traditional rural lifestyles and live it up in the city end up with various levels of failure in resource supply and, very widely, the failure to ‘get rid of waste’. The level to which these issues are mastered varies from country to country and from city to city. On the whole the degree to which solutions are being achieved relate quite closely to the relative availability of money both for relevant authorities to buy effective technologies and thence consumers to pay for the resources and services. Modern ‘middle classes’ in southern cities everywhere manage to achieve lifestyles that mimic those of the North, sometimes even more luxuriant.

However, for significant – in some cities substantial – populations, the reality is life in ‘informal settlements’ and ‘informal economies’, attempting to emulate modern urban lifestyles but under conditions of precarious marginality that are very different from those experienced by their ‘middle class’ (modern class) peers. These include intermittent water supply from few sources; continued ‘rural practice’ of using biofuels for cooking, with rising prices because of depletion of the hinterland; often intermittent supplies of (sometimes ‘stolen’) electricity; increasing under- and mal-nutrition; and sanitary conditions not too different from those, described above, experienced in Medieval European towns.

Attempts have continued for decades for aid agencies and the international development banks to introduce technical systems and infrastructure of the kinds that service the needs of northern cities, also in southern cities and local agencies and institutions – particularly in Latin America - have emulated also the northern practices seemingly on the assumption that in time southern cities will have the resources or otherwise manage somehow

also to possess effective ways of resourcing the poorer parts of the cities and providing adequate waste removal and otherwise pollution-reduction systems.

This story starts from colonial times, when many of the modest colonial cities were run as if they were cities in the metropolitan countries, with electricity and often tramway systems, comprehensive reticulated water supply systems and even sewers (but without treatment plants). Post Second World War and independence, these systems rapidly deteriorated in very many southern cities, ostensibly because development priorities lay elsewhere. The aid agencies and international development banks soon stepped in with a notion that they would supply the necessary support to provide modern infrastructure. However, with rapid urban growth and even more rapid spread of informal settlements, the resources, not so much financial but in terms of local commitment to train staff and administer the systems, fell, we might say to some extent in all cases and in many catastrophically, short of the ideal – or at least the level of ‘workable compromises’ found in northern cities.

As time and failures passed, some inventiveness was applied, departing from orthodoxy that would provide something of a minimum of service. ‘Sites and services’ schemes came and went when it became evident that the level of service was still well beyond what the poorer populations could afford and were soon occupied by classes a cut above the poor masses. The idea, instead, of providing very basic services in situ to the squatters began in the late 1960s in places where governments were prepared to concede that informal settlements were

not going to go away tomorrow but were becoming a permanent dimension of burgeoning cities (Hardoy and Satterthwaite. 1989).

Thus came the paving of paths, the water standpipes per hundred dwellings and the poorly managed communal toilets, as well as attempts – never very successful – to remove solid waste. In terms of the supply of other resources – energy, food and any ambitions to possess other modern consumables – the people were left to fend for themselves which, it should be added, they generally do with amazing resourcefulness with next to no financial means: informal economies circulate tiny amounts of money entering from the formal economy with majorities of the inhabitants of informal settlements providing small services that effectively redistribute the incoming funds to enable all to survive and gradually build more permanent houses and lives.

The intensification of the environmental movement across the 1980s resulted in more effort on behalf of the aid agencies – the World Bank insisting on the need for a ‘brown agenda’, meaning increasing attention to urban needs in the South, to match the ‘green agenda’ of the environmental movement in the North. It also spawned many hundreds of ‘development NGOs’ with commitments to assist communities in the South to achieve the ‘benefits of modernity’, often at the same time with some sense of the ‘sustainability’ of the efforts they undertook. And from the end of the 1980s, some interesting ideas developed in rural areas began to percolate into urban areas, suggesting that the whole attitude to the management of resources and wastes inherited from 19th Century Europe might be fundamentally flawed – indeed not only in the South but also in the North.

3. New approaches to resourcing cities

It was in China, and followed to a degree by projects implemented in the Indian countryside that the change started. As discussed earlier in the paper, the traditional resource cycle in rural areas even in Europe had involved the return of 'wastes' to nature, where they provided nutrients for the next season's crops. It was the particular nature of the urban sanitation crisis in the North that lost the wisdom of 'waste as resource' and introduced the notion of 'disposal', breaking the resource cycle. Rediscovering this cycle didn't mean abandoning the knowledge and inventiveness of modernity and so now it was a matter of discovering the best means to intervene in the cycle to benefit human life and, at the same time to find appropriate ways to break the cycle of disease that, in the past, accompanied the resource cycle.

As already noted, in rural China ancient knowledge of benefiting from the resource cycle was never lost. A new component entered first through knowledge that 'marsh gas' – essentially methane - was combustible and could be harvested from sewage as this ferments, with appropriate containment, and used as cooking fuel or even in engines to produce electricity. The viscous residue - sludge - now inert from a sanitary point of view, can then be applied to soils to enhance agricultural productivity. The early history of this starts at the turn of the 20th century in Germany (ISATS, no date), but from the 1940s, in increasingly massive waves – and since the 1950s strong government backing - by now tens of millions of 'biogas digesters' have been constructed in rural China, 'powering' some 35% of the country's villages. By the end of the first decade of the new century in India there were about a million biodigesters connected both to farm toilets and fuelled by livestock dung and eventually other organic waste.

It was the German Technical Cooperation Agency (GTZ – now German International Cooperation Agency, GIZ) - that initiated a process of integrating the parts starting with a concept they referred to as 'eco-san' or ecological sanitation. This is concerned strategically with 'closing the water and resources cycle' but focuses particular attention on the separate collection of urine – an excellent nitrogenous fertiliser – from faeces that can be composted and applied as a soil conditioner to enhance agricultural production. Eco-san requires very little alteration of a standard – or squat – toilet basin to separate the components of human 'waste' at source and to deposit these into separate collectors.

The GTZ even installed eco-san toilets in its headquarters building as well as initiating pilot projects in many countries. The system was emulated by many NGOs working in rural and increasingly also in urban areas in the South and in 2005, together they founded the Sustainable Urban Sanitation Alliance (SuSanA) to which, by now, over 50 organisations are members. Meanwhile, numbers of NGOs have been initiating the installation of more complete systems in urban areas, starting with schools and hospitals that might be expected to have some kind of commitment to continue to manage these in their own interests. Rain is being 'harvested' from roofs to supply washing water that, once used is then applied, sometimes following treatment in 'constructed wetlands'⁵, to irrigate vegetable plots. Toilet blocks fuel biodigesters providing gas for cooking and water heating and the sludge is extracted for use on the vegetable plots to enhance growth.

Then at a larger scale, financed by development agencies, a few initiatives are being taken at the municipal level to source-separate the organic component of solid waste, including by households but also market wastes, taking these to municipal waste processing sites and using a larger scale of digester to produce biogas for electricity generation and using the sludge on larger-scale peri-urban agriculture. Could this be combined into a coherent system and scaled up to the city level to, at last, provide a sustainable solution to the sanitation woes of southern cities whilst taking some of the pressure off urban water and energy supplies?

Meanwhile, around the world, in the course of the first decade of this century, in certain quarters discomfort had been growing concerning the continuation of 'growth' of all kinds into the future. Most concretely, the continuing rapid growth of cities in the South is clearly straining the supply of sufficient water and energy to maintain the burgeoning concentrations of population. And incipient undernourishment and certainly malnourishment are not difficult to find amongst the urban poor, especially in sub-Saharan Africa but also South Asia and some parts of Latin America. Although not couched in these terms – the ideology continues that economic growth has no end - it was the German Ministry for Economic Cooperation and Development (BMZ) that took the initiative

to organise a conference in November 2011 to debate what they termed the ‘Nexus’ of water, energy and food security to find ways to increase the effectiveness and efficiency of resource supplies and management to and in cities.

The idea soon spread, with the EC devoting its Development Report 2011-12 (ODI et al, 2012) to the problematic, with numbers of conferences and new initiative sprouting around the world, documented on the BMZ ‘platform’ www.water-energy-food.org. The Nexus idea is not just about recycling waste, indeed not necessarily primarily so. What it does, however, is to focus attention on the lack of responsibility at the urban-regional level for the supply of resources. Over the years, municipalities have been divested of responsibility for basic resource supplies to their populations where in the early years of mass urbanisation, the supply of water, the means to efficient sanitation, and the invention and deployment of gas and electricity production and distribution grids was overwhelmingly a partnership between municipalities with sometimes local entrepreneurial initiative. Nowadays, these responsibilities are allocated to a plethora of regional and national agencies and latterly increasingly ‘privatised’ with ‘the mar-

ket’ relied upon to satisfy needs – which it might do well-enough for the ‘middle classes’ but decreasingly effectively for the urban poor.

The Nexus initiative sees the incoherence, wastefulness and in the breach increasing inability of the fragments of urban resource management systems to be capable of supplying adequate means to support urban populations – or at least the growing poorer segment. The watchword being ‘integration’ of responsible institutions and planning systems, classic Nexus projects address more than one of the sectors together: reducing energy needs in supplying water and vice versa, developing urban and peri-urban agriculture to reduce the ‘food miles’ needed to bring food into the city and can be extended also to look at renewable energy options, reducing energy used in buildings and ways to reduce the use of energy-using transport modes, etc.

All of this clearly requires ‘changes in mindsets’ at all levels and thence thorough reform, even rebuilding, and then integration and coordination of local and even national institutions. There is, as in all more recent urban development and management initiatives, an essential dimension of community involvement that will require knowledge and commitment to implement Nexus measures.

NOTES TO CHAPTER 3

5. For the uninitiated, Wikipedia define constructed wetlands as follows: “Natural wetlands act as a biofilter, removing sediments and pollutants such as heavy metals from the water, and constructed wetlands can be designed to emu-

late these features.” Used to clean ‘grey water’ (domestic washing water) they can be placed even in dense urban areas and save considerably on conventional wastewater management systems.

4. Two Nexus Initiatives

The German International Cooperation Agency (GIZ) is an international development consultancy that is a quasi-government organisation that obtains much of its funding from the BMZ. It may take independent initiative and request funding from the BMZ but also harkens to the interests of the BMZ – and in the case of Nexus initiatives, this has been the case. So far, two initiatives have been embarked on and although not yet very far advanced, we here analyse the proposals.

4.1 Ten Asian cities

The first initiative is really putting out feelers and a very small amount of funding to stimulate interest in a number of Asian cities but at the same time to discover what interest there might be and how to help instil a general understanding of the meaning of Nexus actions and how to formulate and execute these. From the start of 2012, ten cities in six Asian countries stretching from Mongolia and China via Thailand and the Philippines to Vietnam and Indonesia were relatively arbitrarily contacted and initial visits paid and interviews held. Then a conference was organised in Bangkok to bring relevant municipal staff together. Regional institutions were also involved with an idea of these eventually becoming platforms to disseminate experiences and generally consolidate understanding and action amongst cities in the region. UN Economic and Social Commission for Asia and the Pacific (ESCAP), based in Bangkok, became the project carrier and the programme is currently underway, running from April 2013 to the end of 2015.

On the basis of the principles conveyed in the conference, the programme is designed to encourage the cities to come up with their own Nexus initiatives that should address two or even three of the resource issues and produce a pilot or demonstration project. By late 2013 the cities had all formed a ‘Nexus Task Force’ that brought together relevant agencies and with a recommendation that this go beyond just municipal departments to involve maybe peri-urban institutions and civil society organisations (GIZ-ESCAP, 2013). With advice offered in response to specific requests, the Task Forces are, at time of writing, formulating their projects for which small amounts of funding will be available for design and implementation.

The programme then envisages regional workshops both theme specific and looking across the whole spectrum of possibilities, that are intended to deepen the understanding of what Nexus means for the future of urban planning and management. Towards the end of the programme, publications and other media will be generated and distributed through regional municipal support institutions that include not only ESCAP but also CITYNET, UCLG-ASPAC, ASEAN and possibly others. It should be noted, that in all the cities visited for the initial interviews, there were one or other tentative starts and pilot projects that could be built upon and the programme design encourages the participating urban stakeholders to expand and deepen their experiences with the hope that these would not only become institutionalised but also disseminated to one another and to yet other cities.

The second initiative is a sub-component of an ambitious move of the GIZ to address the growing problems of many kinds that are being experienced by burgeoning cities and their metropolitan regions throughout the South. One of the four main themes of this programme concerns itself with promoting Nexus ways of planning and managing metropolitan regions. For this programme two cities were selected and the International Council for Local Environmental Initiatives (ICLEI) was contracted for six months to help take tentative steps in the two metropolises to demonstrate what Nexus is all about. In the process, more concrete longer-term projects were designed and whilst as yet there is no commitment to funding these, it is useful to look at what was found already to be present in the two metropolises and where this might lead.

4.2 Dar es Salaam

The first metropolis is Dar es Salaam in Tanzania, which is administratively decentralised to three large municipalities and the project should unfurl in Kinondoni, the largest of the three, with, according to the last census, a population of a little over one million. Although there is the skeleton of a modern city that, apart from debilitating traffic congestion (a problem in most cities North and South), works well enough for the well-to-do. For the majority, informal settlements mean intermittent water supply, high and mounting cooking fuel (charcoal, firewood) prices and widespread under- and mal-nourishment, in many areas regular flooding and ad hoc

sanitation arrangements polluting local environments. Great efforts are being made to remove solid waste but this nevertheless manages in some measure to be discarded on certain areas of vacant land.

With the substantial failure of attempts to provide conventional water supply and sanitation infrastructure⁶, in the context of energy and food crises, new kinds of initiative are being actively explored. The German NGO BORDA has been working quietly in many cities throughout the South on local approaches to solving waste water management problems that include also rain water harvesting and constructed wetlands cleaning wastewater for irrigation of urban agriculture and also biogas digestion from human waste that produces fuel for cooking and fertiliser for urban agriculture.

Other BORDA projects include recycling of components of solid waste including composting of the organic component. In Dar es Salaam they have small projects that might be adapted to new situations and generally 'up-scaled'. Further research is being carried out at Ardh University in Dar es Salaam into biogas digesters, financed by the World Bank. Additionally, the international NGO Water Aid had built some 70 eco-san toilets into houses in an informal settlement to demonstrate the feasibility of these under local circumstance and other international and local NGOs are conducting yet other relevant experiments.

Meanwhile, the Kinondoni Municipal Director is not only aware, but keen to see these components put together into a system that could be 'upscaled' into local communities. The various municipal department staff are also aware – and had indeed undertaken their own projects in rainwater harvesting, more to retain water for urban farming than household use, and then training women from local community organisations (Mtaa) in how to be effective urban farmers.

So with this variegated seedbed, where to move next? Thus far BORDA's success rested with the commitment of hospitals and schools where their projects were implemented to continue to operate them: management and maintenance. The challenge would be to build skills and beyond that a culture that would maintain systems if these were taken beyond formal institutions and into the wider community. Above all, there would need to be incentives to continue to run the system. In the end, looking now at the whole chain as being one of 'managing valuable resources' instead of 'disposing of waste', there was a recent legacy in Kinondoni of small enterprises that had been contracted to remove waste, that disappeared after a few years, and eco-san experiments that demised because no organisation was created to buy and sell the toilet wastes to farmers and then the plastic urine pots were stolen to sell to recycling junk shops...

The answer looks like this: urine and faeces from eco-san toilets can be simply processed and then sold either direct to urban farmers – displacing the purchase of artificial fertilisers - but, better still, processed through biodigesters with sales of gas to displace biofuels and then the sale of sludge as fertiliser to urban farmers who grow vegetables and sell these in their curbside stalls (where currently produce from outside the city is sold at prices that have to include the costs of transport).

So small enterprises – maybe initially with small 'sweetener' subsidies – would create employment and income and incentives to continue indefinitely. The sanitation woes of the settlements could, with the deepening of commitment and efficiency of the system, be greatly ameliorated. We forgot something: organic household waste, market waste, all sorts can be fed to livestock – indeed, there is already significant livestock in the interstices of the city (Schmidt, 2011) - and the animal waste, too, can be fed to the biodigesters or other composting arrangements to improve urban agricultural production.

Three snags arise at the present time: the inner areas of the city are so dense that there is no room for urban agriculture or even biodigesters or mini constructed wetlands. The inner suburbs, however, have leftover spaces, some quite substantial, and then surprising smaller pockets that so far nobody has squatted or that the municipality is reserving for functions that never get built. And the outer suburbs present many opportunities. There are, however, issues of cultural acceptability – for instance to cook with gas made from human shit: queasiness about the handling of human waste instead of the – in sanitation terms – much worse situation of open defecation, 'flying toilets'⁷ and overflowing septic tanks which are, of course, all the consequence of not wanting to think about the matter.

The GIZ project design sees a further BORDA-type system installed in two neighbouring schools in Kinondoni that, once installed and assuming they work well, become a jumping-off point for neighbouring Mtaa to be organised to operate their own systems with the aid of the schools as education, skills-building and culture-changing venues. One can but try – and the seedbed has already been prepared...

4.3 Nashik

The second city is very different. This is Nashik in Maharashtra, just three or four hour's drive from Mumbai, India. Nashik is a city of about one and half million that is relatively well-off by Indian standards, growing rapidly on the basis of an industrial economy overflowing from Mumbai and with a rich agricultural hinterland from where increasing amounts of produce – particularly

grapes – are being exported. Nevertheless, the number of the urban poor is also growing rapidly as are the informal settlements.

At the same time the city is spreading in random fashion into the hinterland, predominantly in the form of four or five floor apartment buildings containing perhaps 16 to 20 apartments to house the new middle class. Meanwhile land speculation is taking thousands of acres of irrigated land out of agricultural production. In fact, this kind of ‘urban sprawl’, is a feature of cities around the world today – starting with the suburbanisation of the United States and more recently Europe too and today in an almost extreme fashion around Asia’s burgeoning cities.

Located on the eastern side of the Western Ghats mountain range, the possibilities of damming the valleys emerging from the mountains to impound water for urban water supply and irrigation have been extensively utilised. The urban water supply now covers the whole city – with the usual simplified systems for the urban poor – but there is concern with the heavy cost of energy for pumping. There is also – a notable exception for Indian cities – a relatively comprehensive system of sewers and sewage treatment plants with all modern facilities that include methane (biogas) production to power small generators to produce electricity to run the plants. By the time the sewage reaches the treatment plants, however, eighty percent of the methane has been lost to the atmosphere as the sewage digests its way down the sewers. Better capture the methane locally and reduce the impacts on global warming. The sewage sludge is also made use of by drying and selling to farmers who are happy to collect it to fertilise their fields – without yet, perhaps, an awareness of the deepening contamination referred to earlier in the paper.

The proposed project has two stages. The first is concerned to bring land where agriculture has been abandoned pending ‘development’, back into production – even if only temporarily. The main ‘problem area’ is land that in the 1980s was laid out in an irrigation system of over six thousand hectares, gravity fed from the Alendi reservoir. As most of the land then already lay on the edge of the city, as this expanded, so planning permission was given for housing and a frantic speculative boom led to most of the land being bought for development. Whilst so far development is very thin on the ground, less than twenty percent of the land is still in agricultural production. In principle the canal system is still functional but in reality the water from the reservoir is being pumped to fields away from the urban area.

A simple mechanism to bring the land back into agriculture, benefiting from gravity-fed, rather than pumped irrigation, is to levy a high tax or fee on owners who do not develop the land over a short period, unless they return the land to farming. How this is done may be pragmatic –

the owners themselves farming or hiring farmers (already a widespread practice in the sub-region) or neighbouring households in the apartment buildings forming associations to farm as an economic side-activity. In discussing the matter with the municipality, the Commissioner (Municipal Director - an agricultural engineer by training) showed enthusiasm and both the District Irrigation and Agricultural Departments indicated a willingness to support such a move. This is Nexus stuff in reducing energy for irrigation and bringing food production, UPA-style, nearer to consumers.

Should this get off the ground, the next stage would be to enhance the productivity of the UPA by moving backwards along the sanitation pathway. The scattered development currently taking place is dysfunctional from the point of view of installation of urban infrastructure: long pipes with few connections and what has so far been discussed above is that anyway household sanitation should be processed as close as possible to home. Thus, future apartment buildings need to be equipped with different pipework systems: rainwater collected on roofs can be used for washing, reducing demand for (pumped) municipal water. Grey water (from washing) can exit separately to constructed wetlands, the treated water then used to increase irrigation.

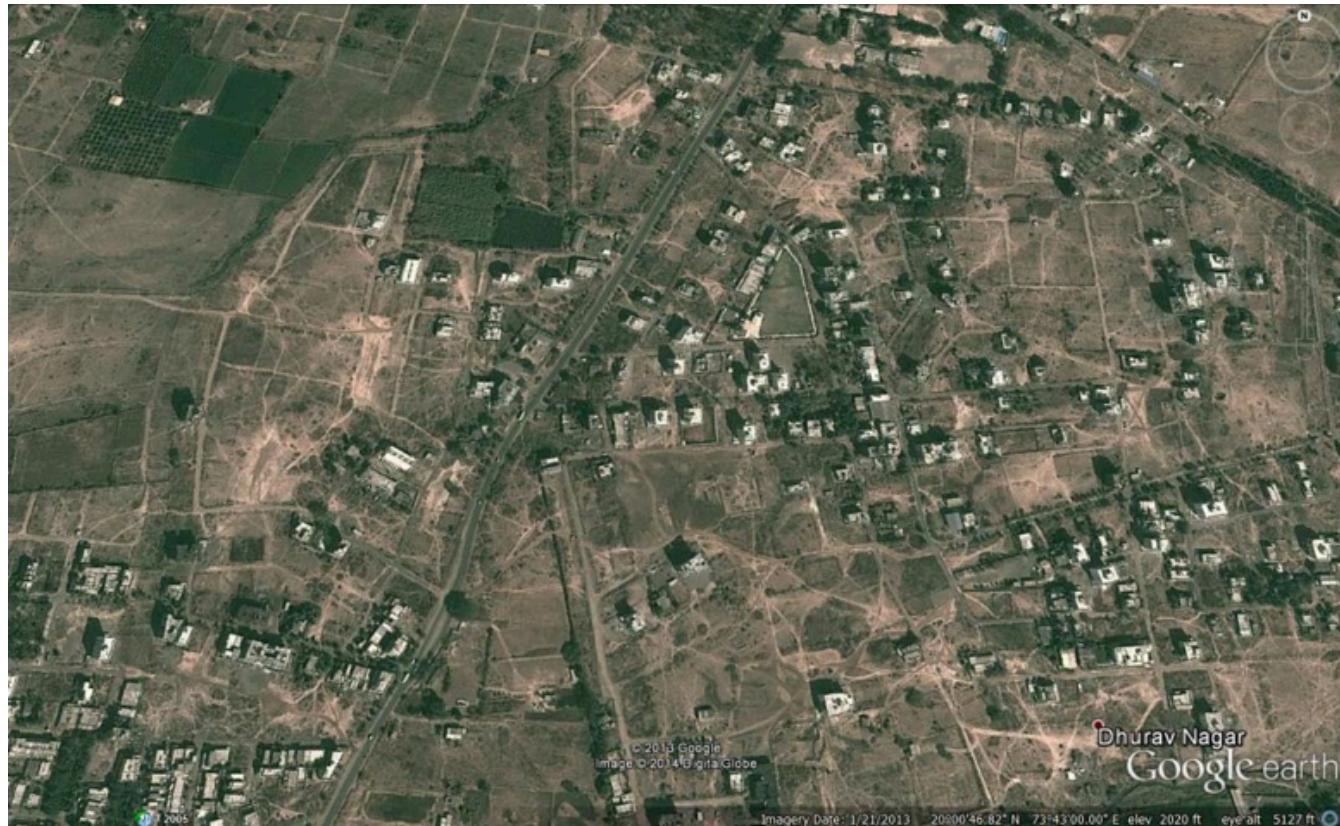
Urine and faeces may have separate downpipes to facilitate separate collection, the first to be treated, diluted and used directly on neighbouring recovered fields. The faeces should go to a biodigester – and if the urban farmers keep animals, their organic waste and agricultural residues can be fed to these and their wastes added into the biodigester. In the recent past, cooking fuel even in urban areas in India was, like in Dar es Salaam, mainly biofuel. However, as the countryside became depleted, so the government promoted the use of LPG which is now the usual urban cooking fuel but which is mainly imported and in the long-run non-renewable. So the biodigester gas can be supplied to the apartments, reducing the need for LPG. And finally, the biodigester sludge is sold to urban farmers to enhance productivity.

Well, this all seems some way from where things are just now. However, the workshop that took place at the end of the project formulation mission indicated that there is widespread knowledge of all the components of such a system and of the general problematic. But here we have exactly a situation for which the Nexus is there to inspire action. The steps are relatively clear and, of course, it will take commitment across a wide spectrum of stakeholders: municipal and district departments (the district is the larger entity within which the city sits and where reside numbers of responsibilities – including irrigation and agriculture and even planning, but not water supply or sewerage) and maybe Maharashtra state institutions and relevant research and training institutions.

But the key will lie outside officialdom: at the willingness of landowners to participate (albeit under pressure and incentives) and above all some kind of community organisation to commitment and support to bring the system into being and to maintain it into the future – understand-

ing it as being in their interests and if it can be made to work, also profitable and job-creating with the strategic Nexus benefits of reducing demand for water and energy brought into the metropolis from outside and at the same time increasing local food production.

Figure 4.1. A typical area of Nashik suburban development



NOTES TO CHAPTER 4

6. Interviewed in the context of project formulation, the local World Bank infrastructure office referred to the situation as '20 years of project failure'. For an amusing, but telling, story of the failures of so many bright ideas to solve Dar es Salaam's sanitation catastrophe, see George, 2008, pp.209-223.

7. A very common phenomenon in many African and some Asian cities sees people defecating into plastic bags and throwing them away in all directions, including the roofs of neighbouring houses, where they break or otherwise leak. In some country's these are referred to as 'flying toilets' but in Kenya they are called 'helicopter toilets'

5. Future perspectives

Readers with knowledge of the context in which these Nexus projects are being proposed will surely be asking themselves how realistic these are. As yet the answer to this lies some years ahead. The benefits, however, are clear. However, as so much in terms of failed ‘urban environmental management’ initiatives in southern cities in the recent past shows, clear though the benefits might be, somehow the economics and politics didn’t allow these to succeed. What we might say about the Nexus approach is simply that we are not talking, as many seem to think, about ‘new initiatives in environmental management’ but, rather, as Adnan Aliani, the head of ESCAP’s Environment and Development Division put it in his keynote speech to the first Bangkok conference on the subject: Nexus is a new approach to Development that calls for a recognition of the wasteful ways of the past and provides profitable initiatives that as an additional bonus solve festering environmental problems.

However, we may also look at it from a very different perspective that sees Nexus as the start of ‘the end of Development’ and the initiation of ways to solve problems of increasing frugality in the future. Contradictorily, the EC 2011-2012 Development Report, referred to earlier, is entitled: Confronting Scarcity: Managing water, energy and land for inclusive and sustainable growth. But how scarce might this scarcity be, and are Nexus initiatives really some kind of spell to maintain growth? The BMZ also likes to see the matter in this light: that just by managing things better, we will struggle on upwards.

Officialdom and most of the world around us cannot face the possibility that maybe the future is no longer onwards and upwards and with the failure of the dreams of a nuclear future and the conquest of the universe, development turned out to be just a function of the exploitation of fossil energy (Atkinson, 2008) and, as access to what remains becomes increasingly difficult, we will return to a world defined by what the biosphere, in its largesse,

offers us, with a little more derived from human ingenuity to tap the sun’s energy directly and harness the energy in the rivers and the winds (Vairley, 2013).

Small but growing initiatives, informed by this perspective, give us many of the burgeoning UPA projects. Some of these in turn grow out of, or are created by, a context in the growing ‘transition initiatives’ that are explicitly concerned to prepare for the ‘downward passage’ of less energy and more modest lifestyle ambitions implied by the decline in energy resources (Hopkins, 2008). Growing food locally and organically becomes a learning experience and adding into the correction in dealing with water resources and ‘waste’ management is simply part of ‘using resources more wisely’ in a situation where to do otherwise as asking for trouble.

Taking two steps back to view the process in longer perspective, two things become very evident. The first is already apparent in attempts to realize Nexus initiatives now: that ‘change in culture’ at all levels: personal attitudes and how we organize our social and community life all the way to professional cultures and cultures of governance faced with the end of modernity must be at the forefront of initiatives and not something that follows on from technical solutions.

The other is that we might expect the outward spread of cities to which we have been witness over the past decades not to be an aberration to be corrected by a return to ‘compact cities’ – as many a conventional planner saw things – but a process that will accelerate, with the demise of megacity centres with their massive demands on energy to sustain them. We might also expect the demise of suburbs that do not manage to transform themselves into modest country towns (Electric Wallpaper Co., 2004) with much of local consumption satisfied from production in the immediate vicinity and manufactured, as in the not so distant past, within the reemerging towns (Kunstler, 2005).

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