

Smart-Wise Sustainable Cities in India

PROJECT REPORT

*Findings from the pilot program of
fieldwork in Bhubaneswar & Kolkata*

**An E.P.S.R.C. funded 'Smart Cities in the
Global South' Project**

Version 0.2

Draft for consultation

28-05-18

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Documentation

Version	Date	Status	Author	Description
0.1	28-03-18	Draft	JR	Draft for internal team comment
0.2	28-05-18	Draft	JR	Draft for stakeholder consultation

Acknowledgments

Funding for this fieldwork is gratefully acknowledged from the EPSRC (Engineering & Physical Science Research Council) 'Smart Cities in the Global South' Institutional Sponsorship programme at the University of Manchester.

We are very grateful for the generous help and hospitality from members of the Xavier University Bhubaneswar, the Xavier Institute of Management Bhubaneswar, and the Indian Institute of Engineering Science and Technology at Shibpur. We are also grateful for feedback at the Dept of Geography at Jadavpur University.

We are also very grateful for all the contributions of interviewees and workshop participants, who helped to make this a quite unique project.

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1) INTRODUCTION

This Report

This report is a summary of the fieldwork and analysis, carried out in March 2018 in Bhubaneswar and Kolkata. This was funded by the UK EPSRC Smart Cities in the Global South program at University of Manchester.

This report aims to provide a range of basic evidence, which can then contribute to policy agendas, academic papers, and further research programs.

The Project

The 'Smart-Wise Cities' project investigates how smart city technologies drive rapid urban change and transformation. Generally, smart city technologies can be very powerful and innovative. They can also disrupt economies and societies, with increased risks of power grabs, land grabs, data grabs, and new patterns of inequality and exclusion.

Smart technologies also bring opportunities for 'Smart-Wise Sustainable Cities'. This 'smart-wise' model aims to manage new technologies for social goals – social inclusion, anti-poverty, anti-corruption, sustainable business, and open governance. The scope includes –

- 'Smart cities' – understanding new digital technologies, and the effect on social and economic change.
- 'Sustainable cities' – cities which respond to issues of inequality, exclusion, unemployment, etc.
- 'Wise cities' – avoiding the negative effects of 'smart', and building the 'collective urban intelligence', so that new technology in urban systems can benefit the whole of society.

To help the exploration of the 'smart-wise' model, not only as a technical system, but as creative human experiences, values and cultures, we use the Synergistic toolkit. Overall, the project explores three main research questions –

- a) How are smart city systems changing the economy and society of Bhubaneswar?
- b) What are the side effects, positive and/or negative?
- c) Is there an alternative 'wise city' model, and which pathways could lead towards it?

These lead to practical questions for the interviews and workshop consultation:

- What do you understand by 'smart' and 'smart cities'?
- How does the smart city change your role or sector?
- Could it work better, and how might we move from 'smart to wise'?

Overall this project is a pilot and test-bed for the smart-wise approach and its synergistic methods. From this, we aim to scale up the methods and applications for a national research program, with major funding from UK / EU / international sources. There is also a global level agenda, in which we aim towards a distributed network of smart-wise city 'collaboratoriums', zones of experimentation in the collective urban intelligence.

The project also included an ethnographic analysis, by Dr Jessica Symons: this is reported separately.

What is a smart city?

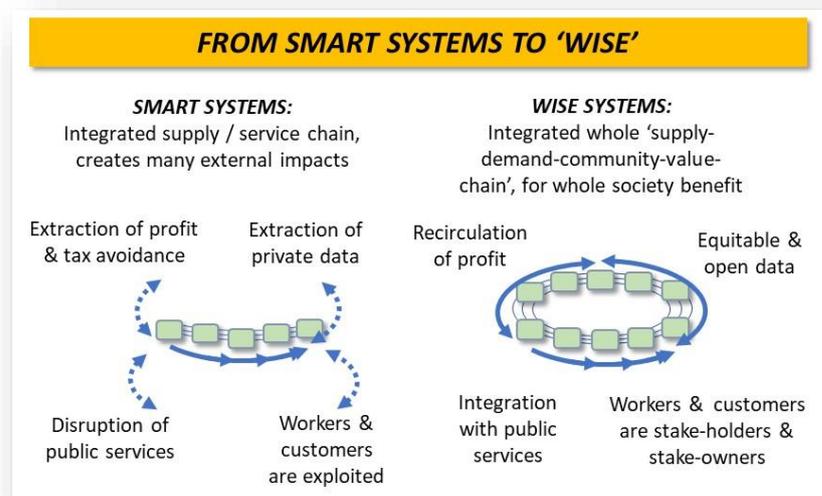
This was the over-arching question put to interviewees and workshop participants. Various responses included:

- Smart city = smart people
- Smart infrastructure = 24 hour water and electricity
- Dynamic change in the collective mind of the people
- Makes a real difference to quality of life
- Everyone is smart, we need a surrounding which helps us to be smarter
- It's all in the context
- A real sense of belonging,
- A comment on technology and people: if you put a villager in a lift s/he might not know what to do. For example we found that rural women could not use the new commode toilets. We need to fit the technology to the people, not the other way round...

As to the wise city, or the move 'from smart to wise',

- This was generally understood as a vision beyond smart, or responding to the problems which might come from smart or 'unsmart', or realizing the aspirations of smart.
- One conceptual framework is in the Annex. This is based on the framework of collective intelligence, which works 'wider, deeper and further' than the mainstream (Ravetz 2015, Ravetz & Miles 2016).

In terms of technology, the difference is visualized here. On the left side is a typical 'smart' system, with a high efficiency supply chain, (e.g. transport, housing, services of all kinds), but with little regard for its external impacts. On the right is a generalized 'wise' system, with benefits all around the wider 'value chain' for community and society. The challenge and question is then, which pathways can lead from 'smart to wise'?



Project Methods

Materials for this pilot project had three parts:

- Interviews
- Workshop
- Desk study

This is the basic questioning and reporting framework for the local inventory, the interviews and the workshop. The framework has two main types of questions: ‘actors’ and ‘factors’:

‘Actor mapping’: i.e. ‘who is involved?’ & who gets positive or negative effects?

- Owners / sponsors / investors in the new smart business / service models?
- Stakeholders on the supply side – workers, managers, suppliers
- Stakeholders on the demand side – users, customers, distributors
- Stakeholders in the wider community

‘Factor mapping’: i.e. ‘how does the case study work?’ what side-effects, positive or negative?

- Smart technologies which are used or developed?
- Data which is managed or generated?
- Smart business models or service models, which are enabled?

In the summary tables, for each of these we look at ‘smart city’ effects: ‘unsmart’ side effects or likely risks: and the ‘smart-wise’ opportunities. More on the framework is in the Annex.

Stakeholders

Various actors and stakeholders were selected for interview and as invited workshop participants. As on the list in the Annex, they included:

- Policy makers & politicians
- Smart city business managers
- Consultants & intermediaries
- SPV and other agencies
- Urban infrastructures e.g. energy, water, transport, waste
- Digital & technology firms & enterprises
- Major businesses, e.g. construction
- NGOs and Civil Society Organizations
- Representatives of grass roots, citizens organizations, informal sectors.
- Academics, education, etc

Case Study Applications

The following case studies were identified, as relevant to the smart-wise city questions. Most are also suitable for comparison with UK / EU smart city studies.

- Bhubaneswar city centre – (900 acre redevelopment area under smart city agenda): (i.e. how does the national policy translate to city level.) including informal sectors & slum areas.
- Solid waste management: (comparison to UK / EU waste systems)
- Slum renewal, livelihoods, and the informal sector: (experiments in progress)
- Housing and building permits: (various online systems)
- Economic development and livelihood: (experiments in progress)
- Culture / heritage / tourism / leisure: (rapidly going online)

- Open governance and participation: e.g. Citizen Connect or MyGov platform – visioning cities & smart systems, with citizen participation:

2) BACKGROUND

BHUBANESWAR SMART CITY

The Bhubaneswar Smart City (BSC) proposal was put together in just 3 months, in a national competition, with sponsorship from the Bloomberg Foundation. About 32% of the Bhubaneswar population took part in a ‘participation pyramid’, with a focus on ‘pride’ and ‘ownership’.

The bid document coordinated by IBI Consulting aimed at accessible, colourful communications on complex issues. The overall vision includes 5 main themes:

- *“Transit oriented city with a compact urban form that promotes active, connected and sustainable mobility choices*
- *Liveable city providing diverse range of housing, educational and recreational opportunities; while enhancing its heritage, arts and traditional communities*
- *Child-friendly city providing accessible, safe, inclusive and vibrant public places*
- *Eco-city co-existing in harmony with nature for nurturing a resilient, clean, green, and healthy environment*
- *Regional economic centre attracting knowledge based enterprises and sustainable tourism activities by leveraging and empowering its institutions, local businesses and informal workforce”*

The technology implementation by the main contractor Honeywell, includes a common payment card, master system integration, optical fibre network and various systems.

The Area Based Development (ABD) in the city centre actually uses the majority of the public funding, in order to improve and make available development land. Meanwhile the city-wide systems are in the order of \$50 million over 5 years.

The context is the state and regional role of Bhubaneswar, a growing centre for ICT, tourism, higher education (building on the established economy of Odisha in minerals, forestry and agriculture. In this way advantages came up, e.g. when Infosys was blocked from expanding in Kolkata, it established in the Bhubaneswar IT Park.

ISSUES & QUESTIONS

Some critical and operational questions were discussed with interviewees, in particular from IBI Group, Honeywell and BSC. Here are some key questions and responses:

Is the BSC about technology and growth, or about social inclusion?

- The social inclusion program was highlighted and possibly won Bhubaneswar the bid.
- BSC use the term ‘socially smart’, with a focus on public space, low income housing, small enterprises.
- ‘Citizens Connect’ with 32% participation, includes the principles for “Inform: consult: involve: collaborate: empower”

Is the SPV opaque and bypassing democratic accountability?

- The SPV is a partnership with majority representation of the public sector (Government of Odisha & BDA).
- There is a BSC Board, with representatives of each ward in the city.
- The SPV model is seen as more efficient in operational / financial terms
- new technology needs private sector expertise, as there is little capacity in the public sector.

Can we manage the social impacts / possible risks of smart technology?

- The social impacts of smart technology will be monitored, but there is little understanding on this.
- The example came up of predictive police and security, i.e. arresting potential criminals before the crime.
- It appeared that the technology contractors would refer such questions to the BMC, while for the BMC it would be a expert technology question.
- Other impacts on informal economies, existing social divisions, potential corruption in public services etc: as yet, there is little research on the potential risks and vulnerabilities.

Can we manage the economic impacts of smart technology?

- Examples such as Uber show the risks of disruption (e.g. recent strikes), in a sector which is mainly informal so far.
- There is clearly a need for a step change in urban transport & other systems; e.g. 500 new buses will be supplied over 5 years, they will be much more efficient with smart operation via the ICOMC.

Is the data of citizens secure and could it be misused?

- the general security framework is in the ICOMC protocols
- this will cover systems for traffic, parking, plug in services, city services, emergency & incident management.
- there will be emerging business opportunities in access to data, which must be managed carefully.
- Possibly there are greater risks in the growth of social media and social networks, which are prone to misuse and abuse by commercial operators or political parties. As yet there are no national policies to deal with this.

Will the physical infrastructure be built in time for the smart systems to run it?

- For infrastructure, there are other funds both public and private, with a 10 year program of implementation.

Is the BSC likely to favour the digital-enabled 'haves' over 'have-nots'?

- One of the highlights and winning features of the BSC is the focus on public participation, (e.g. Citizen Connect), ICT skills, and contribution to social inclusion policies.
- There is a program of future support of digital entrepreneurs (not yet running)

Could the area based development lead to gentrification?

- There is a priority for low income groups, e.g. the 6000 slum dwellers in the area will be rehoused locally.
- The 'Complete Streets' program aims for public space and shared road space.
- There is a street vendor improvement program, including dialogue with representatives. There is a pilot program of new vendor kiosks on Janpath.

What will be the follow up after the 10 year program?

- BSC will continue to run development contracts and maintain the smart systems
- We expect further developments in smart city systems will emerge

Is the BSC a vehicle for neo-liberal privatization of public services?

- BSC sees the public & private sectors each have something to offer in these newly emerging systems, and they look for cooperation on that basis.

What kind of problems are experienced so far?

- There are 100+ staff in BSC, but high calibre staff are hard to attract and retain, outside the major cities
- Consultants have a similar issue, with key managers flying in & out once a month or so.
- General capacity problems in delivery of complex infrastructure, into the Indian context
- E.g. the child-friendly parks program struggled to find new types of play equipment suitable for the local climate.
- Generally there are various local skills in short supply, e.g. ICT, infrastructure, urban planning & management (with credit to XIMB for their new masters program)
- Strong competition from other cities, e.g. Bhopal as 'best for doing business'.

OVERVIEW AND CRITIQUE

Clearly the Indian SC Mission is a large scale experiment, with outcomes yet to emerge, in a fast changing situation of urban transformation. The BSC appears to be a leading example with many positive features, from which others can learn. With the program just in its second year it is too soon to draw firm conclusions. However some key issues come up for critique and debate:

- There is a political economy transition in progress. This is not quite full privatization, more like 'para-statalization'. While in a partnership status, this sees effective control and management of public infrastructure and services, one or more steps removed from the public sector with direct democratic accountability.
- The advanced technology required for such systems is globally sourced, and run by globalized professionals, with the added risk of bypassing local capacity and entrepreneurship.
- The aims of the BSC and similar for social inclusion, participation, public space improvements etc, are positive, but could be vulnerable to unplanned effects on polarization, data misuse etc.
- This is a key issue in a political climate of religious nationalism which appears to be determined to control free debate, and which favours social engineering towards a 'pure' Hindu nation.
- There is a topical role for active debate on all these issues. Such a programme would aim to link citizens with experts with political and business actors, taking a Foresight-type approach to future projections, capacity building and strategic planning.

(some of these issues are illustrated in this extract from the BSC presentation document: a clean and green globalized architects' image, in which traditional informality, local culture and social structures are not really visible.)



Background: the Indian National Smart City Mission

The India National Smart Cities Mission is the context and starting point for this project. The background includes:

- There is a significant expectation that ‘smart cities’ will deliver the urban transformation urgently needed in India. Note that ‘smart cities’ in India is a very broad concept (in contrast to the UK/EU where much urban development is already in place, and there is a greater focus on digital systems).
- However there is growing criticism that smart cities too easily promote the interests of the elite and the ‘haves’ at the expense of the ‘have-nots’
- In particular the informal sectors can benefit from new technologies, but they are also at risk of rapid change and disruption.
- There is a need for new ‘general purpose technology’ digital platforms to enable new apps for informal sectors. e.g. slum mapping will then enable a host of social & economic initiatives
- For the hardware, basic wifi access is still patchy, although mobile coverage increases very rapidly.
- So, there is an important & urgent proposition to be made to national smart city policy, for ‘**Smart-Wise Inclusive Cities**’. This project aims to contribute some real evidence and analysis to that case.

Clearly India is an important case in the global picture of urban transformation: as summarized in this shortlist of key issues in an Indian society of rapid flux (Roy, 2016):

- Rapid social & cultural change, unemployment of young people
- Urban sprawl & ‘socio-economic sprawl’ & massive infrastructure gaps
- New urban segregation & gentrification & bypassing or displacement
- Destruction of urban / peri-urban ecosystems & services, with growing vulnerability
- Rural depopulation, aided by ecosystems destruction & climate change
- Problematic governance, corruption, nepotism, informality, social exclusion,
- Nationalist political context which tends to demonize minorities and freedom of thought
- rapid spread of mobile smart-tech & data-systems, with disruption to traditional livelihoods & social structures.

In the UK / EU / developed world, there are also many smart city initiatives. These also tend to assume that new high technology will bring answers to long -running and structural urban problems. The smart-wise city

approach questions this, and aims to provide alternative solutions, more inclusive of the social side, and more holistic integration between different parts of the community.

Also, the EU Green Digital Charter provides a point of reference (<http://www.greendigitalcharter.eu/>). The GDC includes for guidance and self-assessment tools with a community of users. We propose to use the relevant parts of this, to help structure the research reporting and the follow-on activities. In future the European GDC hopes to collaborate and reach out to partners in India & elsewhere in the majority world.

Smart City Global Perspective

The global urban transformation is seen in India as elsewhere, as both expansion, restructuring, innovation and transition: social, technological, economic, environmental, political and cultural. India has particularly issues with informality and corruption, ethnic and caste divisions, gender issues, rural migration, infrastructure and productivity gaps, and the remains of mass poverty,

The economic growth agenda points towards a deregulated economy with a shrinking welfare system. Urban and peri-urban growth points towards high-value enclaves and the bypassing / displacement of vulnerable communities. As inequalities rise, urban governance tries to balance the social impacts of economic growth, and run public services to do 'more with less'.

Meanwhile the smart technology agenda, as seen with the rise Uber / AirBnB etc, is towards functional innovation with rapid disruption: this can accelerate growth, but also widen the gaps on the social inclusion axis. The smart-tech wave of mobile / social media and universal digitization is changing the structures and foundations of governance and society, but with scarce evidence so far on the effects or risks or opportunities.

The urban transformation pathway 'from smart to wise', is one way to frame the need and potential. This explores the potential for a shift, from a technology-driven 'smart' pathway, towards a more societal 'wise' pathway. This is defined as one which is socially responsive, sustainable, and inclusive under conditions of growth or change. In this, urban systems are actively steered towards societal benefit, for instance in urban planning, energy / water infrastructure, housing systems, social care, skills development or social enterprise.

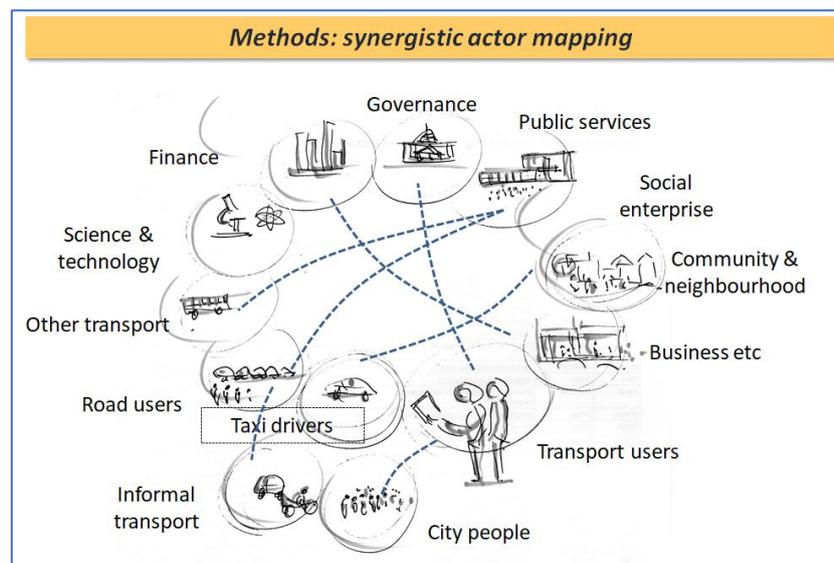
3) OVERVIEW OF THE PILOT PROGRAM

In the following sections we look at 6 key sectors: waste management, housing, slum renewal, economic development, cultural heritage, and the participation-technology interface.

In each sector report there is a common format:

- Key issues for smart people, smart cities and smart technologies
- Workshop findings, with the poster, as of 21st March
- Interview findings from the consultation.
- Summary analytic table for the 'smart / un-smart / smart-wise' agendas
- Summary diagrams of smart-wise 'actors and factors'

For the summary diagrams, the method of mapping is explained more in the Annex. This example shows the general approach: visualization of all relevant actors or factors, and then exploring the relations between, whether positive or negative.



There would be many more sectors which deserve research on a longer program. The selection here should be enough for an initial outline of issues and ways forward. They also should demonstrate the method, with lessons for the follow up, both in India and elsewhere.

4) WASTE & RESOURCE MANAGEMENT

The BSC Plan includes a concentrated improvement of waste management services, moving from 80% coverage to 100%. There is now coordinated door to door collection, supported by a fleet of compactor lorries. Various non-profit and private enterprises are involved, such as Jagrahti (see interview below), contracting their services to BMC. At present there is no formal recycling. There are plans to divert from landfill into an energy recovery plant. However the long term goal of a circular economy is still a long way off.

AGENDAS

The overall agenda for the solid waste management is on several levels:

- Efficient waste collection and management with 100% coverage
- Future move towards a circular economy

'Smart Social'

- Citizens and households are an integral part of the management system
- Education and awareness could be improved, so that school and college students are better informed.

'Smart urban'

- Public spaces in the city are better than many cities, but need a clean-up as soon as possible.
- There is great potential for economic development and new business markets, in a more circular economy of low-zero waste with 'reduce, re-use, recycle'.

'Smart digital'

- New technology has great potential, in management of waste collection, re-use of products, separation and recycling, payment or cost recovery.

WORKSHOP RESULTS

A range of problems was discussed, as on the poster below.

- Lack of human responsibility
- No separation or recycling
- Lack of government enforcement
- Products & food with large amounts of packaging

'Wise' solutions were aimed at the social side, as much as technical.

- Public credits as social incentives for responsible waste management
- Schools programs to educate children on resource management
- One-stop online system for reporting, tracking, payment.
- Industrial & commercial waste online platform for 'industrial symbiosis'.

Long-term questions & challenges:

- How to best use smart technology for a circular economy system?
- Could the rag-pickers use smart tech to play a part in a future smart-wise system?



TECHNICAL ISSUES

In the sector there are many types and sources and management levels for solid waste, e.g.

- Waste categories include: mixed / organic / packaging / plastic / paper / glass / metal / specialist
- Waste sources include: households / businesses / large industry / minerals / agriculture
- Waste routes include the 'hierarchy': reduce / re-use / recycle / recover / landfill
- Waste collection methods are advancing all the time, some more resource intensive
- Waste cost recovery also shows a great variety around the world.

INTERVIEW RESULTS

Jagruiti is a leading non-profit business which now covers 28 wards out of 67 in the BMC area, with an average of 50 workers in each ward. It was established in 2005, a time with many strikes and disputes, and outsourcing was seen as a way forward. Jagruiti now operates a fleet of compactor / dump pressure lorries with GPS and smart tracking. However for management of rotas and routes, experience found that managing a quota of diesel per driver was more effective, than hi-tech GPS tracking. Jagruiti also operates drain & toilet cleaning, road sweepers, bush cutting etc, mainly with traditional low-tech tools.

Household waste collection is in the morning, commercial in the afternoons. There is good contact with households, each worker works door to door, with a set number of streets. However the household culture does not extend to separation at source.

Innovations for town centres are in the pipeline: e.g. large waste containers in the ground, to be lifted by lorry, with smart sensors linked to the central ICOMC. Similar schemes are in consideration for education, health and large commercial zones. Overall there are questions arising:

- Access to slum areas is difficult by waste lorry and requires participation of slum dwellers
- At present separation and recycling is virtually zero, and all waste goes to landfill.

- The system works well in the urban area, but peri-urban and rural areas are not well served.
- Waste volumes are increasing with packaging of almost all retail goods.
- The role of traditional rag-pickers in a newly mechanized system is not yet clear, and possible opportunities might be lost.

ANALYSIS & SUMMARY

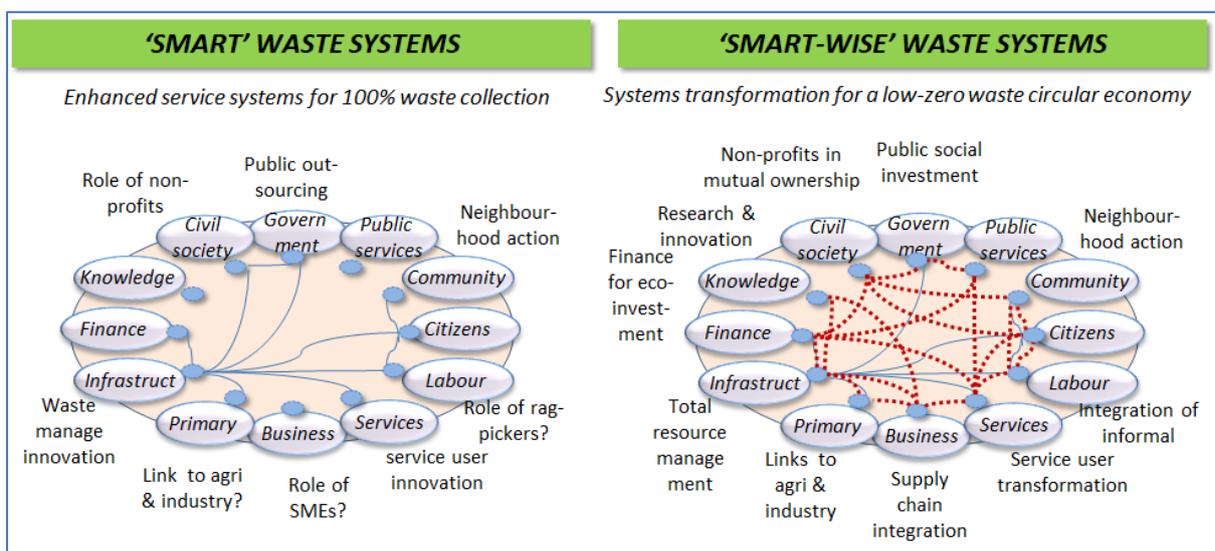
Table 4.1: summary of smart-wise waste & resource management

Focus on Jagruti example	'SMART' - Opportunities, benefits	'UN-SMART' - Problems, risks, impacts	'SMART-WISE' – synergies & pathways
General situation, issues, challenges:	Progress towards 100% household collection	Most waste still goes to landfill	Goals for a low-zero waste circular economy:
ACTORS: who is involved?			
Policy-makers	Streamlined & targeted waste services, public cost savings, open markets	Tech may replace personal services	Integrate waste with total materials management
Supply side: – workers, managers, providers, sponsors / investors	Smart collection schedules, workers know households. Open tendering enables investment & innovation	Rag-pickers may lose their livelihood (e.g. 100,000 in Kolkata)	Integrate rag-pickers into data-enabled circular materials management
Demand side: users, customers	Households are informed on service providers	Little incentive to separate / recycle / clean-up	Platforms for re-use & recycling
Wider community	Cost savings, environmental clean-up	Waste management is not yet in the culture of most households or organizations. Waste / litter is everywhere	Digital-enhanced education & outreach programs: mapping of hotspots: SME systems
FACTORS: how does it work?			
New technologies which are used or developed?	CCTV monitors can identify illegal waste dumping	New opportunities for avoidance, dumping etc	Smart sensors & open platforms link with retail, SMEs, public services etc
Data which is managed or generated?	IEC can send texts for warning, info, fines.	Who holds household data & could it be misused?	Public / open data systems on material management
New business models or service models?	Opportunities for NGO & social providers.	Waste efficiency may crowd out reduction & re-use	Municipal credits for recycling: Online order & payment: Integrated packaging return systems circular business models.
New social & community benefits	Smart waste collection improves QOL.	Could smart systems bypass human systems?	Education & school work 'Freecycle' social exchange systems.

SYNERGISTIC MAPPING

The mapping below shows two contrasting views on the waste management system, compiled from the findings and summary table above:

- On the left, the current development in 'smart' waste collection, with non-profits leading service innovation, some digital systems, but basically to improve to 100% coverage a system of collection and landfill disposal.
- On the right, an outline of a more connected and synergistic '*Systems transformation for a low-zero waste circular economy*'. To achieve this goal is not only a local issue as it depends on supply chains and logistics / packaging from national or global sources. However a local initiative can be a catalyst for wider progress.
- In this, the digital systems can work strategically, to enhance the human systems, at different points on the supply chain / value chain: primary resources, manufacturing, logistics, packaging, households etc.



5) HOUSING & PLANNING

(This is a brief summary of housing and planning issues, covered in less detail than the other sectors: in the workshop, housing was covered alongside others as below.)

HOUSING

The housing mission has an ambitious aim, that in Odisha 100% of the population will be housed in secure dwellings. The shortfall at present is around 6.7 lakh dwellings of which 15% will be fully public housing, located in 113 public bodies. There was a comprehensive demand survey, commissioned by public tender.

Slum dwellers are assisted in a rolling program which aims at the choice to rent new housing in the existing locations. In terms of design, 4 storey housing is provided without lift, or up to 10 floors with a lift provision. There is a priority for the physically challenged.

In terms of policy, maintaining local livelihoods is a priority. However the full integration of housing sites with services, employment and infrastructure, is the responsibility of the BMC planners.

In terms of smart systems, the online approval and geotagging is very helpful. For example, with the beneficiary led construction, (kitchen /wc and 2 rooms), the foundation and plinth stage is geotagged, with approval and subsidy ready in a matter of days. The grant is then extended as each floor is completed. The scheme is targeted at lower income groups (R1.8 lakh / year): and also at women, who have full property rights. There is a pipeline and incentives for rapid construction.

(Information note: the Indian national public housing / subsidy policy has 4 main tracks:

- 'Land as a resource': private sector
- Affordable housing in partnership: parastatals
- Beneficiary led construction: assistance for individual self-build up to 300 ft²
- Credit linked subsidy for local public housing.

'Smart Social'

- Citizen participation in the design and location choices:

'Smart urban'

- Direct Benefit System is online with geo-mapping, and results in 2-day payments

'Smart digital'

- New apps and platforms are emerging rapidly. Current estimates are for around 20% of the population to have the technology to use these.
- The Aardhar online identity system is likely to change rapidly the situation for rural and migrant workers, in the informal economy and with informal land or housing rights.

Challenges:

- Land rights for the 6 lakh of slum dwellers is a long-running issue:
- Rental houses for floating or migrant populations:
- Centre for Homeless is in the BSC scheme, but not yet clear how this will work.

URBAN PLANNING ISSUES

Urban planning in Bhubaneswar works on the Town Planning Scheme (TPS). A masterplan is generalized and sketchy: the details are filled in, often following development, where major landowners prepare sites years in advance.

Land pooling is a common way to assemble development land. Farmers or landholders are plotted lines within new development area: 70-80% have to agree.

Some typical challenges:

- Lack of strategic coordination between BMC and the surrounding Districts, who will benefit financially from development on the fringe. Services and infrastructure are then difficult to provide. The districts are prone to political party influence on development permissions.
- Building regulations seem to be unclear, and the low-income housing proportion varies from 30% to 15% on high value land
- For major public works the SPV model is widely perceived to be outside of democratic control.
- For the BSC, 90% of the public funding is going into the ABD, which raises the possibility of major windfall gains by landowners.

The smart systems for development permits appear to work well: however there is concern that a more open and dynamic development market could accelerate urban sprawl, gentrification and segregation.

The new Mobi bikes are one example of a smart city infrastructure. There are concerns on safety and sharing of roadspace, and there may be a lack of cycling culture in that climate. Possibly the cycling to school route will be the best way to get started.

Another possible clash of new and old is in the reorganization of roadspace: soon there will be smart systems of traffic control, CCTV monitoring, segregation of uses etc, and these could have a large effect on the informality structures of shared space. The lack of physical infrastructure such as white line road markings, in many locations could be a problem for the new smart control systems.

As to a 'smart-wise' city pathway, there are emerging possibilities:

- Enhanced public participation in planning, as in the following sections:
- Smart self-organized renewal of existing settlements and facilities: e.g. the street vendor case above.

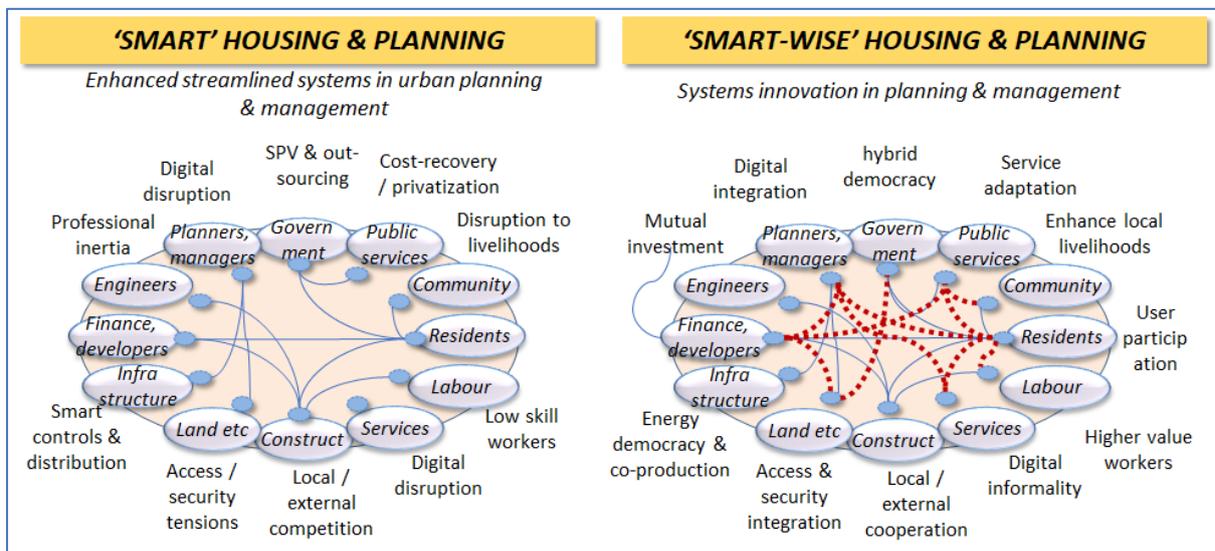
ANALYSIS & SUMMARY

Table 5.1: summary of smart-wise housing & planning

	'SMART' - Opportunities, benefits	'UN-SMART' - Problems, risks, impacts	'SMART-WISE' – synergies & pathways
General situation, issues, challenges:	Housing units to be provided at quantity and speed	Displacement of social communities & economic livelihoods?	Integration of new & old
ACTORS: who is involved?			
Policy-makers	Housing subsidies, regulation & construction systems going online	Online systems may encourage urban sprawl in the peri urban	Peri-urban areas could be fully integrated for markets, services, infrastructure etc
Supply side: – workers, managers, providers, sponsors / investors	Most construction is low-tech and labour intensive	Smart tech-intensive construction could displace many low skill jobs?	Look for ways to connect high-tech efficiency with traditional craftsmanship.
Demand side: users, customers	Platforms for sales, rentals; management: AirBNB as game-changer	New possibilities for speculation, market manipulation?	Integrate AirBNB with community livelihood & housing systems
Wider community	Housing systems part of a wider smart community	One-off projects may be not integrated, possibly increasing social divisions	'smart-wise' urban planning with technical integration and citizen participation
FACTORS: how does it work?			
New technologies which are used or developed?	Geomapping tools are used for permissions & subsidies	(Problems are yet to emerge)	Potential for IOT in housing management & investment
Data which is managed or generated?	Housing data useful for services & infrastructure	Housing value data can accelerate gentrification & segregation	Potential for data integration on housing provision, social & economic needs & activities, with urban policies
New business models or service models?	New intermediaries in housing market	Risk of speculation via new intermediaries	Potential for new models of housing provision or land assembly as above.

SYNERGISTIC MAPPING

The synergistic mapping below shows the actors / stakeholders who are involved in housing and planning. This is a generalized map compiled from the findings and summary table above:



- On the left, a smart digital-enabled housing and planning system: there are great improvements in efficiency, and increased provision, but also many possible gaps. These include the integration of new development, the tensions / competition between urban and peri-urban districts, the role of private landowners and building contractors.
- On the right, the new links show how at least some of these gaps could be filled, as listed in the table above.

6) SLUM RENEWAL & LIVELIHOOD

Around 36% of the population of Bhubaneswar lives in slum areas, i.e. around 355,000 people. There is long experience of policy and management in working with slum dwellers to improve or relocate. This case study included consultations with the Kargil community, the Kargil Urban Micro Business Centre, and a follow up workshop group. Some key questions arise:

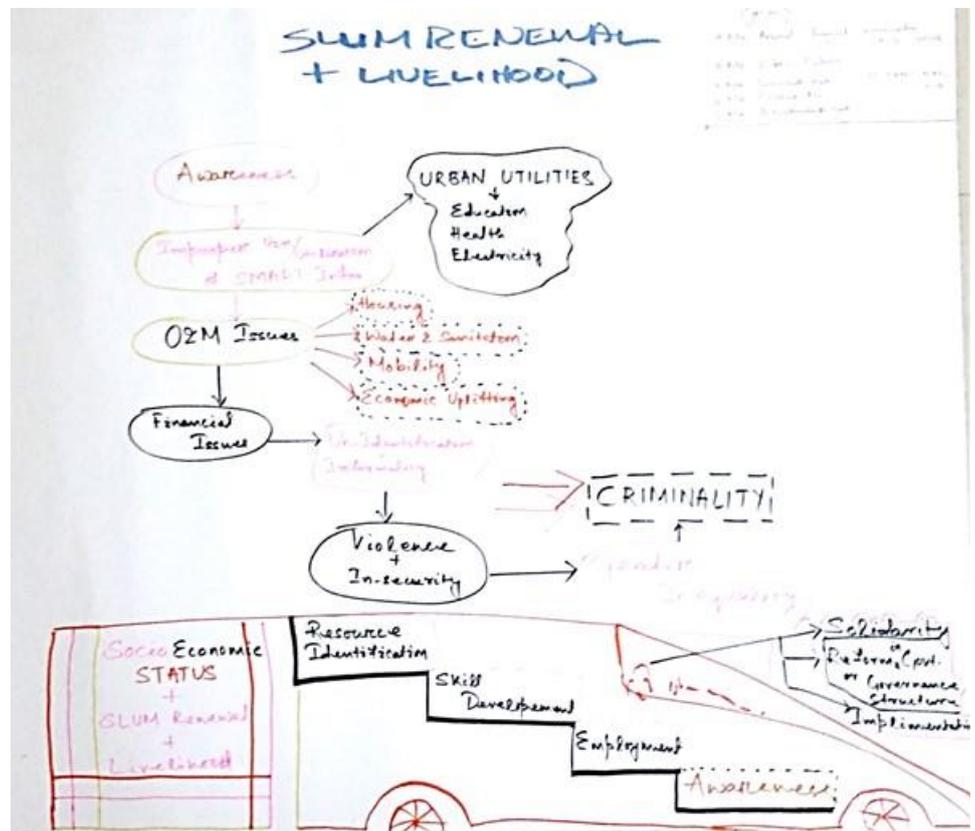
- 'Smart city' means in this case, firstly, a city which can provide secure shelter for all residents.
- Smart technology may help to deliver this goal with improved efficiency.
- However slum dwellers are more likely to live and work informally, with risks of smart disruption.
- Overall, 'smart' or 'wise' was seen to revolve around 'smart people' – what this means can be discussed -

'Smart people'

- Capacity building & livelihood approach
- Gender & inter-generational inclusion
- How to integrate the informal?

'Smart urban'

- Appropriate infrastructure for low income groups.
- Integrating slum renewal to urban form & pattern.
- The Kargil area is also the site of a prototype 'water ATM' which delivers high quality low cost water, with online card payments, with smart sensors for water management.



'Smart technology'

- Local economy platforms?
- Capacity building apps & platforms?
- New forms of slum self-organization?

WORKSHOP FINDINGS

The discussion and the poster here, raised some open questions and challenges:

- Smart systems can increase efficiency in housing, water & sanitation, transport and education.
- However there may be a growing digital divide, with gaps between IT-literates and others (generally older, more rural, less educated).
- Risk of smart systems abuse or 'improper use', extending the informal / criminal economy to the manipulation of apps and platforms.
- There is a possibility of new types of 'smart criminality', feeding off violence and insecurity, increasing gender and caste inequality, taking advantage of smart city systems.

In response, the 'smart livelihood' agenda must bring together -

- Resource identification, i.e. community assets, capabilities
- Skills development, both formal and informal
- Employment and entrepreneurial awareness
- Social solidarity and mutual aid platforms
- Government reform and mobilization for positive action.

ECONOMY AND LIVELIHOOD

This theme ranges far and wide, and the workshop discussion illustrated could only open the door on this.

Here we draw on the discussion on the political economy of economic growth, as in Sen et al (2014). This analyses economic development as an institutional space for 'deals', i.e. extended exchanges, investments, collaborations etc. This can be mapped as various combinations of 'ordered' and 'disordered' deals: and 'open' and 'closed' deals (Table 7.1)

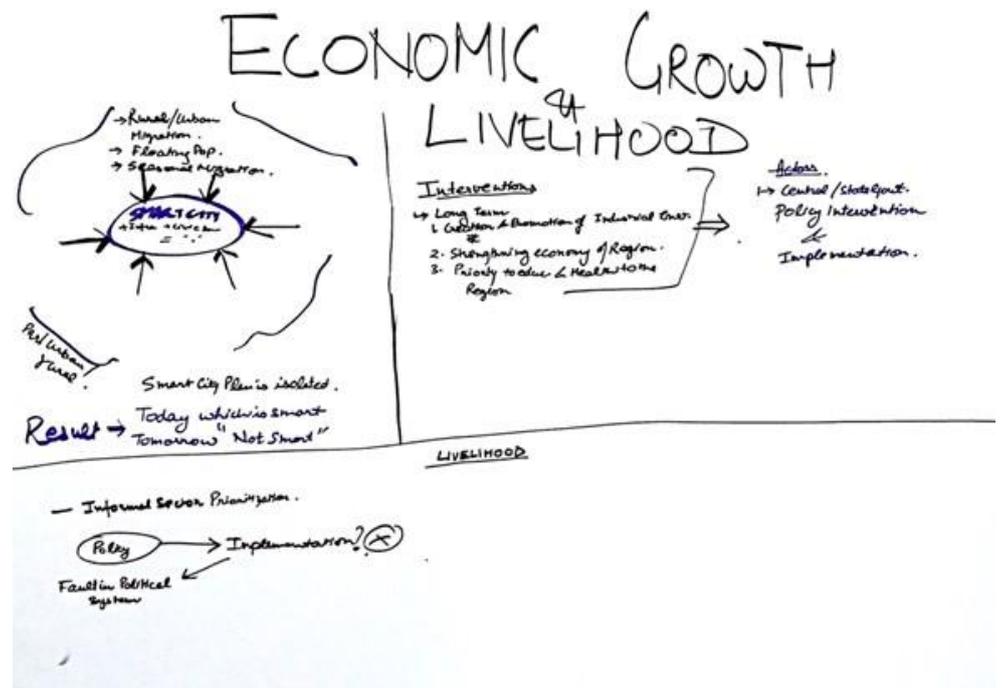


Table 6.1: framework for political economic development (Sen et al 2014).

		Closed deals	Open deals
Kickstarting growth VVV	Disordered deals	Only those with political connections can make deals, and even they cannot be certain that officials will deliver.	Anyone can make a deal, but no-one is certain that officials will deliver.
	Ordered deals	Only those with political connections can make deals, but they can be confident that officials will deliver	Anyone can make a deal, and they can be certain that officials will deliver.
	Maintaining growth>>		

There are profound implications for the smart transition and the potential for ‘smart-wise’ economic systems.

Smart platform technologies for markets, skills, contracts, geo-locational services etc, change the game from closed towards open deals. With enhanced ‘mutual information’ between sellers and buyers, or contractors and clients, there is greater transparency. This also moves from disordered to ordered types. However it is equally possible that system effects emerge, such as the manipulation of service rating sites, the speculation on trading platforms, or the expropriation of citizen data or user data, for covert business opportunities. Further research is needed to explore such multiple effects.

INTERVIEW FINDINGS

The Kargil Urban Micro Business Centre is a pioneering attempt to enable secure livelihoods and capacity building for local slum dwellers. The land is on loan from the Government of Odisha, with partnership funding via a SPV partnership with BMC and Centurion University. It is now approaching the end of a 5 year program, with the Director on secondment from Centurion. The site is the location for around 12 businesses including catering, textiles, early years education, light manufacturing, digital and ICT skills. The organization provides training, capacity building, supply chain linkages, employment opportunities etc. The surrounding area of Kargil has mainly self-organized basic water and electricity infrastructure, and many residents are employed, however there is continued lack of security and vulnerability.

On the face the Business Centre seems to be an ideal model, however, there are major challenges, financial and institutional. Attempts to find a subsidy from BMC were abandoned due to bureaucratic hurdles. Managing the centre is expensive, and there is no direct way to recoup costs: and so its continuation after the 5 year program may be in doubt. The most successful graduates tend to move on, and the centre has to start right at the beginning with new recruits. All this is similar to countless attempts at local economic development and capacity building, in the UK and around the world, and some wider lessons may be relevant here.

Discussion raised potentials and opportunities for the near future, to connect smart city thinking with the practical reality of community development and social livelihoods.

- Smart city platforms could enable a more effective market place for skills, services, supply chains, and particularly public procurement.

- Smart city profiling and valuation could help in closing the virtuous circle of forward investment for future return, both financial and social, so ensuring the future of this and similar Centres.
- However, the impact of platform systems such as transport, has only just started, and the near future is quite unknown.
- If micro-finance is seen as a viable way forward, then smart platforms and blockchain distributed ledger systems might be transformative in this sector.
- The best response might be to focus on capacity building for ‘smart people’, i.e. digitally enabled, mobile and entrepreneurial.

ANALYSIS & SUMMARY

This covers two main agendas: general slum renewal and livelihoods: and the Business Centre and similar models. The general prospects for slum renewal and urban pro-poor policy are widely researched, e.g. Mitlin (2014). This shows a growing awareness of the politics of informality and clientelism, not just as negative forces to be critiqued, but as the reality to be managed: and if possible, the starting point for new means of development and empowerment.

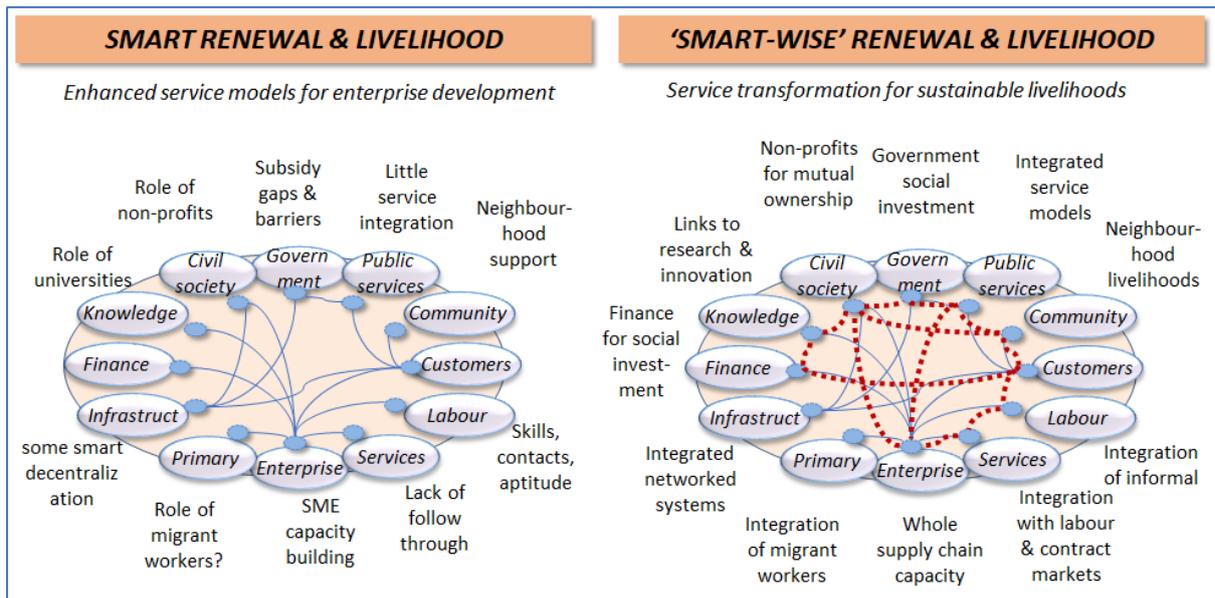
Table 6.2: summary of smart-wise renewal & livelihood

	‘SMART’ - Opportunities, benefits	‘UN-SMART’ - Problems, risks, impacts	‘SMART-WISE’ – synergies & pathways
General situation, issues, challenges:	Physical slum renewal can be much more efficient, and this can enable social / economic development	Disruption of informality, may bring criminal opportunities	Bring the informal economy & embedded resources into the smart-wise loop.
ACTORS: who is involved?			
Policy & governance	Smart systems for land management, infrastructure, construction etc	Risk of government by algorithm, excluding human dimensions	Slum settlement platforms for democratic / participative self-governance
Supply side: workers, managers, providers, sponsors / investors	Some online education and training and skills. Rapid advance in ICT skills & infrastructure.	Risk of digital divide and disruption of informality	Smart platforms for skills, resources, services, supply chains, and public procurement.
Demand side: users, customers	Online markets not yet running in slum area context	Smart online systems crowd out traditional / informal suppliers	Smart platforms for skills, services, supply chains, and public procurement.
Wider community	New prototypes emerging, e.g. water ATM	Risk of digital divide and disruption of informality	Integration of wider social & economic opportunities.
FACTORS: how does it work?			
New technologies which are used or developed?	e.g. the water ATM points to similar smart sensor concepts in other sectors	Smart slum infrastructure could reduce the pressure to upgrade or relocate	Integrated systems, self-organizing & adaptable to slum areas & also to improved areas.
Data which is managed or generated?	The national Aardhar online ID system may transform informality & slum areas	Inter-operable data could be used for social engineering & political manipulation of slum dwellers.	Open transparent & participative data management, as a resource for all.

SYNERGISTIC MAPPING

This diagram focuses on the case of the micro-business centre, its successes and problems so far with the contribution of smart systems or 'smart thinking': and then the potential for more integrated future development

- On the left, a stakeholder mapping of the micro-business system and process of capacity building, showing many of the gaps and barriers listed above.
- On the right, a sketch of a more integrated set of value chains, including:
- linking enterprise development with public procurement / contracting, with employment and skills platforms;
- linking public services with community livelihoods, with local labour / skills and enterprise development
- linking smart micro-finance with customers, local labour, community livelihoods.



7) CULTURAL HERITAGE

BACKGROUND:

Bhubaneswar is a temple city, situated in the 'Golden Triangle' with Puri and Konnack, a prime location for Indian and Odishya culture and heritage. In line for UNESCO status, the area hosts 1.9 million visitors and 24 major festivals per year. Tourism and heritage is a major part of the wider visitor economy, with bio-medical, corporate and higher education as major growth sectors. Several issues come up for discussion:

- What is the smart city role in improving the visitor / tourism experience?
- How best to integrate visitors/ tourists to the local economy and community?
- Can the smart city help to realize cultural heritage & creative arts in the community & society?

AGENDAS

The agendas for 'smart people, smart cities and smart technologies' are each emerging rapidly. However many of the religious sites and monuments, and social practices which surround them, are deeply traditional. It will be very topical, as to how far the digital can work alongside these traditional sites and embedded practices.

SMART PEOPLE +

- Social inclusion for heritage policy
- co-production for heritage management
- New channels for cultural livelihoods, e.g. life-story-book

SMART CITIES+

- Communications, way-finding,
- Integrating heritage to urban form

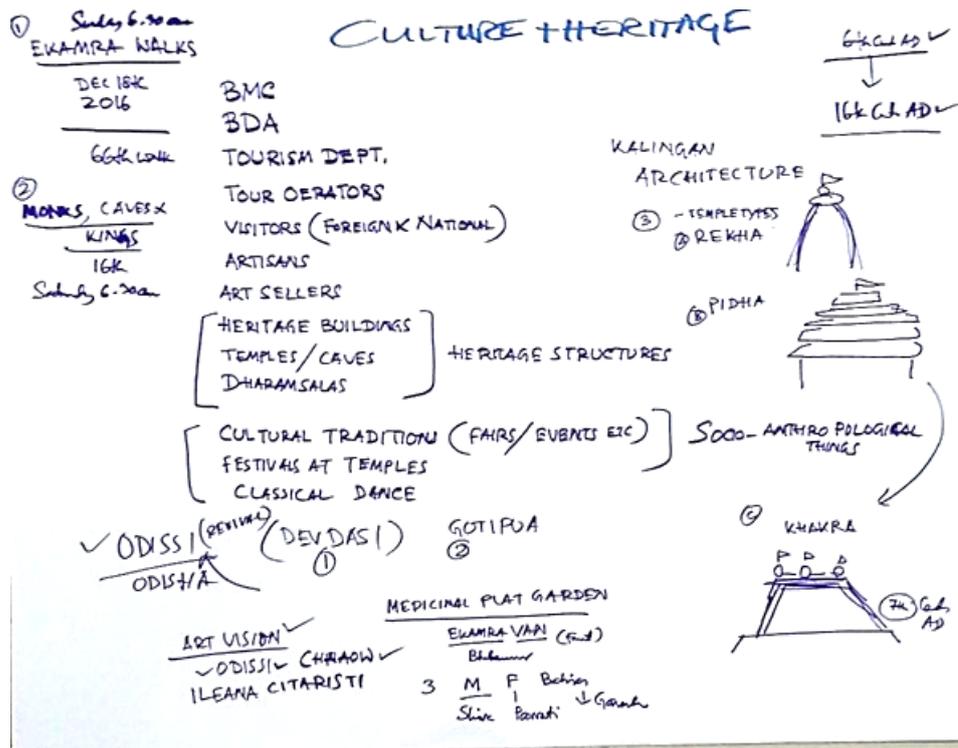
SMART TECHNOLOGY+

- Apps for education & awareness
- Eco-social tourism platform
- Heritage-related business:

WORKSHOP FINDINGS

The discussion took a wide ranging and holistic view of culture and heritage (C&H), not only as historic monuments and objects, but many kinds of events and festivals, designs and crafts, new creative media and social practices in the community. The directly involved 'actors' include culture / heritage enterprises, craft artisans, heritage managers etc. There is also a much wider set, such as: transport providers, catering and accommodation, retailers and distributors, education and public relations, publishing and web development, manufacturing and personal services.

At present the smart systems of online information / education, trading, booking, event management etc, are in the early stages, and not so well integrated. As they evolve, they could be targeted towards different types of visitors, such as cultural, corporate, higher education, lifestyle and so on. There are many examples and experiments overseas, with apps, platforms, smart heritage



curation and conservation, site or project management. One resource is in the EU programs which aim to demonstrate and apply such innovations.

These and others raise general questions:

- Could the smart digital enabled approach enhance the visitor experience, the management of cultural heritage and its place in the local economy and society?
- Could there be side effects in the digital-functional approach to culture and heritage, which in reality is deeply embedded in the community and society?
- What might be a smart-wise approach which takes these effects into account?

ANALYSIS

This table sums up the key differences between 'smart', 'un-smart', and a potential agenda for 'smart-wise' culture and heritage.

Table 7.1: summary of smart-wise cultural heritage

	'SMART' – emerging opportunities, benefits	'UN-SMART' - Problems, risks, impacts	'SMART-WISE' – synergies & pathways
General situation, issues, challenges:	The C&H sector is very traditional & smart systems could bring great benefits	Smart C&H could be a commodity & economic sector, bypassing social role	General aim for wise C&H to integrate efficiency with social & cultural roles
ACTORS: who is involved?			
Policy & governance	Smart C&H brings cost savings & service improvements	Smart C&H is a commodity & sector, bypassing its social roles & informal economy	Forward look to culture-responsive local economic strategy
Supply side: – workers, managers, providers, sponsors, investors	Online retail opportunities for business models & supply chains	smart C&H may lead to mechanization of older craft skills.	Wise systems integrate traditional with digital skills
Demand side: users, customers	integrated & professional services & products for users	smart C&H platforms could lead to monopoly providers	Enable open markets for large & small
Wider community	Smart C&H can enhance & mobilize the resources for wider access	side effects if smart C&H, disrupts traditional place in community and society	Platform-enabled eco-social tourism, with active local links,
FACTORS: how does it work?			
New technologies which are used or developed	New GPS apps for C&H interpretation	3D printing etc may replace or mechanize older craft skills.	Leading edge VR & 3D modelling for objects, landscapes etc, bring history to life
Data which is managed or generated	Integrated spatial data on C&H resources, for policy / management	Risk of disruption of informal, unrecognized, embedded C&H	Experiments in community heritage, citizens post material on a platform
New business models or service models?	Early stages of going online	Risk of mass commodity tourism which devalues local C&H	Potential for integrated place / product / service enterprises

8) OPEN GOVERNMENT & SOCIAL TECHNOLOGY

This section merges two workshop themes, i.e. 'participation and citizenship', and the 'technology and people'.

For citizenship there is a general challenge: lack of awareness of smart city potential, coupled with the inertia of existing systems. However there is also disruptive change coming from various directions – social, economic, and urban-rural.

There is a vision of social integration between low, medium and high income groups. This includes a special role for NGOs in supporting urban poor with livelihood initiatives.

There is also a special role for government, however there are many barriers and gaps between policy and practice. The smart city generally and the BSC here is seen with potential to overcome such barriers and gaps. However the smart governance systems may also help to divide, polarize and segregate different social groups, and displace the vital human qualities of citizenship.

AGENDAS

'Smart Social'

- The ultimate goal of a smart city is a community of people with mutual aid, respect, tolerance, redistribution etc. Online systems have to be targeted on this goal.

'Smart urban'

- An urban system with multi-level feedback is clearly more smart in functional terms. If such feedback is based on a wider community, deeper levels of value, and further horizons of cause-effect, then a 'wiser' collective intelligence can emerge.

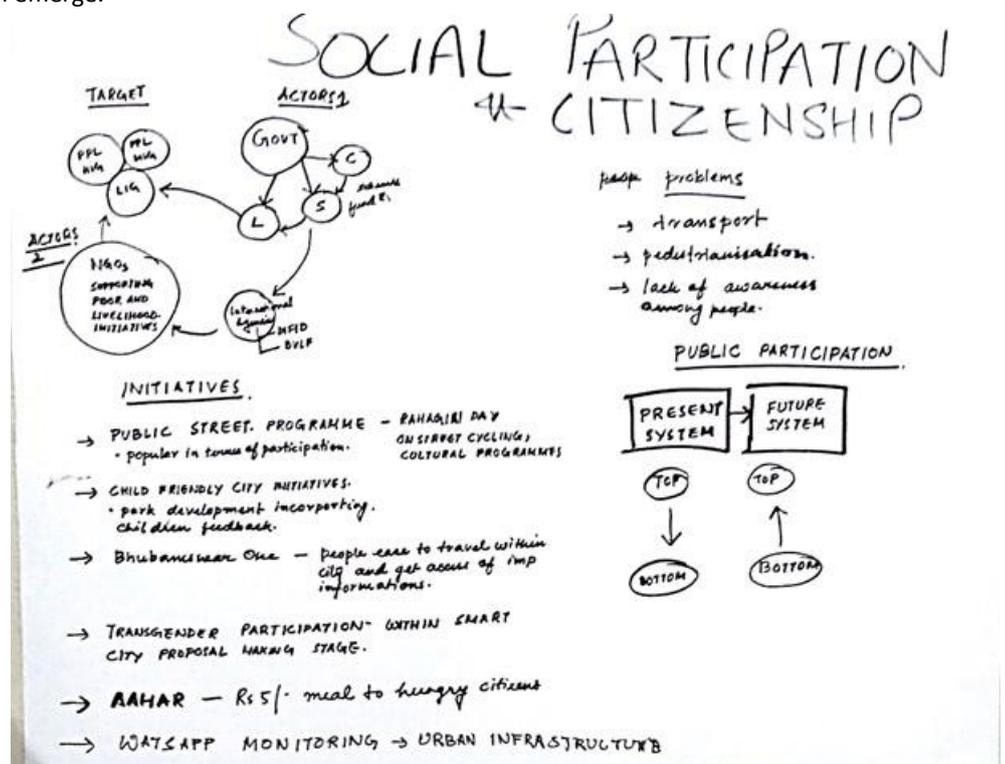
'Smart digital'

- Many experiments in online participation, citizen feedback, online platforms, social networks etc.

WORKSHOP FINDINGS

Overall there is an emerging agenda, from smart to wise forms of citizenship.

Potential initiatives, within the framework of BSC, which could mobilize and enhance:



- Public street program, e.g. Rahagiri day, with on-street cycling, cultural programs
- Child friendly city initiatives: parks development including children's feedback/
- Bhubaneswar One: integrated travel within the city, with access to information and improvements.
- Transgender participation, within BSC proposal making stage
- Aahar – including the Rs 5/ meal to hungry citizens
- Whatsapp monitoring of urban infrastructures.

TECHNOLOGY ISSUES

From consultation with the main systems contractor Honeywell, interesting issues emerged. Honeywell was working at national level 3-4 years ago, in collaboration with Tata, on a City Surveillance project. They bid for Bhubaneswar system contract, as one of 4 bidders. The national SCM followed on 'Digital India' which was 60% rural.

Smart in this context is taken as 'sustainable, measurable, actionable, responsive and targeted'. The design of a City Operations Centre was done with 99 cities in mind, with a budget of Rs 7 lakh crore (around \$15 billion). In Bhubaneswar the Honeywell role majors on transport. 650 km of optical fibre is being laid, which will provide complete public wifi, (only 1% of fibre capacity is used at present). Internet of things (IOT) is a global Strategic Alignment project, including data security protocols. For capacity building there is a digital entrepreneur program, with a \$100m fund for startups, based in Bangalore.

Crime and security systems are a major program, e.g. all 52 cities in Madhya Pradesh are covered, also the Kumbh Mela and similar large events. The discussion explored the huge challenges raised by 'predictive policing', as above: it seemed that Honeywell are the technology providers, BMC / BDA are the policy-makers, and there could be a very large gap between.

There is a parallel eGov stream, focused on digitizing government certificates and forms: in this and similar, BSC is the customer, representing BDA & BMC.

Overall the SPV coordinates with hard infrastructure as and when, but if progress falls behind this could be a challenge. The systems are designed as far as possible for open data, with a citizen portal for customer feedback, with 'how to help' facilities.

Table 8.1: summary of smart-wise digital government & participation

	'SMART' - Opportunities, benefits	'UN-SMART' - Problems, risks, impacts	'SMART-WISE' – synergies & pathways
General situation, issues, challenges:	Early days in the smart tech transition for government and participation.	risks in a changing citizen-government balance: can politics really be more open, or is the technology a cover for other forces?	Open smart-wise governance and 'strategic policy intelligence' has great potential to be worked out
ACTORS: who is involved?			
Policy-makers	Rapid efficiency gains are possible	Risk of government by algorithm, widening the digital divide.	Integrated governance-citizenship systems
Supply side: workers, managers, providers, sponsors / investors	Public service providers also gain efficiency	Risk of disruption of low-skill labour, existing informality	providers include for livelihood of all stakeholders, with social / mutual ownership
Demand side: users, customers	Public service users have info, access, common payment systems, all increasing participation.	Risk of online systems which debase or bypass social mutual aid & reciprocity	Users / customers may integrated smart tech with smart community
Wider community	Citizenship should be enhanced by level access to online platforms	Risk of data capture or system manipulation by political or factional interests	Digital literacy and smart social inclusion: technology at the service of the people
FACTORS: what works?			
New technologies which are used or developed?	Smart sensors may enhance social involvement & sense of commitment	Smart technology may displace common human interactions	
Data which is managed or generated?	Open public data can enable a community of data users and analysts	Data is open to theft, sabotage, misuse or cyber-crime of many kinds.	
New business models or service models?	Open public data can enable new social enterprise models, e.g. slum dweller livelihoods	New platform business models e.g. Uber, can disrupt, displace and avoid taxes or social commitments.	

9) COMPARISON: SMART CITY / GREEN CITY

EXPERIENCE FROM RAJARHAT

Rajarhat is a fast-growing planned satellite city, information technology and residential hub, developed on the north-eastern fringes of Kolkata. It consists of a 7000 acre area including the former villages Rajarhat and Bhangar, with former cultivable lands and water bodies. The development process of investing in residential and industrial facilities and infrastructure was started in the late 1990s and is still in progress. The master plan envisions a township which is at least three times bigger than the neighbouring planned Salt Lake City. Otherwise named the 'New Town', Rajarhat has been also declared as a Solar City, and recently a Smart Green City. However, Rajarhat is not in the national Indian 100 Smart Cities Mission, and there is an interesting contrast between this very successful planned city, and the other 'retrofit' Smart Cities as per the example from Bhubaneswar.

This summary is drawn from interviews with the Addl. Chief Secretary Govt. of West Bengal, Chairman and Managing Director of HIDCO: and the Rajarhat chief architect.

The development originated in the housing dept of West Bengal, following an organic plan based on existing landscapes and settlements. The land was mainly low lying and at the time low value. The new development includes 700 acres of mainly open land in an Eco-Park.

Following the Kolkata tradition, the water plant is mainly local, and the waste water treatment is via oxidation ponds which support local fish culture. (Roy 1994). There is close attention to the water and flood management, for instance with a canal around the perimeter which drains the raised ground level. A full EIA process was carried out. The solid waste management is advanced, with incineration and composting, although there is still a large landfill on the site.

The Area I development is mainly housing, now 70% complete: the Area II development is mainly commercial development. Half of the housing provision is for high-income / middle income groups: half is in low-income / middle income groups, all allocated by lotteries. The HIG is sold at a premium price: the MIG is priced at even cost: the LIG is subsidized and priced for affordability. There is group housing which retains community structures, built by joint ventures, mainly on 5 acre plots. There is also a few 'super-high-income' units at 3000 ft². Much of the LIG and MIG is provided by HIDCO, with priority given to local users. Various mechanisms for land pooling were tried, on the whole in N India the plots are larger compared to S India.

The process was not all straightforward. There was a long period when the IT firms did not arrive, due to wider political forces in the state, so the Silicon Kolkata remained an idea only. There was a influx of informal street vendors before the full facilities were available: now the vendors are provided with shop units at low cost. There is a diversity of transport modes including mobile bikes available on an app for 1 rupee.

Questions on 'community' come up in every new town: it might be fair to say the elderly are the mainstay of the community, and there is high demand for old people's accommodation. Meanwhile there are increasing numbers of families.

Overall there is a powerful vision, of a new town for a new future. The Green City was achieved through a SPV, but one which is (arguably) in complete democratic control. It looks for universal solutions to the problems of

Indian cities: it starts from the greening, sustainability and cleanliness and then applies the principles to many other forms of social or economic structures.

Unlike many other new towns Rajarhat puts social inclusion as a top priority; there are already 2000 for LIGs and a further 10000 dwellings are on the way, all cross-subsidized as above. For the elderly there is a 3 acre Seniors Park, with facilities such as an aviary, reading rooms and cultural events. There are older persons housing, at 10 storeys and 100 dwellings per block, with a full package of care, meals etc. The occupation rights are granted for a lifetime, for a fee of 25 lakhs, which is 75% refunded to nominees after the occupant passes away. For young disabled persons there is a special Sensory Park.

For the corporate community there are business clubs with public funding, including sports, leisure, catering etc. Many inward investments are in progress, such as the Tata Health Hub, the State Bank of India, Institute of Management, financial and fin-tech organizations. Infosys has been a long story, from the transfer of land in 2007, to being finally launched here in 2018.

The highlight is the Eco Park, of 320 acres, with 47 different ecosystem zones. This contains a performing arts centre with events for many special groups, and a dedication to the national 'rebel' poet of West Bengal Kazi Nazrul Islam. There is a special welcome for the younger people, and various universities are setting up, also nursing colleges, business schools etc.

On the question of smart cities, this seems in the first case to be aimed at the 'happiness of citizens'. There are links with the IIT Karagpur and the Centre for Happiness studies, with ongoing assessment with the residents and workers of Rajarhat. There is a strong element of meditation, Tai Chi, immersion ceremonies and similar. For the digital needs, the main roads through the town have a public free wifi coming shortly.

In terms of financial sustainability, the development was launched with R12 crores, for the initial tracts, which was paid back completely by year 7-8. There is detailed financial analysis of break even prices for the subsidy schemes, with various differential prices. The MIG and LIG housing is over-subscribed by at least 5 times: e.g. a recent sale of 75 plots had 5000 applicants, at prices in the region of R40 lakh. Part of the subsidy goes for free land which is available for universities, in an overall concept of a Centre for Human Excellence.

Questions come up on the security and mixing of street life, in comparison to the adjacent Salt Lake City: are there provisions for diverse and vibrant towns, e.g. the Singapore shop-houses. It seems the plan includes for mixed uses throughout: there is nearly 50% residential floorspace in the CBD, and in the residential areas up to 40% is in small business use. Plot ratios are from 6 in the CBD to 4 in the other areas. There are incentives for high efficiency Green Buildings with a 10% premium and a star rating system.

Overall the urban planning and design vision is one of densification, mixing, planned redistribution and cross-subsidy, social inclusion for special groups, a high value knowledge economy and integration of urban living and working wherever possible.

IMPLICATIONS FOR SMART CITY MISSION

The Green City program is similar in some ways to the SCM, and there are 4 of the SCM in West Bengal, compared to 116 designated Green Cities in the same state.

From the Green City perspective, 'smart' can be taken to represent an unrealistic aspiration, that technology will solve complex urban problems. In comparison the green city concept starts with practical sustainability solutions, and works back from there.

This highlights the 'smart' as an umbrella term with different meanings for different purposes: as of course is 'green'. One way to frame the options could be:

- Smart: sees new technology as the catalyst for improved infrastructure and public services
- Green: sees sustainability as an organizing principle for infrastructure, public services, urban planning and economic development
- 'Smart-wise' aims at the full integration of technical systems with human systems of collective intelligence.
- 'Green-wise' also aims likewise at the full integration of the environmental sustainability agenda with other social & economic domains of collective intelligence.

10) CONCLUSIONS & NEXT STEPS

Overview & Typology

The Indian smart city mission is one attempt to accelerate by government incentive and subsidy, a process already in motion, the digitalization of infrastructure, government and public services. It also involves by default, an economic development agenda for the shift towards middle-higher value knowledge based sectors.

From an international perspective the Indian experience is not unique, but it is certainly very instructive. There is a wide range and differences between cities around the world, at different stages of development. This suggests a global smart urban development typology:

Table 10.1: summary of global smart urban development typology

	<i>digital-enhanced physical infrastructure</i>	<i>Advanced smart digital infrastructure</i>	<i>Digital enhanced economic, governance models</i>	<i>Autonomous / landscape digital transition effects</i>	<i>Wise socio-technical systems development ??</i>
<i>Early industrial / low income</i>	Digital as accelerator of 100% energy, water, transport	Prototypes in smart platform / & co-production services	jump to new business / governance models	SMS is agent of transition: wifi is patchy	
<i>Late industrial / middle income</i>	Digital enhanced centralized systems	Mixed systems	Efficiencies in business / governance	Autonomous transition with existing systems	
<i>Post industrial retrofit / mixed</i>	Digital enhanced upgrading of centralized systems	Full transition to smart platform / & co-production services	Effectiveness in business / governance	Autonomous transition with new systems in the gaps	
<i>Post industrial new / high income</i>	new systems with integral smart management	Fully autonomous systems	Limits of existing business & governance	Limits of digital systems	

The reality behind the typology is highly mixed: any one city can contain areas and sectors and social groups from each of these categories. In practice, the differences between 'digital-enhanced physical infrastructure' and 'advanced smart digital infrastructure' can be argued. However in the broad scale there are clear differences, as best shown by key indicators such as the economic profile and average income.

Implications of this for smart city strategy could be very topical, in any part of the world. At the moment much smart city activity appears to be driven by inflated hopes, political spin, corporate marketing and consultant mystique. There are knowledge gaps, financial gaps, accountability gaps and technology gaps all around. The first implication is to fit the smart city strategy to the appropriate development level, as shown by the Indian experience. However this is not so simple where urban economies and societies are totally mixed up, with jumps and sudden transitions and threshold effects. The technology and its socio-technical applications and impacts, are all highly unknown and possibly unknowable. The outcomes can take various forms:

- Smart technology as enabler for more efficient urban infrastructure and services.
- Smart technology as bandwagon, and/or proxy, and/or substitute, for wider and deeper forms of development.

- Smart technology in evolutionary perspective, as creative disruption of older systems, enabling a new capitalist elite, with mass expropriation of data and technical intelligence.

RECOMMENDATIONS FOR RESEARCH

It is an understatement that this huge and topical area of smart and/or smart-wise cities is under-researched. The time cycle of academic research of around 5 years is far too slow for the fast moving digital frontier. With that in mind, there are some useful and urgent directions to follow:

Fundamental & basic:

- Analysis of collective intelligence in socio-technical systems and transitions
- AI and collective intelligence perspectives
- Deeper cognitive complexity and wise intelligence

Applied socio-technical systems analysis;

- Platform economics, co-productive services, prosumer partnerships
- Social practice perspectives
- Political ecology perspectives
- Social & policy innovation
- Transition management perspectives

Applied urban and development studies

- Digital-enhanced governance in transition
- Digital-enhanced economic development in transition
- Digital-enhanced spatial development in transition

Normative studies:

- Pathways and road maps from smart to wise

RECOMMENDATIONS FOR POLICY

- Develop smart / wise digital and infrastructure systems, via open democratic and accountable process, wherever possible.
- Where data is generated, develop codes and practices to ensure social responsibility, accountability and security.
- Evaluate the social and economic and political impacts of new smart systems, and the effects on social distribution and inclusion, economic livelihood, political citizenship.
- Integrate smart digital systems into 'wise social inclusive' systems for public services and public administration.
- All smart or smart-wise developments to be discussed with pro-active stakeholder participation

11) ANNEX

ABBREVIATIONS

ABD	Area Based Development
BDA	Bhubaneswar Development Agency
BMC	Bhubaneswar Municipal Corporation
BSC	Bhubaneswar Smart City (SPV)
ICT	Information & communications technology
IOT	Internet of Things
SCM	Smart City Mission
SPV	Special Purpose Vehicle (public-private partnership)

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ORGANIZATIONS CONSULTED

To be supplied.

WORKSHOP AGENDA & PARTICIPANTS

Aims of the workshop: analyse the Smart City program, and smart systems in general: explore a possible ‘wise’
 city model, and ways towards it: feedback to policy and professional practice (local & national).

Questions for the workshop: –

- How is the Smart City program, & smart technologies in general, changing the city of Bhubaneswar?
- What are the side effects, positive and/or negative?
- Is there a ‘wise city’ model, beyond ‘smart’, and how to move towards it?

Table 11.1: smart-wise workshop programme

		ACTIVITY	METHODS
2.30	Lighting of Lamp Introductions	<ul style="list-style-type: none"> Prof. Kajri Mishra: Welcome address: Introductions of participants Prof. Souvanic Roy: Urban challenge - Significance of the Workshop Prof. Tathagata Chatterji: Why Bhubaneswar Joe Ravetz / Jessica Symons: Introduction to 'Smart-wise cities' 	<i>(The reporting will be anonymous)</i>
3.00	Open discussion	General questions – <ul style="list-style-type: none"> What are your challenges & issues? What visions & opportunities? What does 'smart' mean in all this? 	Speakers are requested to take 1-2 minutes max.
3.20	Form the tables for key themes / sectors	Proposals for theme/sectors tables	Anyone can propose a theme/sector: others can join according to interest. Everyone is requested to mix and join between sectors & organizations.
3.30	<i>Recirculation</i>	<i>Take some tea & move to the new tables.</i>	<i>Tables are formed for the key themes (e.g. transport, housing, solid waste etc).</i>
3.40	Mapping the landscape	For each theme: <ul style="list-style-type: none"> Who is involved with the smart city? What are the side-effects for different actors / stakeholders? 	Form tables of around 6 persons each, with a proposer & reporter. Each table works with creative thinking, writing & drawing on sticky notes.
4.00	Mapping the future	For each theme: <ul style="list-style-type: none"> What might happen in 5-10-20 years? (best or worst) 	Similar to above.
4.10	Mapping the synergies	For each theme: - <ul style="list-style-type: none"> For the best possible future, what are the priorities? who will collaborate & work together? Can the smart city help in this? 	Similar to above.
4.40-5.00	Review & discussion	Each table makes brief summary General discussion on ways forward	

Policy Framework

“Smart inclusive growth” (‘SIG’) has emerged as a focal policy agenda, e.g. in OECD, WEF, the UK and the EU urban agenda of ‘smart sustainable inclusion’. The Indian equivalent is

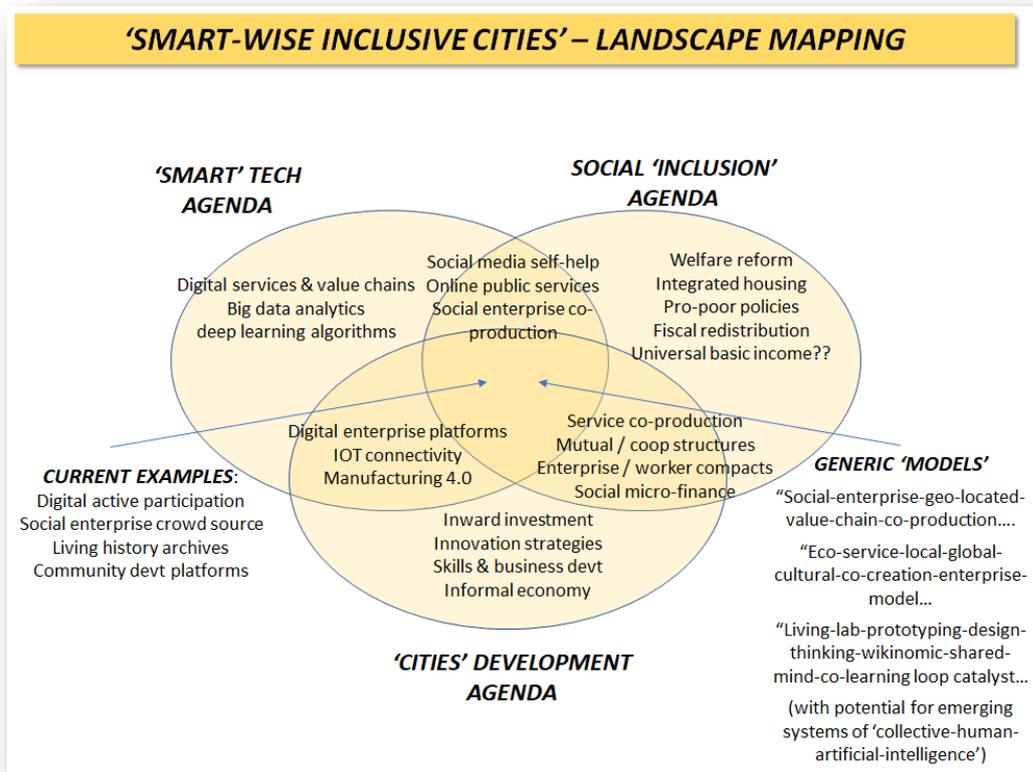
The “smart inclusive growth” proposition aims to bring three different strands together, as for instance:

- **‘SG&I’:** (*‘smart growth with inclusion’*) - Smart technology / informatics systems, with potential to enable new enterprise & service models, which can then enable and promote social inclusion (example sectors in health, education, housing, social policy).
- **‘SI&G’:** (*‘smart inclusive with growth’*) - General transitions in smart technology / informatics systems, now embedded in social networks and community enterprise, with potential to contribute to economic

growth: (examples of Facebook etc as catalysts in social enterprises, sharing economy, cultural co-production, micro-finance for entrepreneurs etc).

- **'S&IG'**: (*'inclusive growth with smart'*) - Inclusive growth programmes which could benefit by, or be transformed through new smart technology / informatics systems (e.g. procurement, labour market and skills, social enterprise, local economic participation etc).

This forms the backdrop to the '100 Smart Cities Mission' in India, together with structural systems such as the online identity system, together with autonomous trends in mobile platforms and trading systems, social media, business platforms etc.



Technology / informatic framework

The analytical framework and theoretical foundations for this research, are based on complex systems analysis, enterprise modelling, and information theory, as applied to the smart city *problematique* (Ravetz, forthcoming: Shroff 2012). The systems mapping diagram here shows some general structures, from which many detailed applications can follow:

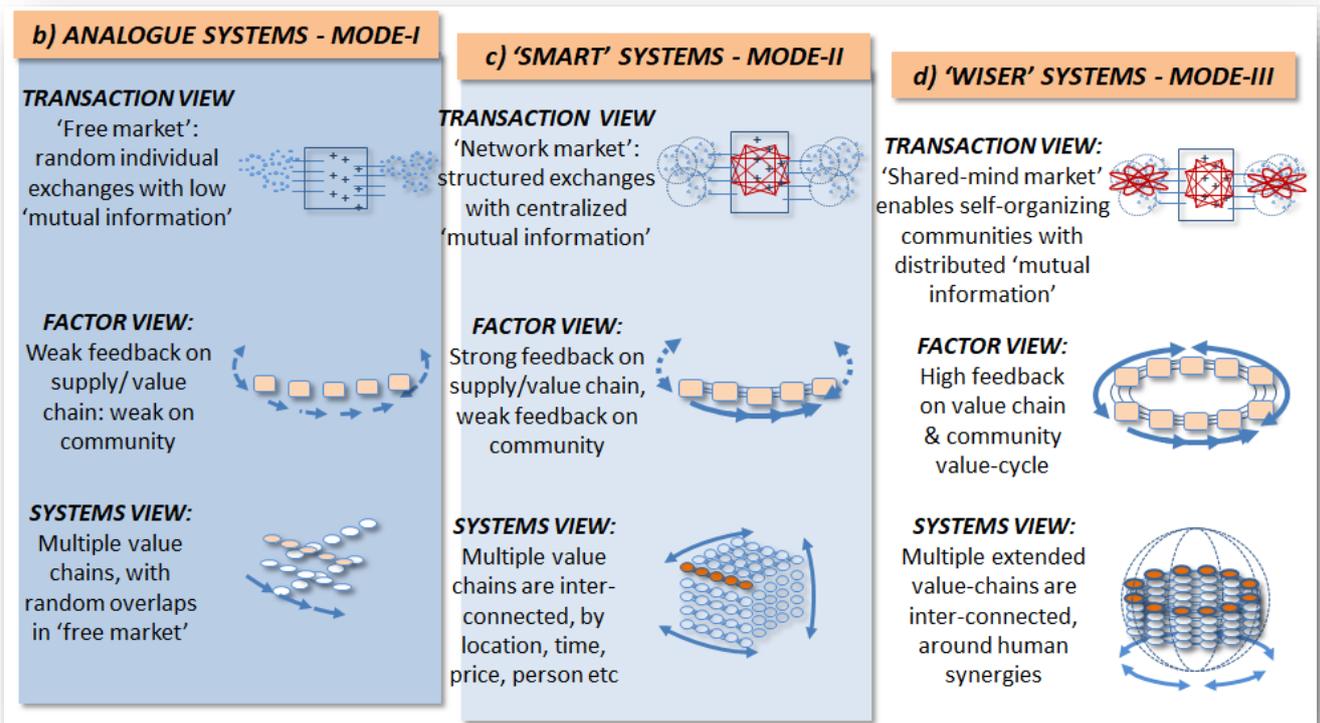
- at the upper part, a detail of 'transactions' in a generic 'marketplace', and the effect of technology
- 'factor' view, on supply chains, value chains, business models etc
- 'systems' view of the larger structures which combine multiple value chains, business models

Then the mapping contrasts the 'mode-I analogue' systems of market exchange (on the left), with mode-II 'smart' systems (centre), and 'mode-III wise' systems (on the right).

- **Mode 1** type analogue system or marketplace: ‘Free market’ with random individual exchanges, with low ‘mutual information’. There are verbal & print channels for informatic search, feedback, value-added. These market principles also apply to systems of policy, enterprise, project management etc. This describes conventional market problems such as price optimality or equilibrium.
- **Mode-II** type smart system or marketplace: – ‘Managed market’: structured exchanges with high ‘mutual information’. ‘Smart’ digital marketplace: informatic channels for monitoring, search, feedback, pattern-making. High innovation & disruptive power, with value-add expropriated by the technology system. This focuses on evolutionary type business innovation, e.g. how to run a real-time taxi platform
- **Mode-III** problems – ‘Deeper-mind market’: self-organizing communities with high ‘mutual information’. A ‘wise’ shared-mind marketplace of collective intelligence which combine tech-human systems. High innovation for design of synergistic value chains & institutions, with value-added internalized. This focuses on co-evolutionary & societal agendas, beyond simple definition or measurement. E.g. how to enable a more liveable community?? How to promote social inclusion in a divided society??

Figure 3: synergistic framework for technology systems

Source: Ravetz 2015 & in press



Application of the analytic framework: this is basically a structuring device for enquiry into complex systems and phenomena. It’s directly suitable for looking at transformative smart business models (e.g. Uber), which lead from mode-I to mode-II enterprise. It can then help to suggest directions for ‘wiser’ business models, which build in social responsibility, resilience, recirculation of value-added and so on. The marketplace analogy is transferable to policy systems with a logic of rational management logic. For more complex combinations of social, technical, economic, policy etc, the framework helps to structure enquiries with research questions which are otherwise intractable.

In terms of research process (see next section), the mode-I and mode-II are generally in the earlier 'baseline' and 'change mapping' stages. The mode-III systems thinking comes into its own, for the later stages of 'synergy mapping' and 'pathway mapping', the more creative design and synthesis of ways forward. In this way, the synergistic framework helps to address the 'cognitive complexity' of the central problem of this research - ***"how to manage the smart-wise inclusive transformation"***.