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CHANCE2SUSTAIN

Engaging with Sustainability Issues in Metropolitan Chennai

City Report

By Loraine Kennedy, Aurélie Varrel, Eric Denis,
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Hortense Rouanet, Tara Saharan.

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1.1. Introducing Chennai[1]

Chennai is the largest metropolitan city in South India (8.7 million in 2011) and the provincial capital of the large state of Tamil Nadu (population 72 million in 2011). Before that, under British rule, the city was the capital of the Madras Presidency, and was known as Madras until 1996, when the name was officially changed to Chennai. Located on the east coast of India, on the Bay of Bengal, sea trade has been an important aspect of the regional economy since at least the colonial period. Still today, the city combines political functions with economic command functions for both manufacturing and services, reflecting the region's diversified economy. The Chennai metropolitan area has witnessed strong growth over the last 20 years in automobile manufacturing, software services, hardware manufacturing, healthcare and financial services (CDP 2009). However, it should be noted that only 30% of total employment in the city takes place in the formal sector i.e., is covered by contracts and labour laws, the remaining 70% falls in the informal sector. This underscores the importance of small and micro enterprises and self-employment for providing goods, services and livelihoods in the local economy. It is indicative of a largely low-income economy, like most other Indian cities, which can also be inferred from statistics on housing (approximately 23% of Chennai's inhabitants reside in informal settlements) and from maps of socio-spatial inequalities in access to amenities, also called "hot spots" of deprivation (see Baud et al. 2009). Compared to Delhi and Kalyan, the two other Indian cities in the Chance2Sustain study, Chennai has some distinct characteristics. Like Delhi it combines administrative and economic command functions, but the public sector tends to be less predominant in some important respects, notably land planning and regulation, leaving relatively more room for private sector actors.[2] In absolute terms, Chennai's urban region (including the adjoining districts of Tiruvallur and Kanchipuram) is one of India's most dynamic regions, registering a total investment of Rs 522 659 crores (approx. 62 billion euros)[3] during the period 1995-2010 (Shaw 2012: 37-8). In terms of risks, Chennai appears more vulnerable in many respects than both Kalyan and Delhi; it has the lowest per capita availability of water among India's large cities and its location on the coast exposes it to the effects of climate change.

The following quote from the Second Master Plan for Chennai Metropolitan Area suggests that planners in Chennai have taken cognisance of these risks and have envisioned a future that explicitly engages with the sustainable cities agenda. It expresses the aim to promote a more sustainable city by putting into place strategies that integrate economic, social and environmental factors. At least rhetorically then, the Master Plan embraces the core concepts of the sustainable cities agenda, which have circulated widely within international policy and donor networks.

"The vision of Chennai Metropolitan Development Area is to make Chennai *a prime metropolis* which will become more livable, economically vibrant, environmentally sustainable and with better assets for the future generations" (CMDA 2008: 17, italics added).

Using expert knowledge for city planning and borrowing international models for urban development are not new practices in Chennai. For instance, Gandhinagar was built on the southern banks of the Adyar river in 1947 by the Madras Cooperative House construction Society and modeled on a garden city. "This layout, as the government literature portrayed, was modeled on the modern neighborhood idea which was a most popular form of development adopted by the town planners in western countries then" (Srivathsan (2012: 5, citing Sitalakshmi 2007). At that time, Gandhinagar was located just outside the city limits. This example is particularly compelling given that the main case study analysed in Chennai, the IT expressway, was also built just outside Chennai corporation limits, until the boundaries were expanded in 2011 to encompass it. Instead of housing, the IT expressway is a project that promotes economic development, and it drew its inspiration from other national and international examples.

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1   This section draws on material from the India Country Report, provided mainly by A. Varrel, E. Denis and L. Kennedy.

2   During the period 1995-2010, the share of private capital (Indian and foreign combined) in total investments was considerably higher in Chennai than in Delhi: approximately 59% compared to 36%) (Shaw 2012, table 7, p 42).

3   Compared to Rs 1 060 234 crores for Delhi (with Faridabad, Gurgaon, Ghaziabad and Noida) (Shaw 2012: 37-8).

A greater focus on growth and on strategic planning is evident in both the Master Plan and the City (Comprehensive) Development Plan elaborated in the framework of the National Urban Renewal Mission (JNNURM). This trend can be interpreted within a "competitive cities" framework wherein political leaders, often working in close collaboration with private sector actors, including international consulting agencies, engage in city marketing in order to position their cities on the global scale and attract investment.[4]

In 2012, Tamil Nadu's Chief Minister Jayalalithaa inaugurated 'Vision Tamil Nadu 2023', a document that outlines the State's plan for infrastructure development to be achieved in the next decade.[5] Included among the desired outcomes are an increase of per capita income of people of the state to USD 10 000, the median income of upper middle income countries, the attainment of a high standard of social development, with the Human Development Index of the State matching those of developed countries, and the provision of high quality infrastructure.[6] The document is clearly informed by the 'infrastructure-led growth' model, whereby investments in infrastructure constitute the key for achieving higher economic growth. The document announces the preparation of investment plans for seven broad sectors including 'urban infrastructure', in which one of the projects is to develop Chennai into a 'megapolis' (megalopolis) (*Vision Tamil Nadu 2023* 2012: 61). The vision document, prepared with the support of the Asian Development Bank, draws inspiration from current debates on resilience, as this extract demonstrates:

> The world has become more complex, volatile and unpredictable in the past few decades than it has ever been in history, and it is likely to remain so in the future. Therefore, any visioning exercise has to contend with the uncertainties that will affect us in the future. Accordingly, contingency plans and alternatives have to be thought through and that calls for a responsive and capable government at the helm of the state at all times. Vision 2023 accordingly, addresses the differential requirements of various stakeholders in the state with a view to enabling high

rates of growth and economic development that is highly inclusive and sensitive to potential downsides *by conferring resilience to the state's economic and social fabric.* (*Vision Tamil Nadu 2023* 2012: 10, emphasis added)

1.2. History

Chennai (known as Madras until 1996) is the oldest municipal corporation in India, created in 1688 by the British. The area hosted several localities dotted with Hindu temples and a port allegedly existed there and was active in the 1st century B.C. The Portuguese settled down in 1522 and created a fort (San Thome area); in 1639 the British East India Company acquired land where Fort St. George was built. It was an outpost and a port in the Gulf of Bengal at a time when South India remained disputed by the French, the Dutch, the Portuguese and the British.

During the long period of domination under the British empire Madras became the administrative capital of the Madras Presidency, a territory of British India that extended over the major part of South India. Madras developed economically during the colonial period as an industrial city centred on the port. The 'trading post economy'[7] consisted in exporting raw and semi-finished goods and importing manufactured goods from Britain. As an administrative capital, the influence of the metropolis extended far beyond the borders of what would become Madras State in 1956, after the large-scale reorganisation of State boundaries along linguistic lines. Madras became the capital of Madras State, although this decision was disputed by many people in Andhra Pradesh, especially those from areas that had belonged to the Madras Presidency. Madras State, far smaller than the Presidency, was renamed Tamil Nadu (Land of the Tamils) in 1968. The official name of Madras was changed to Chennai in 1996.

1.3. Population growth and spatial expansion

Chennai is the fourth largest metropolis after Delhi, Mumbai and Kolkata. Chennai's population has grown steadily since Independence but at a slower pace than Delhi and Mumbai. Some factors that might explain this growth trajectory include:

4   See the WP2 Literature Review: http://www.chance2sustain.eu/26.0.html

5   The document is available on the government website, http://www.tn.gov.in/ last consulted 17 July 2013.

6   The seven sectors are energy, transport, industrial and commercial, urban infrastructure, agriculture and human development (health and education). See "Jayalalithaa envisages high growth trajectory", *The Hindu*, Chennai edition, March 23, 2012.

7   The term économie de comptoirs is from Durand-Dastès 1995.

- the proximity to other large cities especially Bangalore and Hyderabad, respectively 5th and 6th cities by size in the country, located at a distance of 330 km and 700 km;

- the filling out of the urban hierarchy at intermediate levels in South India, namely in Tamil Nadu and Andhra Pradesh. Tamil Nadu is India's most urbanised state (48% of its population, according to 2011 Census);

- after 1956, regional political dynamics led the city to look inward toward the State, and it may have lost some ground as a national-scale metropolis. Regaining a national status has become a challenge for the State's political leadership, as neighbours Bangalore and Hyderabad are challenging Chennai's historical supremacy in the southern part of the country.

Table 1 shows the growth rate of population between 1971 and 2011 for both Chennai city (i.e. Chennai municipal corporation) and Chennai metropolitan area, which reached 8.7 million inhabitants in the 2011 Census. The growth rate has been slowing down for both Chennai city and Chennai Metropolitan Area, within the official administrative boundaries, as per the Census. One can observe the spill over of demographic growth from the limits of Chennai city (176 km^2) into the metropolitan area outside city limits, which is almost seven times larger.

Table 2 shows the decline in the contribution of migration to this moderate growth rate. It turns out to be mostly migration from the State of Tamil Nadu itself, this trend reinforcing over time. Ethnographic material indicates also much migration from the neighbouring State of Andhra Pradesh (Kamble 1982).

As for the spatial expansion of Chennai, the presence of the sea on the East has forced expansion in other directions. Chennai's location is also marked by three major rivers beds and backwaters. The Indiapolis database evaluates the total surface of Chennai built-up area currently at 588 km^2, with

Table 1: Chennai population and population growth (1971-2011)

	Population					Annual				AREA
	1971	1981	1991	2001	2011	1971-1981	1981-1991	1991-2001	2001-2011	(km2)
Chennai city	2,642,000	3,285,000	3,843,000	4,343,000	4,681,087	2.2	1.58	1.23	0.75	176
Chennai	3,504,000	4,601,000	5,818,000	7,041,000	8,696,010	2.76	2.37	1.93	2.11	1189

Source: Chennai Metropolitan Development Authority, 2008 based on Census, 2001; Census 2011.

Table 2: Migration to Chennai (1961-2001) (in Lakhs)

Year	Total Population	Total migrants to the City from						Un-classified	Total migrants in lakhs	% of Total Migrants to total population
		Other parts of Tamil Nadu		Other parts of India (Excluding Tamil Nadu)		Other Countries				
		No. in lakhs	%	No. in lakhs	%	No. in lakhs	%			
1961	17.29	4.47	69.45	1.71	26.60	0.25	3.90	--	6.44	37.24
1971	24.69	5.51	70.61	2.00	25.63	0.29	3.76	--	7.80	31.59
1981	32.84	7.19	71.28	2.55	25.31	0.34	3.41	--	10.08	30.70
1991	38.43	6.44	70.51	2.42	26.47	0.28	3.01	0.04	9.18	23.90
2001	43.44	6.98	74.49	2.23	23.80	0.16	1.71		9.37	21.57

Source: Adapted from Chennai Metropolitan Development Authority, 2008, based on Census data. NB 1 lakh = 100 000.

a population of approximately 7 million people (source: e-Geopolis, Indiapolis database, 2010), which coincides quite well with the official figures of Table 1 (CMDA 2008).

1.4. Levels of government and territorial jurisdictions in the metropolitan region

Chennai Municipal Corporation (CMC), also known by its official name, the Corporation of Chennai, was expanded in 2011, merging 42 local bodies, including 9 municipalities, 8 town panchayats and 25 village panchayats (cf. Map 1 on page 8). The Corporation is now made up of 200 wards, grouped into 15 ward committees. The newly annexed areas, which include some of the localities where in-depth case studies are being carried out for the C2S project, were divided into 93 wards, and the remaining 107 wards were created out of the original 155 within the old city limits. Municipal elections were held just after the expansion in October 2011, where the councillors elect the mayor and deputy mayor who preside over six standing committees.

To cope with demographic growth, the Chennai Metropolitan Area (CMA) was first drawn in 1967, and has not changed since 1974. It is the fourth largest metropolitan area in India, designed at a very early stage. The Madras Metropolitan Development Authority (now the Chennai Metropolitan Development Authority; CMDA) was set up as an ad hoc body in 1972 and became statutory in 1975 (under the Tamil Nadu Town and Country Planning Act, 1971).

It is comprised of 3 districts:

– the totality of Chennai district (176 km²)

– a portion of Thiruvallur District (637 km²) to the North and North-West

– a portion of Kancheepuram District (376 km²) to the South and South-West

Whereas Chennai Corporation has an elected body the CMDA is only an administrative structure. The local bodies outside of Chennai Corporation are a mix of 304 rural and urban local panchayats (villages), plus municipalities with elected bodies (last elections were held in 2011). The management of these two overlapping areas, the Corporation and the Metropolitan, comprising of local bodies with four different administrative statuses, has become extremely complicated.

Given that the CMDA does not have an elected board, State-level politicians and civil servants consider this area to be under their jurisdiction. For basic services, the corporation and local bodies within the metropolitan area (municipalities, town panchayats, village panchayats) share responsibility for maintaining roads, pedestrian ways, streetlights, solid waste collection and management, micro-drainage, parks under their jurisdiction, to the extent that agencies appointed by the State or the Metropolitan Authority do not take charge of them.

This omnipresence of the State government in local service delivery has been recently reinforced by the burgeoning of new parastatal agencies and special purpose vehicles, which can on occasion bypass pre-existing agencies. Examples include:

• Tamil Nadu Road Development Corporation (TNRDC), incorporated in 1998 was set-up to attract private investments for road infrastructure and to build roads under Public-Private Partnership (PPP) framework[8] ;

• Chennai Rivers Restoration Trust, bypasses the Chennai Metropolitan Water sanitation and Sewage Board, TN Slum Clearance Board, Public Works Department.

The then newly appointed CMDA developed the first Madras Urban Development Plan (1974) and then the Madras Metropolitan Plan (1975), setting up mid-term and long-term development goals and land use rules. It seems that there were numerous plans drawn up over time, some

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8   As of 2009, TNRDC is a 50:50 joint venture company of TIDCO and TIDEL Park Ltd. Cf. http://www.tnrdc.com

Table 3: Selected agencies operating in Chennai Metropolitan Area.

CMC and CMA agencies	– Metropolitan Bus Corporation – Chennai Metropolitan Water sanitation and Sewage Board (it serves only Chennai Corporation and some areas, including the IT Corridor, etc)
Tamil Nadu State government agencies	– Tamil Nadu Housing Board – Tamil Nadu Electricity Board – Tamil Nadu Slum Clearance Board – Public Works Department – Highways Department

Source: Field research and official documents.

Map 1: Administrative divisions in the Municipal Corporation of Chennai and the 2011 expansion

PROPOSED EXPANSION OF CHENNAI - ZONE WISE

S.No	Ward Committee	Name of the Zone	No of Ward	Ward Number
1	I	Thiruvottiyur	14	1 to 14
2	II	Manali	7	15 to 21
3	III	Madhavaram	12	22 to 33
4	IV	Tondiarpet	15	34 to 48
5	V	Royapuram	15	49 to 63
6	VI	Thiru-Vi-Kanagar	15	64 to 78
7	VII	Ambattur	15	79 to 93
8	VIII	Annanagar	15	94 to 108
9	IX	Teynampet	18	109 to 126
10	X	Kodambakkam	16	127 to 142
11	XI	Valasaravakkam	13	143 to 155
12	XII	Alandur	12	156 to 167
13	XIII	Adyar	13	170 to 182
14	XIV	Perungudi	11	168, 169 183 to 191
15	XV	Shozhinganallur	9	192 to 200

Source: Municipal Corporation of Chennai website

with the support of foreign consulting firms (1980), but there was no new Metropolitan Plan until the Second Master Plan for Chennai Metropolitan Area 2026, which was submitted in 2005 and approved after a consultation phase in 2007.[9]

There are presently lively debates about the extension of CMDA and the repositioning of the area vis-à-vis the regional economy, given the important political stakes. A plan for "Chennai Mega-Region" submitted in April 2012 includes Sriperumbudur, Kelambakkam, Tiruvallur and Maraimalai Nagar in a comprehensive plan that could expand to cover the whole of Kancheepuram and Tiruvallur districts as well as Arakkonam taluk in Vellore district. Of the two options currently under consideration, one advocates an extension up to 4400 km² and the other 8800 km² (cf. diagram below). Chennai could become the third metropolitan region of India in term of population and the biggest in area.[10]

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9   It was published at the end of 2008 and is available online: http://www.cmdachennai.gov.in/SMP_main.html .

10   See A. Srivathsan, Chennai to push its boundaries, but how far? *The Hindu*, June 6, 2013

Diagram: Plan for "Chennai Mega-Region"
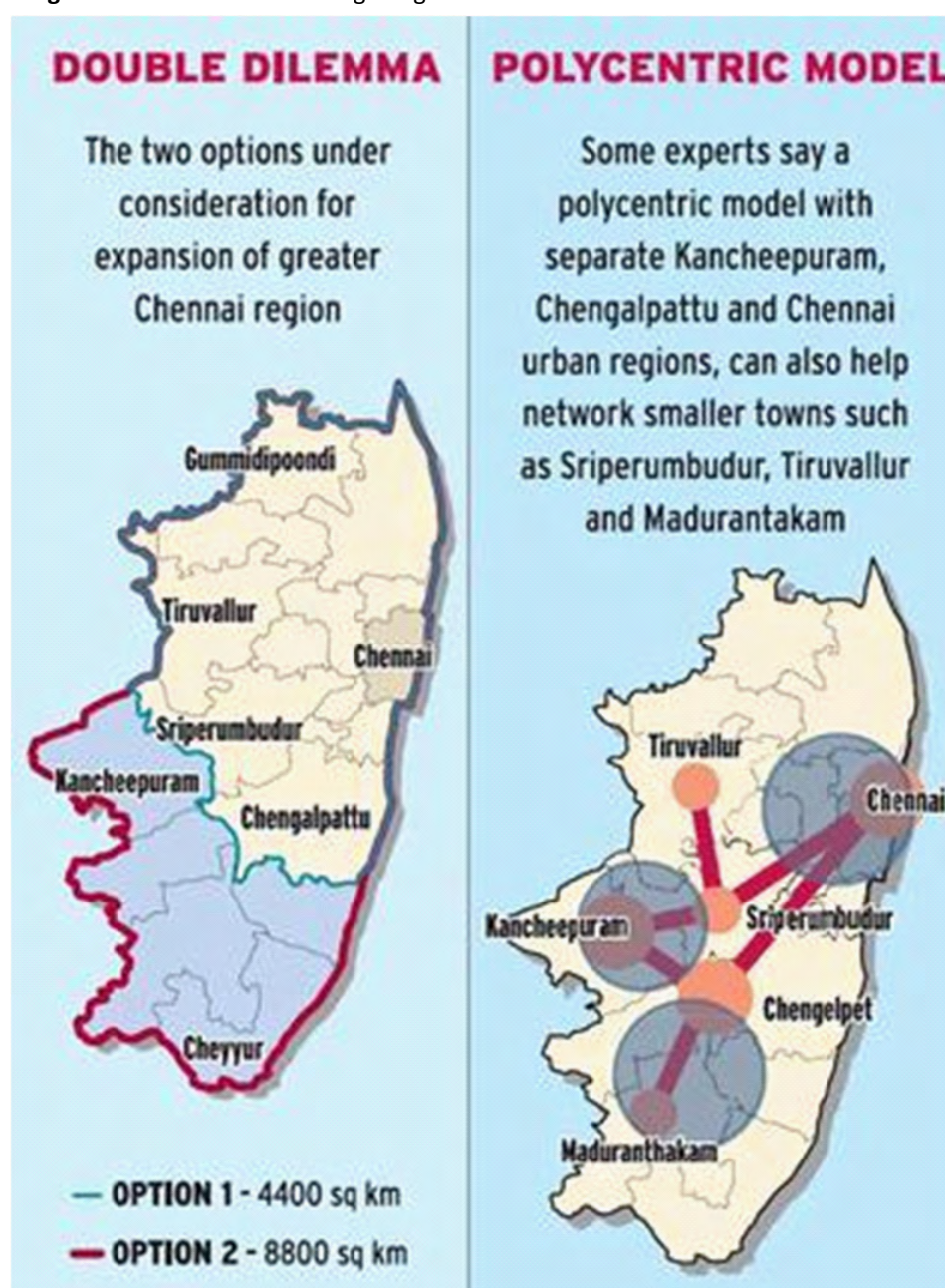
Source: A. Srivathsan, Chennai to push its boundaries, but how far? The Hindu, June 6, 2013.

2 Mega-projects as an Expression of Economic Growth Strategies

2.1. Visions for Chennai [11]

The main city vision document for Chennai is the first volume of the Second Master Plan for Chennai Metropolitan Area 2026 that was made public in 2008, called 'Vision, Strategies and action Plans'. The first statement on Chennai economy in this document reads as follows:

The economic base of Chennai City had shifted from trade and commerce to administration and services by the early part of the 20th Century. In the post-Independence period, manufacturing became an important sector and CMA continues to be the most important industrial area in the State. Recent trend shows that the economic structure of the City is tertiarised with growing contribution by Information Technology/Information Technology Enabling Service/Business Process Outsourcing Industries (IT-BPO) (2008, p.13).

Taken as a whole, the document presents Chennai's economy as mixed, with a balance between secondary and tertiary activities. It places emphasis on IT-BPO activities.

This diversity as well as certain sectors of activity are put forward in the revised Comprehensive Development Plan (CDP) – which only covers the CMC area - prepared for JNNURM in 2009[12]: "Chennai has a diversified formal sector economic base driven by the automobile, *software development and business outsourcing*, hardware manufacturing, healthcare, and *financial services industries.*" (2009, p.35, emphasis added). As for its national and international positioning, it states:

Chennai is the capital of Tamil Nadu and India's 4th largest metropolitan area with a strategic position in international trade of both goods and services. Chennai is an important centre for the automobile industry producing for both domestic and export

markets, an expanding IT industry relying extensively on global outsourcing, and one of India's largest ports […] All of these factors suggest that Chennai must think globally, and strive for internationally recognized standards of development in order to further promote Chennai in the world. At the same time it must take a diversified approach to economic development to smooth the impacts of uncontrollable global shifts in demand (2009, p.25).

Hence it appears that the emphasis in this vision document is more on empowering Chennai to compete at the international level than at the national level. Interestingly, neither of these documents draws any sort of comparison with the other three ten million-plus cities of India – i.e., Delhi, Mumbai and Kolkata. It is also striking to see how much importance is given to the IT-BPO sector. It was in part for this reason that the WP2 case study, selected in the framework of the C2S project, concentrates on megaproject development in relation to this sector of activity.

2.2. Megaproject development for promoting the IT-BPO sector

The most recent generation of megaprojects envisaged for Chennai are the Ennore deep port, the elevated highway from Maduravoyal to Koyambedu (designed to serve the port), the Nemeli desalination plant, the Outer Ring Road (peripheral belt) and the metro. It is obvious that most of these projects correspond to international templates of metropolitan infrastructures meant to enhance the city region functioning, but they are not necessarily well adapted to local conditions.[13] They contribute to projecting the State and metropolitan economy at the international level: the elevated highway is intended to improve access to the port area for trucks, especially those carrying automobiles produced in the western part of the metro region, while the deep port caters to the needs of an export-oriented sector. These infrastructure projects aim to transform Chennai into a global city region, by providing it

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11   This section draws on research conducted under WP2, mainly research conducted by Aurélie Varrel, M. Vijayabaskar and M. Suresh Babu.

12   Chennai CDP 2009 followed the initial 2006 CDP document, which was rejected by JNNURM and subsequently reworked by a consortium of high profile activists with the support of an international consultancy firm. It mostly points at avenues for infrastructure investment under the JNNURM scheme.

13   For example, the costs for running the desalination plant are such that the treated water is much more expensive than average, in addition to requiring large amounts of electricity in a State prone to power scarcity.

with the attributes of a 'world class city', notably the capacity of the economic sectors to compete at the international level, for instance by turning Chennai into a regional hub for the automobile industry. Of equal importance, as we shall see, has been the drive to develop the IT industry.

The development of the export-oriented IT and IT Enabled Services (ITES or BPO) sector has become a salient feature of India's growth story and is widely considered to be a growth engine for the country. Indeed, for over three decades now, the IT sector has been given attention by India's political elites, as is reflected in various vision documents. The State of Tamil Nadu has been at the forefront of this trend, by introducing one of the first State-level IT policies as early as 1997, the same year as Karnataka (of which Bangalore is the capital). One striking example of Tamil Nadu's proactive attitude towards the IT sector is the designation of one growth corridor especially for the IT sector[14], i.e., the 'South IT Corridor' (CDP 2009, p.26).

The idea of a corridor dedicated to the IT industry emerged in the early 2000s at the time when several IT companies started locating premises along the Old Mahabalipuram Road. The term "IT Corridor" was apparently borrowed from a project that was developed by a Singaporean urban planning consultant at the end of the 1990s for Bangalore, referring to an integrated township including services and residential areas. It was intended to be developed in the eastern suburbs of Bangalore, but after a long debate on its possible inclusion in the Bangalore Master Plan of 2007, it was ruled out and does not appear in the document. The transposition of that model to Chennai has by and large consisted in upgrading the existing Old Mahabalipuram Road [OMR] into an IT Expressway (ITEL) to connect IT parks situated on this roadway, as well as numerous private companies. Parastatal agencies were put in charge of developing the IT Corridor and providing high quality services along the road (power, water) and allowing extra Floor Space Index for IT activities along the road. The megaproject per se is the IT Expressway Limited (as it is a special purpose vehicle). It corresponds to the upgraded OMR, but the whole area is known in planning documents, and increasingly in the public at large, as the "IT Corridor"[15]. It is particularly interesting that the model comes from Bangalore, the city that is more or less

considered as the capital of IT in India, and that it was developed by a foreign, Singapore-based consultancy, as Singapore is largely considered a reference in terms of economic and urban development in South India (Ghosh 2008; Yahay 2008).

The central role of the road as a way to develop the area can be seen as a reflection of the importance given to transport infrastructure in India since Independence. It builds indeed on older projects: the widening of Old Mahabalipuram Road from a 2-lane to a 4-lane road was initially included in a more general plan of road upgrading undertaken by the GoTN Highways Department, the Radial Road Scheme (1997). In 2001 a new set of priorities included work on the road; in addition to the change of government brought in as a result of elections in 2001, the start of operations at TIDEL Park, situated just on the southern edge of the city, brought to light the pitiful condition of existing roads. A recently created parastatal agency, Tamil Nadu Road Development Corporation (TNRDC), was assigned to take charge of the project, with high ambitions: "The project, in a way, exemplifies the IT/ITES prowess of Tamil Nadu, and the commitment of successive governments to create and nurture *world class infrastructure* to preserve the State's position as *one amongst the most favoured investment destinations in the country*." (Malmarugan and Narayan 2006 ; emphasis added). The objective was to create a benchmark in terms of road development in India. Although the revamping of the project governance after 2006 (completion of Phase 1 and internal reorganization at TNRDC) and 2009 (TNRDC fully under control of GoTN) gave way to less lofty ambitions, i.e., mainly just completing the road, there has nonetheless been a remarkable focus on the road as a catalyst for fostering sectorial development. The result is a 6 lane-Expressway approximately 20 km long, with all accesses tolled.

In researching this megaproject, one of main goals was to understand the economic effects produced through its implementation in terms of both service provision and capital allocation (e.g. through the construction sector boom). To address this question, it is useful to situate the importance of the IT industry in the local economy.

Overall the IT-BPO sector generates roughly 6% of GDP in India, with aggregate revenue of US$ 101 billion for the fiscal year 2011-12 (GoI, 2012, p.1). Tamil Nadu is currently the third or fourth ranked State for IT industry in the country, in terms of IT export value. It comes after Karnataka (Bangalore-Mysore) and Maharashtra (Mumbai and Pune), ahead of the National Capital Region and other cities, with 46 crores rupees (i.e. more than 7.5 billion US dollars) export in the fiscal years 2012 and 2013. Chennai

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14   The Second Master Plan for Chennai Metropolitan Area 2026 developed a vision of urban development along corridors of circulation coupled with economic specialization, e.g., East Coast Road as 'Entertainment Corridor', the NH4 as 'Automative Corridor', and Old Mahabalipuram Road as 'IT Corridor'.

15   The road is also officially named: Rajiv Gandhi Salai.

Map 2: Industrial and IT Corridors in Chennai (2010)
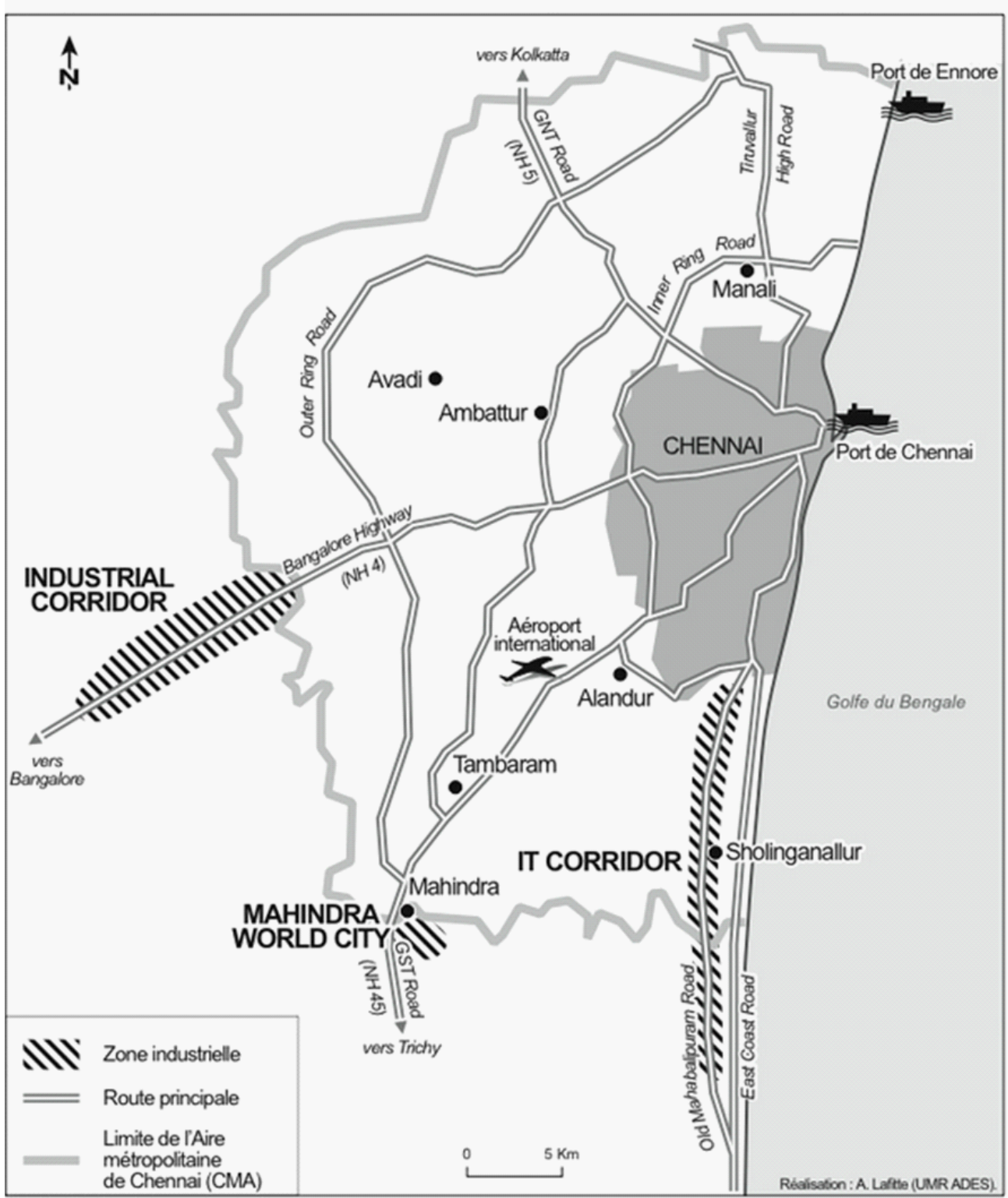
Source: Kamala Marius-Gnanou, 2010

accommodates more than 90% of Tamil Nadu's 350 000 employees in the IT and ITES sector and concentrates almost all export-oriented activities in Tamil Nadu IT sector (*Nasscom, interview, 2011*). In this sense, Chennai contributes largely to the pre-eminence of South India in the Indian IT sector. From research conducted in this project, the IT Corridor turns out to host about two thirds of this workforce, thus it can be considered as forming, to some extent at least, an IT cluster. For instance, CTS/Cognizant, the biggest Chennai-based IT company, has located as many as 12 out of 14 of its Chennai offices along the IT road in various premises. Concretely, the IT Corridor is made up of the expressway and the adjacent roads; key landmarks include three IT parks, developed by State-level parastatal agencies, hosting various companies within their large compounds, in office buildings provided by the agencies or in premises built by the individual companies. In addition there has been a mushrooming of various company campuses (e.g. Cognizant own campus-cum-headquarters) and privately-run IT buildings and special economic zones (SEZ). The attractiveness of the area was enhanced by various tax and financial incentives for companies settling down in the area (listed in the next point).

The daily presence of nearly 200 000 IT employees in the area, plus the considerable revamping of what was formerly a semi-rural fringe, has triggered considerable indirect employment opportunities in retail services (shops, food stalls, restaurants), support services (security and cleaning) and transport, which are further detailed in the next section. Additionally the demand for housing for employees has introduced another major change of the landscape and local economy, which can be summarized by four types of development. First, the boom in housing (for rental and purchase) has translated into a constant increase in density and has raised land values along the road and in nearby localities, with the general development of *residential houses* on the one hand, and of *apartment buildings* in selected locations on the other hand, especially at the two extremities of the Corridor such as the affluent suburbs of Adyar and in the once-rural Egattur and Kazipattur areas in the southern part of the Corridor (cf. images nos. 3 and 4). Densification is apparent, as shown in image no. 1, taken in the northern half of the area. Furthermore, many house owners in the previously rural localities have built *multi-storey houses* including single rooms rented out to bachelors (who are overrepresented in the software industry, (cf. below). There has also been a considerable mushrooming of women's ('ladies') and men's ('gents') *hostels,* which rent single or shared rooms on a monthly basis.

Meanwhile, water and power provision have not kept pace with the remarkable increase of daily commuters and new residents, contrary to initial projections of the IT Expressway mega-project (see further section 4). The situation has deteriorated to the point where it takes a toll on companies' profits to run mostly on water tankers and uninterruptible power supply (UPS) generators, which makes the area increasingly less attractive than in the first half of the 2000s, when most companies settled here.[16] To summarize, the road infrastructure has helped to develop the area economically turning it into a buoyant new suburban extension of Chennai to the South, but the lack of sufficient water and power infrastructure have become major drawbacks. For this reason, and also because the housing provision lags behind demand, most IT employees still commute from the city and from along the coast, which results in major traffic congestion along the Expressway. The overall development of the area is also not yet up to the level of IT employees' middle-class requirements and aspirations.[17]

2.3. Consolidating the vision[18]

As far as the IT Expressway megaproject is concerned, its implementation and the consolidation of the vision underpinning it i.e., an IT cluster built around 'world class' infrastructure, were facilitated by a series of supporting laws and notifications, including the following:

- The land acquisition process was conducted under the Tamil Nadu Highway Act 2001, which effectively replaced the Land Acquisition Act of 1894 and allowed the State to use a fast-track, taking possession of the land within 30 days after public notification, without waiting for compensation payment nor for court decision in case of litigation. Acquisition was conducted by a special team belonging to the TNRDC, so that the entire process took less than two years.

- In addition to the IT Expressway, other large-scale undertakings have been developed by parastatal agencies over the last decade to attract IT companies and support the development of the sector in Chennai. In particular, three IT parks were built along the Expressway, each one located approximately 10 km from the other ones (see Map 2). These clusters

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16   This analysis is based on interviews conducted by Aurélie Varrel with company representatives, November 2011 - March 2012, Chennai.

17   Source: interviews conducted by A. Varrel with real estate salespersons, Chennai, March 2012.

18   IT Corridor and IT Expressway are used interchangeably in the text.

Image 1: Residential and commercial built-up areas between the IT Expressway and Pallikanarai marshland (Okkyiam Thoraipakkam). The competition for space between individual houses, residential townships and office buildings (then under construction) is apparent.

Source: A. Varrel, O.T., March 2012

Image 2: House with additional upper storeys offering rooms for rent. The verticalization of what used to be village houses is a noticeable trend in all villages near the IT Expressway.

Source: A. Varrel, Padur, August 2010

Image 3:   Hiranandani township, in Egattur, at the southern exit of the expressway. This picture illustrates the mushrooming of upscale residential buildings in Egattur and further, around the southern toll and beyond CMA limits.

Source: A. Varrel, Chennai area, November 2011

Image 4:   Panorama of the rapidly changing residential landscape, south of the toll gate along Muttukadu laguna.

Source: A. Varrel, Chennai area, August 2010

or enclaves offer specialised infrastructure required by IT companies to start their operations:

- TIDCO (Tamil Nadu Industrial Development Corporation) developed TIDEL park at Taramani, on the southern edge of Chennai city (the northern extremity/entrance of the Expressway) in 1998-2002;

- The Electronics Corporation of Tamil Nadu built ELCOT Park in Sholinganallur, at mid-distance from the tolls, along the road connecting the IT Expressway to the airport. The project was launched in 2005, but has moved at a slow pace, due in large part to the fact that it is located on a marshland, and is being built as a polder.

- SIPCOT (State Industries Promotion Corporation of Tamil Nadu) Park in Siruseri, was officially launched in 2005. However, development did not get fully under way until 2009, probably because of its remote location from the city.

Each of these parks can be considered as a mega-project per se that was developed by distinct (competing?) para-statal agencies under slightly different dispositions. The IT Expressway links them both with each other and with the central part of the metropolis. It is to be noted that these three facilities have been converted into Special Economic Zones, as per the national SEZ Act, 2005.

- **Change in CMA boundaries.** The extension of the CMC boundaries in June 2011 (see Map 1 on page 8) to include the area between Perungudi and Semmencheri reflects the will to streamline the management of this area. In theory it should enable more stringent enforcement of rules and regulations by the Corporation and by Chennai Metropolitan Development Authority (urban planning body).

- **ITEL phase 2.** Even though the IT Expressway is in some important respects not yet completed (missing service lanes, sidewalks), especially in the southern part furthest from the city, the decision to extend it was made in 2009. Phase 2 aims to link Siruseri, located at the southern edge of the Corridor, to the town of Mamallapuram, a length of 26 km. The initial 2 to 4-lane project was upgraded to a 6-lane facility, which will require considerable land acquisition. The approval of a second phase effectively sanctions Phase 1, despite the shortcomings in implementation compared to initial ambitions, but it resembles in many respects a more classical project of road widening and upgrading with a view to turning it into an expressway. As yet, no incentives have been announced to attract the IT sector or any other type of economic activity.

2.4. Assessing the role of large-scale infrastructure projects in the urban economy

As stated above, the IT Corridor has become the major IT location in the city. Notwithstanding, three observations are in order: (1) in some cases companies still choose to maintain their headquarters and marketing activities in the central part of the city; (2) attractive alternative locations compete with the IT Corridor, notably the DLF and Olympia SEZs, two large privately-developed IT parks that are closer to the city limits and to the international airport; (3) the density of IT activities decreases as the distance from the Guindy education hub and the airport increases, accounting for the lower density and success rate of IT parks and buildings in the southern half of the Corridor. Yet the buoyant development of activities in the Siruseri SIPCOT IT Park (at the extreme southern end of the Corridor), manifested on one hand by the recent relocation of India's n°1 IT company, which has regrouped all its Chennai activities there, and the mushrooming of more than a dozen large scale residential complexes in the same area on the other hand, seem to hint at a discontinuous pattern of nodal development in the southern part of the Corridor. This specific area displays some similarities with the model of 'edge city' defined by Joel Garreau (1991) as a spatial template of metropolitan regions in the post-fordist era: a high concentration of office and residential space catering to the services sector, built in a metropolitan peripheral location with no previous urbanization, connected by road only. Hence this large-scale road infrastructure turns out to have become one of the structures guiding the urbanization front in the southern fringe of the metropolitan region. The development of a node concentrating activities and residential facilities far to the South is of particular interest, as it parallels the Mahindra World City experience taking place in the southwest of Chennai (see Map 2), which is a privately developed integrated industrial township. These new polarities hint at emerging forms of peripheral developments.

WP2 research involved questioning how megaprojects fit with the planning schemes and city visions. In the particular case of Chennai most megaprojects were not announced in the Master Plans. It should be noted however that the process of planning in Chennai has suffered considerable delay, contestation and disruption over the years[19]. Furthermore, city vision documents are scarce (*cf.*

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19   Between the First Master Plan (1976) and 2007, there was no official vision document guiding Chennai's development. The 2nd Master Plan, initially submitted in 1995, was suspended by court order and was revamped before being published in 2008. See Srivathsan 2012.

supra). Besides this local specificity, the transport related megaprojects, such as the MRTS-city train, the forthcoming metro and the projected monorail have all been initiated and developed by the Government of Tamil Nadu (GoTN). The political decision making with regard to these projects has been disconnected from the planning exercise. In general, such high profile projects are indeed very much linked to the ruling political parties and turn out to be ad hoc projects, they are then often incorporated a posteriori in planning and vision documents. The IT Expressway described above is a good example of such a process. It was actually developed during the revision exercise for the Second Master Plan. It was during the adjournment of the document initially proposed (post-1995), around 2000, that the government commissioned the CMDA planners to elaborate the idea of an IT Corridor along the OMR.[20]

Our research suggests that one of the reasons the (regional) State government promotes transport infrastructure megaprojects in Chennai is the visibility and appeal to modernisation that are encapsulated in such projects. Such projects are usually associated with one prominent politician, who thereby proves his/her commitment to Chennai constituencies with a pet project. Such projects also help to project the city as a modern metropolis, both at the national and international scales: intra-city train, tolled intra-urban highway, metro, all these projects correspond to successive generations of 'modern' forms of urban transport. Secondly, such projects serve the interests of well-documented collusion between politicians, bureaucrats and contractors by fuelling the cash machine embedded in large-scale roadworks. Last, it is relatively easy to have them funded: large-scale transport projects attract international funding from various foreign or transnational organizations, as they can be labelled both as "development driven" but also involve foreign private companies who may come with funding from their respective national governments[21]. Thus States are able to maintain control over such projects while receiving ample funding.

However, since these projects are dependent on the ruling party at the regional scale (GoTN), they can be shelved after elections, which does not fit with the time scale of full development and implementation required for large scale projects, nor with planning/visioning time span.[22] Hence the difficulties observed in completing the IT Expressway are a reminder of the non-completion and neglect faced by several previous transport projects in Chennai once their political promoters were removed from power e.g., MRTS and its huge stations, which were nearly abandoned until 2012[23] and the monorail project that was shelved in 2006 and revived after 2011, when the ADMK Chief Minister returned to power. Importantly, it should be noted that the PPP model that was promoted to develop the IT Expressway did not prevent it from being vulnerable to this pattern of political influence.

2.5. Actors and stakeholders – competing strategies and interests shaping social and spatial patterns in the city

To what extent can the development of the IT Expressway, a road infrastructure meant to help develop a highly specialized economic zone, be seen as the result of a growth coalition? Here we will analyze the relations between public actors like GoTN and parastatal agencies engaged in the making of the area, as well as private sector actors such as IT companies and real estate companies. With respect to the public sector, the IT sector has received continuous support from the ruling parties at the State government level through various policies and through the actions of various parastatal agencies, depending on different ministries.

There were several instances when these different actors formally came together to build up collaboration in order to develop the area. As mentioned, the government's interest in developing an IT Corridor started taking shape in the early 2000s at a time when IT companies started locating their premises along the OMR, and this triggered the government's request for a preliminary report (*cf. infra*). A meeting was convened by TNRDC and ELCOT at the end of 2004, with all major real estate companies in Chennai

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20 This document, which was not released in the public domain could not be located for the study, suggested various planning decisions to facilitate this upgrading. For instance, in the first draft (1995) the road between Perungudi and Pallavaran had already been designated for this purpose.

21 This conjunction of public and private interests and co-funding is exemplified by the recent plan of investments of the Japan International Cooperation Agency signed with GoTN for road infrastructure development in Chennai area, with special focus on developing the outer ring road and the "automotive Corridor" area (National Highway 4), where Japanese companies own numerous production units.

22 In the last decades, the two main parties in Tamil Nadu generally alternate at each election.

23 After 2012, work in these stations has either been funded by the private sector – ex Thiruvanmyur station that serves Tidel Park, or by Southern railways, motivated by safety reasons.

invited. ELCOT presented projections of IT growth, TNRDC presented the road project and both agencies encouraged developers to build IT buildings and parks along the OMR to meet future demand for office space. They were requested to 'accompany' in this way the road upgrading process, turning it into an expressway, in exchange for relaxation on building rules, notably floor space index (FSI). The response looks extremely positive, judging by the numerous recent buildings along the road. Yet the 2008 crisis, then the uncertainty surrounding the expiry of the STPI scheme (Central government scheme offering various tax and customs relaxations to the IT industry) under which most of these buildings were registered (with no possibility to transfer to SEZ) resulted in long delays before occupancy for many of these buildings.

A second instance was the initiative of an IT group under Steering Committee of the State Planning Commission (including high ranked officials and IT sector representatives) in 2011-2012. In this discussion space, IT companies raised demands to the government, (e.g., for completing roadworks, improving bus transport, providing power), and PPP style projects were considered wherein IT companies would fund some secondary infrastructures and for operating public transport along the IT Expressway, etc. Yet this group was a short-lived one. Hence it is difficult to talk about a growth coalition, based on public and private actors coming together to develop the area, as it lacks stability and also a nodal point of coordination. The extension of CMC boundaries up to Semmencheri in June 2011 should contribute to streamlining the management of the area, by enforcing a stronger control by the Corporation and by the CMDA (for enforcing planning rules). But as much development has already occurred, it may involve mostly regularization of existing developments.

As for the IT industry, it must be noted that its agenda is put forward in other arenas than merely at the State-level, through its influential national-level organization Nasscom, which conveys to the central government the demands raised by the major actors of the sector.

The IT Expressway megaproject has shaped urbanisation patterns by channelling investments (by real estate companies and by IT companies) to this part of the metropolitan area, creating a fast-developing corridor. It is to be noted that this megaproject did not involve major population displacements, contrary to many large-scale projects. But development of the area creates pressure on land prices and occupancy. It translates into indirect effects on lower-income residents, for instance for villagers, who are being displaced from agriculture and fishing occupations, and for working-class residents, who are being priced out of the new residential developments.

Furthermore, the strong political support to the economic development of this area was not accompanied by public investment in basic services, as illustrated by the pending issue of power and water scarcity. Last, this is an ecologically-sensitive area, as it is a low lying area, bordered by a canal-cum-laguna to the East (Buckingham Canal, Muttukadu Laguna) and by a major water body to the West (Pallikanarai Marshland) (more in Section 4 below). The area is also classified as prone to tsunami. This translates into seasonal floods and instable ground, which jeopardizes the sustainability of the massive investments in large and high buildings.

2.6. Socio-economic effects of the IT Corridor[24]

A pilot study, built around a primary survey, was conducted to examine the local economic linkages generated by the development of IT activities in the IT Corridor to understand the links between the creation of new mega-infrastructures and the evolution of the urban economy. In particular, the study sought to generate data about the patterns of direct and indirect employment created in the IT Corridor, and to gain insights into the new consumption and mobility patterns of those employed in the IT firms.[25]

In the case of technology or IT parks, economic linkages can be classified into direct, indirect and spin-off effects. The first set of direct linkages may refer to the immediate outcomes like employment and its income effect arising from construction of infrastructure. The second set of direct linkages emanate from employment and profits and the consequent income effects generated from firms moving to benefit from the infrastructure created. Indirect linkages include supplementary employment and income generated through new services that cater to the demand emanating from direct effects. Transport services, food supply, security and gardening services, housing, banking and other commercial services are some of the indirect linkages that can be generated. Spin-offs refer to the possible productive linkages that are generated due to demand for new inputs. Software development for IT firms, computer maintenance and hardware supply are some of the possible spin-offs that can be envisaged.

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24 Funded by the CNRS partner, and coordinated by Eric Denis at the French Institute of Pondicherry, this study was designed and supervised by M. Vijayabaskar (MIDS) and M. Suresh Babu (IIT-Madras).

25 With regard to the latter, the analysis is limited here to the consumption of housing due to space constraints.

Table 4: Summary of economic linkages

| Type	Direct Linkages:	Indirect linkages	Spin-off effects
Description	Immediate outcomes include income and employment from new firms (start-ups, relocation) and from construction of infrastructure	Income and employment generated from services catering to news demands for transport, food supply, gardening, commercial services	Income and employment generated through demand for new inputs, e.g., software development
Time Frame	Short term	Short to medium term	Long term
Example(s)	Construction of infrastructure, employment at IT firms	Employment at firms servicing new activities, transport services etc.	Software development, computers maintenance

Source: Vijayabaskar, Suresh Babu (2013).

Since the IT parks were already built at the time of the survey, it was not possible to capture the linkages created by the construction of the parks. Hence, the analysis was confined to linkages created by the employment generated through the functioning of these parks, both direct employment in the IT firms and indirect employment generated within the two parks like security, food and gardening services. The emphasis was on the nature of employment generated, patterns in sourcing of labour, extent of labour drawn from within the city and importantly on the nature of segmentation generated based on access to formal education, family background, skill levels, gender and caste. This provided insights into the immediate but differentiated linkages that have been created by the new megaproject.

Although the aim had been to study a sample based on employees in one of the IT parks, the firms managing the parks along the IT Corridor did not grant permission for the study. Consequently, the sample was compiled through contacts in individual firms located in two IT parks, namely the Ascendas IT park at Taramani and the SIPCOT park at Siruseri.[26] The survey was conducted using a structured questionnaire with a few open-ended questions on the perceptions of the employees about working and living on the IT Corridor. The data was collected partly by distributing questionnaires among the employees of the respective companies and partly through direct interviews. The choice of respondents was guided largely by access and hence done primarily through snow-balling techniques. A total of 154 employees in the two parks were surveyed. As far as their type of employment, most respondents were engaged in the IT sector (88), followed by services in the BPO sector

(10) and others belonged to sectors such as management engineering, research analysis, banking, accounting, etc.

The respondents consisted of 99 male and 55 female employees, a ratio that reflects to some extent the gender bias in IT-related employment, although data generated at a macro level tends to reveal an even smaller share of women employees in the software services sector. The age profile of the respondents too conforms to macro-scale observations with most falling in the 20-30 age group (Graph 1), and more than 50% are unmarried. The predominance of youth in the workforce definitely has implications for the nature of consumption and mobility that will be discussed later. Regarding the geographical origins of the employees, an important observation is the fact that most of the respondents are from outside Chennai and have in fact moved to Chennai to work in the IT firms (Table 4). Though there are variations across gender on this point, a large share of the total originates from outside the city.[27]

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27   A few of those interviewed have moved to Chennai to study in colleges in the city after which they have found placements in these IT firms.

Graph 1: Age Group of the Respondents

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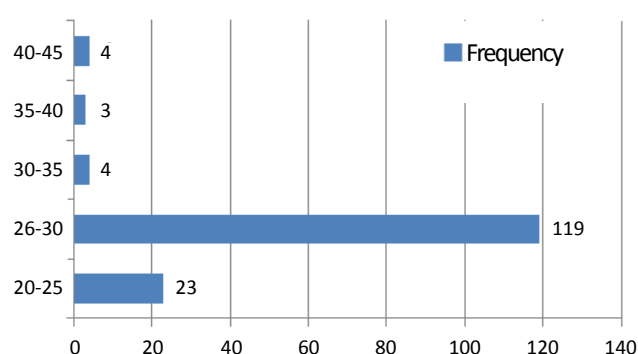
26   Some of the major companies selected randomly were Tata Consultancy firm (Siruseri), Cognizant Technology solutions (Siruseri and OMR Navalur), Polaris (OMR Navalur) Nokia, and Siemens.

Table 5: Summary of economic linkages

Gender	Marital Status (%)		Place Of Origin (%)				
	Married	Unmarried	Rural	Small Town	Metro	Adjoining Chennai	Chennai
Male	43	56	12	49	5	13	20
Female	19	35	4	26	3	4	18

Not surprisingly, the labour market for employment in the IT sector is characterised by a high level of educational qualifications, which naturally restricts access. All the respondents have undergone at least undergraduate education, access to which is confined to only 10 to 13 % of the population in that age group in the country (the variation in the estimate comes from the differences in the data sets used to calculate the gross enrolment ratio). This exclusivity also implies that the benefits of the huge subsidies given to private capital to promote the development of IT parks tend to accrue only to a small segment of the labour market. It should be noted that this exclusivity is in fact less in a state like Tamil Nadu, which has followed a policy of affirmative action (reservation) in higher education in favour of candidates from backward, most backward and scheduled caste households. This is partly apparent in the survey from the fact that a significant number of respondents come from small towns and even from rural areas in some cases. In Delhi or Bangalore, the exclusivity is likely to be even higher.

Indirect employment effects

The study also examined indirect employment opportunities generated through new services that cater to the demand emanating from direct employment and income effects. Obviously it is not possible to map all the linkages that are formed due to this megaproject, due to its scale and its nature, but nonetheless some clear effects can be observed for instance in transport services, food supply, security, housekeeping and housing. Interviews for this part of the study took place in and around the Siruseri IT Park as well as IITM Research Park, Ascendas IT Park and TIDEL Park. They consisted in detailed and semi-structured interviews with cab, bus and autorickshaw drivers, security guards, restaurant, grocery and shop owners and employees, hawkers and managers of working women's hostels.[28] Due to space limitations only selected findings

about the transport sector are presented here (drivers of private cars, cabs, buses).

Though Chennai has one of the country's better bus networks, commuters indicated that there are not enough transport services to the outlying hubs. It is evident to anyone travelling along the IT Corridor that there has been insufficient planning for transport infrastructure to access IT firms and parks on the IT Corridor. Massive traffic jams are an everyday occurrence during the peak hours. These jams are particularly visible at two junctions that intersect with two arterial roads and at the three toll booths. Tankers transporting water, autorickshaws transporting passengers to and from locations on the IT Corridor to older residential neighbourhoods and villages located off the IT Corridor, shared autorickshaws and vans run by private operators, private cars of middle and higher ranked IT employees driven more often by paid drivers than by the owners themselves (cf. image no. 5), public transport buses carrying passengers who are predominantly working in the many non-IT jobs (with lower wages than those paid to the IT sector employees) in this area or long term residents returning from work in other parts of the city, private air conditioned buses carrying IT employees, private cabs engaged by IT firms for senior staff and for those employees private vans and cabs carrying call centre and back office processing employees (cf. image no. 6), heavy vehicles carrying construction material for the various ongoing works on this road, in addition to the large number of two wheelers (motorcycles, scooters) divided between IT and non IT-employees all vie for space on this what has been increasingly recognized as a traffic hotspot in the city. Although the public transport service run by the para-statal Madras Metropolitan Transport Corporation (MMTC) runs 400 trips to the IT Corridor daily, these are services that only touch the road at various points. Rajani Seshadri, a vice-president at Tata Consultancy Services, one of the major firms present in Chennai stated: "We need a service that runs from

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28   IT Parks have strict measures against the presence of outsiders and consequently it was difficult to conduct the interviews; there was also unwillingness among the

people approached. Finally, interviews were conducted with 20 cab drivers, 15 bus drivers, 30 security personnel, and a few owners each of restaurants, hostels and small commercial shops.

Image 5: Private cars and taxis parking outside Tdiel Park, with drivers waiting

Source: A. Varrel, Chennai, March 2012

Image 6: Company buses outside Ascendas Park and side activity for drivers and passengers: sugar cane crusher

Source: A. Varrel, Chennai, March 2012

Image 7:   Fleets of company buses transporting IT employees require parking space during shifts, occupy any spare space in the area

Source: A. Varrel, Chennai, April 2012

Image 8:   Side activities: street vendors gathered on the sidewalk opposite to Ascendas Park main entrance
Source: A. Varrel, Chennai, March 2012

Madhya Kailash to Siruseri. A bus is safer than sending employees alone in cabs at night. Doing this would bring revenue to the government". The company, with five offices on the stretch, has 15,000 employees who travel in cabs, company buses or private vehicles (cf. image no. 7). [29]

Regarding private cars, there are a large number of drivers employed directly by upper middle class professionals and upper income segments in the city. Many of these professionals are employees of IT firms who engage drivers not only to drop them off and bring them back, but also to undertake a range of household chores like picking up their children from school, taking them to classes, shopping for household requirements, paying of bills, etc. Salary levels for this segment have increased considerably in the last 6-8 years with a growing demand emanating primarily from the boom in the IT sector. Starting with a salary of Rs 5000 in 2006, a driver respondent in this category receives at present a salary of Rs 11,000. This doubling of salary in a span of 6 years is, according to him, primarily due to the inability of supply to keep pace with the growing demand for drivers. An important reason has been that most of the drivers in this segment are drawn from neighbourhoods that are located close to the places where the employers reside. Since employers do not provide accommodation to their drivers, the entrants into this segment tend to be those who have access to housing in close proximity to the employers' residences. In areas like Tiruvanmiyur, Adyar and Velacheri, where many IT professionals employed on the IT Corridor live, drivers are recruited from nearby poorer neighbourhoods/slums. A significant number of them also come from Taramani, which is close to all the three areas. They commute in two wheelers to their employers' houses.

Another segment which has grown in large numbers along with the growth of the IT sector in the city are drivers employed with private cab firms working exclusively or largely for IT sector firms.[30] According to a cab driver working for Tata Consultancy Services, nearly 500 cabs are provided to Siruseri SIPCOT, on a daily basis.

The age group of the 20 cab drivers interviewed, all male, was between 19 years to 45 years, with most falling in the below 30 category. More than 50% of them have migrated from different parts of Tamil Nadu. While a large share come from neighbouring districts like Thiruvannamalai, Vellore, Villupuram and Cuddalore, a substantial proportion also come from the southern districts of the state, particularly the semi-arid regions. A majority of them are unmarried. The attraction of higher salaries for drivers in Chennai is reported to be a major incentive in their decision to migrate.

Many of the respondents report that they are happy with the development of the IT Corridor as they believe it has improved their employment prospects. To some however, problems like traffic congestion, late night pick-ups and drops and problems posed by stagnant water and drainage overflows during the rainy seasons because of poor sewage systems in this area are sources of concern. Many of them also feel that once they are married and have children, it will be difficult for them to keep such work hours. In terms of upward mobility in this profession, there are two routes. Some of them who are long term residents of Chennai with housing located close to elite neighbourhoods prefer to take up employment with wealthy households, as it offers them more steady work hours and the possibility of returning home in the evenings. But in general, a major route of mobility is to save and to buy a second hand or a new car of their own. Once they buy a car, they see themselves as being an entrepreneur where they have the freedom to offer their services to the cab company of their choice. They need to pay a small share of their earnings as a commission to the parent firm whereas whatever work the parent firm gets, they get a small proportion. The advantage of being linked to a larger firm is the access to the car rental market opened up by large IT firms, which they as individuals would find it hard to access.

In terms of salaries reported, there is a substantial difference between cab owners and those driving for the local travel agents, who in turn pay them the monthly salaries. Cab Owners report earnings of nearly 40,000 per month whereas cab drivers report an income of hardly 10,000 per month. Clearly, there are incentives for drivers to invest in a car of their own. However, there are also significant risks involved, such as indebtedness or car accidents.

The last major segment of drivers are the bus drivers working for private bus operators who are engaged by IT firms on the Corridor to transport IT employees from different parts of the city. Given the fact that many employees reside very far from the IT parks, and the paucity of public transport, there is a compelling need for IT firms to provide transport facilities for their employees. Even use of private transport tends to be exhausting for long distance commuters given the traffic, not to mention the costs involved. There are a few dominant bus operators catering

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29 See "Wanted: Shuttles on IT way to ease travel", *Times of India*, 12 April 2010. URL http://articles.timesofindia.indiatimes.com/2010-04-12/chennai/28125459_1_bus-corridor-bus-rapid-transport-system-madhya-kailash accessed on 17 July 2013.

30 Some of the main companies that cater to the IT parks/firms are Aristo logistics, SAM, Mahindra, AP Travels. Other vendors include Praveen travels, OMR travels, i-gate, SRS and B-R Travels.

to IT firms on the IT Corridor. For this study 12 bus drivers employed in three of these firms were interviewed.

In the case of bus drivers, the proportion of migrant workers is higher compared to that of cab drivers. Once again, the bus drivers were male and mainly belonged to the age group of 22-45. While some of them have studied till 10th, we also find that their educational qualifications are generally less than those of the cab drivers. An important finding was that none of them is directly employed by the IT firms. Despite the fact that all of them drive exclusively for specific IT firms, all of them are employees of the bus operators. This gives an idea of prevailing labour relations and the ubiquitous use of sub-contracting by IT firms. Some of the transport firms do not provide social security benefits like ESI or Provident Fund, while others do. Parveen Travels is the major contributor to the bus service in the SIPCOT IT park. It runs more than 200 buses to the park out of which 110 buses run only for Tata Consulting Services, followed by 30 for Cognizant Technology Solutions Corporation. The basic monthly salary earned by a bus driver is Rs 7500 with a compulsory and annual increment of Rs 250. It was found that an element of tightness in the labour market allows bus drivers a degree of bargaining power.

Other economic activities analysed in the study included:

– private security services (for IT firms, residential complexes, gated communities, etc), which has become one of the fastest growing segments of low-end service sector employment in India's large cities;[31]

– housekeeping and maintenance staff, which are an integral part of any IT Park;

– food vending: IT parks provide food courts, some of which are open to the public and include global food retail chains; private eating establishments along the IT Corridor catering to many different income groups from high-end to very cheap[32];

– hostels providing rental housing for men and women employed in the IT firms.

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31 As Vijay K. Nagaraj points out, India is home to one of the largest private security industry in the world, employing anywhere between 5 and 6 million guards in about 15,000 odd firms (2012: 10). Industry bodies have pointed out the potential for this industry in future. Over a period of time, this sector has also witnessed the rise of large domestic firms and the entry of foreign firms through takeover and mergers. G4S, a leading firm in this segment, for example, is a multinational firm with operations in 125 countries.

32 It was observed that most restaurants within food courts and along the IT Corridor are branches of existing restaurants. There are hardly any stand-alone restaurants on the IT Corridor.

Housing and Residential Patterns

The entry of large numbers of unmarried men and women from outside the city generates demand for housing, which has led to shifts in rental patterns in parts of the city. Earlier, there was reluctance on the part of property owners to offer their houses for rent to unmarried men and women as they were perceived as incapable of maintaining the value of the premises. However with the demand from this segment backed by relatively high salaries, there has been a growing preference for such tenants as they can afford to pay more than the previously prevailing rates, especially when two or more take a single apartment for rent. Rental advertisements in the residential neighbourhoods bordering the IT Corridor clearly reflect this trend. On the one hand, there is an explicitly stated preference for 'bachelors'. Significantly, this demand from high paid software employees has also led to tremendous increase in the price of housing rentals and land/apartment values in these neighbourhoods.[33] Employees who are renting premises indicated a preference for neighbourhoods bordering on the IT Corridor like Tiruvanmiyur, Velachery, Taramani and Navalur. Whereas the first three are very close to the IT Corridor, Navalur is a village located directly on the IT Corridor and is witnessing large scale commercialization, real estate boom, and rise of several apartment complexes. Other localities where respondents reported living are located further away, in the city centre, like Mylapore, T. Nagar and Nungambakkam. In such cases, respondents tend to live with other members of the family and are long-term residents.

Given that migrants account for the bulk of the workforce, most do not own the houses or apartments where they are staying. 107 of the 154 respondents lived in rented premises. Interestingly, this also includes some of the married male respondents whose families are often left in their or their spouses' native place. Only 34 married respondents were living with their family and the rest of them (i.e., 28) stayed with friends, as paying guests or in rented places. For those with children, the need to travel frequently to clients' sites tends to disrupt the schooling schedules, leading many of them to leave their children in their native places to ensure continuity in schooling. Or else, the spouses too are employed in other cities and both of them try to seek jobs to move in together.

Of the 107 respondents who do not own a house in Chennai, many spend a good amount of their income on rent. This can be better understood with the help of the Table 5 below, which shows that 49 of the respondents spend up to 5000 rupees per month on rent, followed by 20 employees who spend Rs 7500-

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33 See "Property values in an unequal city", *The Hindu*, 2 June 2007. URL: http://www.hindu.com/pp/2007/06/02/stories/2007060250620100.htm last accessed on 18 July 2012.

10,000 per month. Three respondents pay above Rs. 15,000 for rent. At the same time, 83 of the respondents report a salary of less than Rs. 30,000 per month. Thus, going by the salary reported, many of them spend anywhere between 20-30 per cent of their salaries on rents. Those who are paying less tend to be those sharing accommodation with some of their friends and colleagues. This demand for housing as pointed out earlier has led to tremendous increase in rents in the neighbourhoods close to the IT Corridor.

Importantly, this growth in rental income implies two possible tendencies. One, the income generated through employment in the IT parks tends to be shared with property owners in the vicinity of the Corridor. The income accruing to property owners is therefore not additional income but a share of the income of the software employees appropriated through property ownership. Importantly, this increase in rentals is likely to have a negative impact on those who do not have access to either property or incomes of the magnitude offered by the IT sector. This leads to a serious crowding out effect, since this inequity in access to housing tends to be aggravated by the lack of state investments in affordable housing in the city.

Even though the bulk of the respondents stay in proximity to the IT Corridor, a majority indicated that they travel more than 10 km to reach their workplace. Only a small proportion of them travel less than 5 km to their workplace. The SIPCOT SEZ in Siruseri is located at the Southern end of the Corridor, and hence

even living in neighbourhoods in the Northern part of the Corridor like Adyar or Tiruvanmiyur implies a travel distance of more than 10 kms. Interestingly, many indicate that they are unwilling to shift to some of the new residential complexes that have come up on the IT Corridor at this stage. Accessing other amenities of urban life appears to be one important factor. For some of the female respondents, safety was one of the primary reasons for choosing a particular locality.

Table 6: Amount spent on rent by the respondents (per month)

Rupees (per month)	Rent
0-2500	7
2500-5000	49
5000-7500	19
7500-10,000	20
10,000-12,500	5
12,500-15,000	4
Above 15,000	3
NA	47
Total	**154**

3 Addressing Urban Inequality: Focus on Sub-standard Settlements

3.1. Shortage of decent housing and socio-spatial segregation[34]

As per the Census data, 19% of the population of Chennai Municipal Corporation lived in so-called 'slums' in 2001 and 28.5% in 2011[35]. However, the definition of a slum used by the Census of India includes heterogeneous types of settlements, and excludes the small slum clusters with less than 300 people, which

are likely to be the most precarious and underserved (see Box below). Therefore, this percentage does not capture properly the extent of housing poverty.

The 2003-04 survey of slums undertaken by a private consultant for the Tamil Nadu Slum Clearance Board and the Tamil Nadu Urban Infrastructure Financial Services limited (TNUIFSL)[36] listed 242

34 This section is primarily based on inputs from Véronique Dupont and R. Dhanalakshmi, on the basis of research conducted in the framework of WP3.

35 This increase in the percentage of slum population would require further investigation and analysis when more detailed census data are available.

36 Source: TNSCB & TNUIFS. Pre-feasibility study for identification of environmental infrastructure in slums in Chennai Metropolitan Area [Indian Resources Information & Management Technologies, Ltd, Hyderabad in association with Community Consulting Indian Pvt Ltd (TGC India), Chennai]. Final Report- Chennai Corporation Area (September 2005) & Final Report- Chennai Metropolitan Area (excluding CMC) (April 2006).

Box 1:   Definition of slums as per the Census of India

The Census defines slums in the following terms: "(…) residential areas where dwellings are unfit for human habitation by reasons of dilapidation, overcrowding, faulty arrangements and design of such buildings, narrowness or faulty arrangement of street, lack of ventilation, light, or sanitation facilities or any combination of these factors which are detrimental to the safety and health. (…) For the purpose of Census, slums have been categorized and defined as of the following three types:

– Notified Slums: All notified areas in a town or city notified as 'Slum' by State, Union Territory Administration or Local Government under any Act including a 'Slum Act',

– Recognized Slums: All areas recognised as 'Slum' by State, UT Administration or Local Government, Housing and Slum Boards, which may have not been formally notified as slum under any act,

– Identified Slums: A compact area of at least 300 population or about 60-70 households of poorly built congested tenements, in unhygienic environment usually with inadequate infrastructure and lacking in proper sanitary and drinking water facilities."[37]

majority of squatter settlements located along water ways (73 slums housing 29,144 families), the rest being located along road margins, railways, and the seashore. Within the metropolitan area (but outside Chennai Municipal Corporation), 202 undeveloped slums were identified, out of which 90 located in objectionable areas, mostly squatter settlements along waterways and informal settlements along the seashore. However, this survey underestimated the actual number of undeveloped slums: during field work conducted in 2011 and 2012, we identified in the metropolitan area thirty-year-old objectionable squatter settlements along the Buckingham Canal (such as Arignar Anna Nagar – Canal Bank Road, selected for our case study), which were not listed and mapped in the 2003-04 survey.

Baud et al.'s study of deprivation mapping in Chennai, based on 2001 census data within the limits of the then Municipal Corporation, showed that the hotspots of poverty were found at that time in the old industrial northern areas of the city, built between 1900 and 1940 (Baud & al., 2009: 9). These areas had also a high percentage of people living in slums (Map 3). As explained below, new clusters of poverty have been created in the 2000s by the construction in the southern periphery of large-scale resettlement colonies for displaced slum dwellers, which gained the reputation of being 'ghetto[s] of poverty, crime and squalor' (Coelho & al., 2012: 53; see also Arabindoo, 2011b).

'undeveloped'[38] slums within the limits of Chennai Municipal Corporation, housing around 72,000 families or 330,000 people, accounting for less than 10% of the city population. A large majority (65%) of these settlements were located on government land. Noteworthy, out of these 242 identified slums, 122 (41,683 families) were categorized as 'objectionable' slums[39], which comprised a

3.2. Social housing and policies towards slums

The Tamil Nadu Slum Areas (Improvement and Clearance) Act, 1971 was modelled on the national Slum Areas (Improvement and Clearance) Act of 1956, which was first implemented in Delhi. However, the policies of the DMK (Dravida Munnetra Kazhagam) party, which won Assembly elections in Tamil Nadu in 1967, 'sharply diverged from the national housing policy. While the central government housing policy began to emphasise the role of the state as a facilitator of housing rather than a builder, the DMK housing policies focused on state construction of housing, explicitly limited evictions, and created a public discourse that allowed groups of political adept squatters to consolidate their hold on public land' (Raman, 2011: 75). The stated goals of the Tamil Nadu Slum Clearance Board (TNSCB) at the time of its inception in 1971 were 'to fully clear the city of slum within seven years, to prevent new slums from taking shape, and to provide basic amenities for slum-dwellers until their huts could be cleared and replaced with tenements' (ibid: 76). Three main broad strategies have been implemented by the TNSCB:

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37 Cf. Census of India 2011: http://www.censusindia.gov.in/ last consulted on 17 July 2013.

38 'Undeveloped' slums are differentiated from 'developed' slums, i.e. slums identified in a previous survey conducted in 1986-87, and which were since then developed and/or improved through development schemes and initiatives However, no clear definition of "undeveloped slums" is provided in the report beyond this distinction..

39 As per the Chennai Metropolitan Authority, "the slums situated on river margins, road margins, seashore and places required for public purposes are categorized as objectionable slums". Source: Chennai Metropolitan Development Authority, "Shelter", p. 147. URL: http://www.cmdachennai.gov.in/Volume3_English_PDF/Vol3_Chapter06_Shelter.pdf (last accessed 20-11-2012).

IMD [0,1]
- 0.17 to 0.22
- 0.22 to 0.30
- 0.30 to 0.38
- 0.38 to 0.46
- 0.46 to 0.54
- 0.54 to 0.57
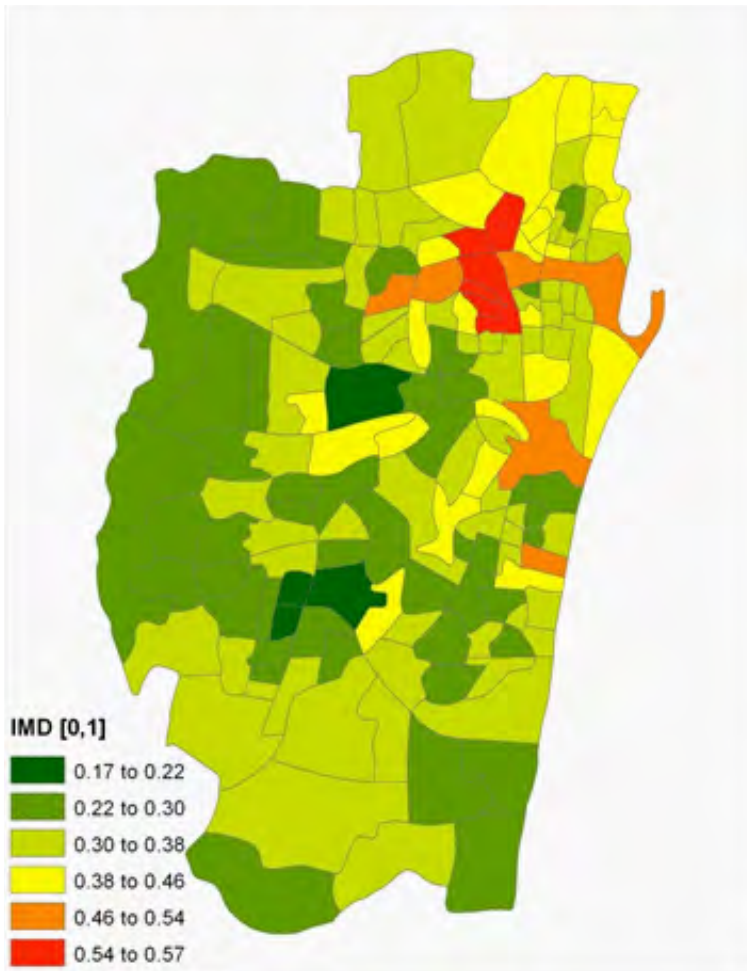
Map 3: Index of multiple deprivations and percentage of slum population in the Municipal Corporation of Chennai in 2001

Source data: Census of India 2001
Map conception: Baud et al. 2009; map design: Karin Pfeffer
Projection: WGS 1984 - UTM Zone 44 N

% slum pop
- 0 to 1
- 1 to 5
- 5 to 15
- 15 to 50
- 50 to 100
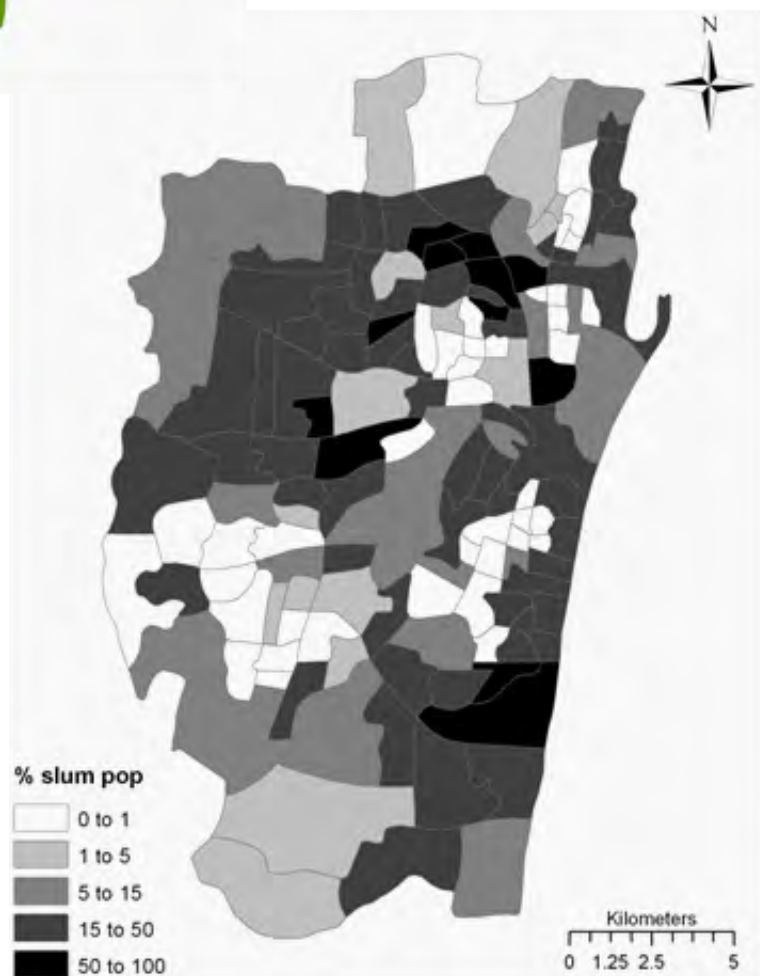
Source: Karin Pfeffer + I.Baud et al. 2009

1. *In situ* development – consists in providing basic infrastructure/amenities such as water supply, road and sanitation facilities in the slums on site;

2. *In situ* reconstruction – consists in constructing multi-storied tenements at the same location for the slum dwellers;

3. Rehabilitation and resettlement –consists in providing dwelling units in blocks of flats at alternative locations along with (in principle) infrastructure and services.

'TNSCB has been one of the pioneer agencies to construct *in situ* houses for the slum dwellers. However, in the recent past, TNSCB states that it is facing issues in implementing *in situ* development as well as reconstruction schemes because of lack of adequate open space in the urban areas for planned housing initiatives' (PUCL, 2010: 12).

The intervention of the World Bank in Chennai has in fact strongly impacted the implementation of policies toward slums in the city, as analysed by Nitya Raman in her paper 'The board and the bank' (2011), that provides a good summary of the changing scenario[40]:

Arguing that the initial years of the Tamil Nadu Slum Clearance Board were dominated by the priorities of the then ruling party, the Dravida Munnetra Kazhagam, whose government created it in 1971, this paper points out that shelter policies in the state had a formal orientation away from eviction and resettlement and towards in situ tenement construction, alongside an informal tendency to protect and reward those groups of the urban poor that the party was trying to court for votes. This arrangement was affected by the World Bank's entry into the domain of urban-sector funding in 1975, which, despite stiff resistance from the implementing agencies, eventually managed to change the focus of local policies and to a great extent delink the *TNSCB* from political influence. The effects of this can be seen in the *TNSCB*'s current housing policies. (…) [Thus,] by 2000, the TNSCB was almost exclusively involved in building large-scale tenement clusters on the outskirts of Chennai to house slum-dwellers evicted and relocated from central areas of the city. (Raman 2011: 74).

The two large resettlement complexes established in the 2000s in the southern periphery of Chennai, outside the limits of the Municipal Corporation at that time, namely Kannagi Nagar and Semmenchery resettlement colonies, are an illustration of the above policy shift (Map 4). They provide shelter currently to around 16,000 and 6,800 households respectively. Another resettlement complex in multi-storied buildings, the Perumbakkam scheme (near Semmenchery), is under construction, with funding from the Jawaharlal Nehru National Urban Renewal Mission. This large-scale complex was initially planned for a total capacity of 20,000 tenements, in order to resettle residents of slums located on objectionable land. The first phase of around 6000 tenements is nearing completion.

Slum evictions and population displacement gained momentum in the 2000s, as a result of the construction of urban transport infrastructure, as well as several restoration projects of waterways, canals and riverbanks and the beautification of the Marina beach (Coelho & Raman, 2010; Arabindoo, 2011a).[41]

3.3. Social mobilization and participation in sub-standard settlements[42]

How do civil society organisations (CSOs) mobilize to address the issues of sub-standard settlements? Which kinds of 'spaces' does the government provide for participation, i.e., 'invited spaces' (Cornwall, 2002) or claimed by the residents, i.e., 'invented spaces' (Miraftab, 2004) with regard to public action affecting these settlements? These questions were addressed by analysing two interlinked settlement case studies, both located in the IT Corridor area (Maps 1 & 4).

3.3.1. Introduction of the settlement case studies

The IT Corridor is an interesting site for examining issues pertaining to sub-standard settlements, as the development of this Corridor has been associated with

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40 Some observers contest this interpretation of the World Bank's influence, arguing that local political compulsions have continued to shape policy decisions taken by TNSCB.

41 For further details, see Dupont and Dhanalaskhmi (2013).

42 This section draws on Dupont and Dhanalakshmi (2013). Details on the methodology, source of data and further developments regarding the case studies are available in that report. For details regarding the conceptual and analytical framework, see Braathen et al. (2011).

Map 4: Location of case studies in the IT Corridor area of Chennai

1 SSPDL Matrix Tower

2 ASV Suntech Park

3 Elcot IT park

4 InfoSys

5 Sipcot Aspire

Legend

IT corridor companies

- ● campuses of big companies
- ● big IT parks (parastatal, pub. dev'd)
- ● big IT parks (privately dev'd)
- ● IT buildings, occupied
- ● IT buildings, unoccupied (04-2012)
- ● infrastructure
- ● undefined

C2S project sites

- IT clusters
- Resettlement areas
- Squatter settlement

Boundaries

- –·–·– Chennai MC boundary new
- ······· Chennai MC boundary old

Topography

- —— coastline
- —— other roads
- —— primary roads
- —— secondary roads
- —— trunk road
- ✳ Flood hotspot
- marshy land
- water bodies

Kilometers
1.5 0.75 0 1.5

Sources: Fieldwork data chance2sustain
Conception and design: Baud, Dupont, Pfeffer, Varrel 2013
Coordinate system: GCS WGS 1984

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rising land values and concomitant land speculation, the extension of the MRTS, and various 'beautification' operations, especially along the Buckingham Canal that flows parallel to the IT Corridor, in short, transformations that usually entail slum evictions. In addition, the larger resettlement colonies built for evicted slum families since the 2000s are located in the IT Corridor zone. Consequently, we selected for in-depth study a squatter settlement along the Buckingham Canal, namely Arignar Anna Nagar, which is part of the 'objectionable' slums of the Canal Bank Road, and the resettlement colony Kannagi Nagar (to where many families evicted from Arignar Anna Nagar were relocated). The selection of these two cases allowed us to articulate issues relating both to squatter settlements and resettlement colonies.

Arignar Anna Nagar (AAN) stretches along 1.5 km on both sides of the Buckingham Canal, on land belonging to the Public Works Department. It is located in the former Neelankarai panchayat, and was included in the Municipal Corporation Area in November 2011 following the extension of the corporation boundaries (see Maps 1 & 4). The first settlers arrived 30-35 years ago, and today around 1500–2000 households are living in this locality. The area is prone to flooding, and the settlement is characterised by an acute deficit in basic urban services as well as physical and social infrastructure. The lack of drainage and sewerage system, and till very recently of garbage collection, contributed to make the locality highly unsanitary. However, the last field visits in 2013, subsequent to its inclusion in the Municipal Corporation area, revealed notable improvements. This indicates that being 'in the city' (as per its administrative delimitations) or outside, on its margins, does matter for slum dwellers.

Kannagi Nagar resettlement colony is located at about 25 km from the city centre, in the former Okkiyam Thoraipakkam panchayat, now included in the same municipal zone as AAN, namely Sholinganallur or Zone XV (Maps 1 & 4). This large housing complex of 16,000 one-room tenements in two or three-storied buildings was developed by the TNSCB for slum dwellers evicted from different places in the city, to make way for infrastructure projects or due to their location on objectionable sites. It also accommodated many victims of the December 2004 tsunami. The first relocated families arrived in 2000, followed by several waves of resettlement. Lack of adequate facilities in the colony and limited access to urban resources have been critical issues. Yet, without solving these infrastructural problems, the TNSCB is constructing 8000 additional flats (PUCL, 2010).

3.3.2. Social mobilization in the settlements in response to critical issues

In the **Arignar Ana Nagar squatter settlement,** the residents have continuously struggled to get more public amenities, especially through repeated representations to the local authorities (Panchayat and now the Municipal Councillors). The local members of the Democratic Youth Federation of India (DYFI) played an active role in addressing some of these issues, although their impact proved to be limited mainly to one street. Nevertheless, they collected financial contributions from the residents to build a pedestrian bridge over the canal, showing that residents could organize themselves at times of necessity and achieve results. In their endeavour to improve the living conditions in their settlement, the DYFI members got support from the Communist Party of India (Marxist)–CPI(M). The patronage of this political party is also a way for the organisation to scale-up their demands.

The most critical issue in AAN, as in all 'objectionable' slums, is the lack of security of tenure and the risk of eviction. In July-August 2002, a large demolition drive was carried out along the Buckingham Canal to facilitate desilting and widening of the canal. In the IT Corridor area, around 2300 families were evicted from the first row of houses located along the canal, including 500 families in AAN. The evicted families were resettled in Kannagi Nagar, although the flats were not ready for habitation. The eviction was described in a newspaper as 'a swift, low-resistance operation'[43]. Yet, the lack of resistance in the settlements at the time of eviction did not mean the lack of prior collective action to oppose it: a signature campaign against the evictions, a road blockage and a rally to the Secretariat (the seat of the State government) had been organized by the CPI(M). The main demands included: no eviction, provision of all civic amenities, and ownership rights with proper land titles. However, the protest had no effect and ironically, and tragically, the bulldozers arrived on the site to start the demolition in AAN at the very moment when the slum dwellers were demonstrating in the city.

Several developments currently underway along the IT Corridor present new threats of demolition for the squatter settlements along the Buckingham Canal. These include plans for the beautification of the canal as part of IT Corridor project, and to revive this canal as a navigation channel for efficient and cost-effective transportation. The construction of a wall along both sides of the canal started in 2011,

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43   See "Evicted slum dwellers shifted to Okkiyam Thoraipakkam", *The Hindu*, 31 July 2002.

officially for flood control, with nevertheless a possible hidden agenda to protect the banks from new encroachments. Lastly, in March 2012, there was an announcement of the removal of all squatter settlements located along waterways, including the Buckingham Canal. Faced with the pending threat of eviction, most residents in AAN seem to accept the fact that, being on government land, their future relocation is inevitable, although they remain very critical of the living conditions in the big resettlement complexes. There is indeed a discrepancy between the slum dwellers' general acceptance and pragmatic vision (as explained below), and the more radical stance of the CPI(M) activists.

This case study allowed us to identify a combination of factors limiting social mobilization. Some may be specific to the Canal Bank Road squatter settlements and their geographical marginalization, on the fringe of the city, as a result of which they remained out of the reach of some major social movements for workers and slum dwellers in the city. Further, the location of these settlements, in the same zone as Kannagi Nagar resettlement colony, would make relocation to the latter comparatively less disruptive and thus more acceptable than for people from inner city slums. In AAN, an additional obstacle stems from the weak social organizational structure in this settlement. Other observed factors have a broader significance to understand low resistance to eviction in squatter settlements. One is the lack of accurate information in advance regarding the date of eviction. According to some residents, withholding such information is a deliberate strategy on the part of the government, to avoid the organization of protests. Another factor is the divide between house owners and tenants, with diverging interests in case of demolition and resettlement. A third hindering factor, also observed in the slums of Delhi, is economic precariousness, as poor people cannot afford to spend time and lose money in long-lasting collective action. In addition, one should also consider the coping strategies and rationale of the affected households, in the highly constrained context of removal of objectionable slums. If the eviction is seen as inevitable, efforts are better focussed on getting some compensation in the form of a resettlement flat, which is an asset and a prospective profitable good that they may rent out or resell for monetary benefit. Finally, the weakening of social mobilization observed in the Canal Bank Road squatter settlements would also appear to reflects the trend observed since the 1990s described as the 'gradual weakening and eventual collapse of slum-based, struggle-oriented collective action against evictions' (Coelho & Raman, 2010: 23; see also Coehlo & Venkat, 2009).

Kannagi Nagar (KN) resettlement colony provides a significant example of mobilization campaign for better amenities. The residents formed the Kannagi Nagar Welfare Association and, with the strategic support of a rights-focused NGO, they organised in 2008 a postcard campaign demanding adequate basic amenities and public services, which were still lacking eight years after the establishment of the colony (PUCL, 2010). About 50,000 postcards were addressed to the then Minister for Slum Clearance and Accommodation Control. Importantly, the media were invited to follow this campaign and politicised the issue. According to a recent study, 'The government responded by arranging a grievance day in KN in which several government ministers came to listen to the resettled people. After the meeting some important improvements were made, such as a police station being established, but recurrent problems with the water supply and drainage were only solved temporarily' (Cummings, 2012: 31). Moreover, public social infrastructure remains grossly inadequate, with especially no public health centre for a colony of around 70,000 people. Other modes of engagement of the residents with the state in order to improve their living conditions include protests (such as blocking the nearby highway) and, more frequently, addressing collective complaints to government officers (mostly to the local TNSCB office) and local politicians. Overall, 'while the TNSCB does sometimes respond to protests and complaints, it has only provided permanent improvements to KN over a long period of time' (*Ibid*: 25). The decision taken by many resettled families who eventually left KN, sometimes returning to their previous localities (as observed in AAN) after selling or renting out their tenements, further highlights a form of individual protest to unsustainable living conditions in the resettlement colony. Although such transactions are irregular, i.e., not allowed under the conditions of resettlement, they concern about 45% of the tenements.

On the whole, mobilization has proven to be difficult in KN resettlement colony due to the lack of solidarity among residents. The divisions stem from the fact that different groups of resettled people came from different locations in the city, sometimes under distinct schemes, and thus received different treatment from the state, e.g., regarding distinct financial modalities to access a tenement[44]; moreover, the quality of services in different sections of the colony varies. The operating mode of some welfare NGOs working in KN, where they provide social services to small sections of the colony without cooperating with each other,

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44   Priti Narayan, "A first hand look at resettlement : Kannagi Nagar", blog, Transparent Chennai, 15.11.2012 [URL: http://www.transparentchennai. com/a-first-hand-look-at-resettlement-kannagi-nagar/], last accessed 20 January 2014.

creates further divisions in the community and curbs collective action. Fieldwork surveys suggest that the impact of the NGOs' actions on the people's empowerment is questionable. Finally, other factors hindering mobilization in KN include 'the resettled people's lack of knowledge about their entitlements and government processes', the fear of getting into trouble if they confront the government, and (as observed in squatter settlements) the lack of time and resources (Cummings, 2012: 26).

3.3.3. Issues of governance: knowledge gaps, and lack of consultation and participation

Our investigations into the implementation process of eviction and resettlement indicated the absence of a systematic and proper procedure for information sharing prior to the relocation, not only regarding the date of eviction, but also the financial modalities of the resettlement. Moreover, the deplorable state of housing in KN at the time of relocation in 2002 from the Canal Bank Road (soiled tenements, clogged toilets, no power or water supply) demonstrates that the basic needs of the resettled families were not taken into consideration. More generally,

as shown by the case study of KN, 'slum resettlement and rehabilitation is planned and carried out without the participation of the slum dwellers in the planning process, [and] slum dwellers are not consulted on their needs' (Cummings, 2012: 45). The TNSCB consulted only the NGOs working in KN regarding the provision of welfare services, specifically NGOs co-opted by the government, and this was only after the resettlement colony had been constructed and the families relocated. Consequently, the issue of knowledge is twofold: (1) the slum dwellers are not properly informed about the impending dramatic changes in their life imposed on them, nor about their entitlements, and (2) the government has not sought to obtain proper knowledge about the needs and priorities of the slum dwellers to be resettled. With respect to the question of knowledge, the initiatives of some activists groups such as the People's Union for Civil Liberties and the Citizens' Rights Forum deserve mention: through their campaigns and fact findings reports (PUCL, 2010), these activists contribute 'to bridge the knowledge gap between the slum dwellers and the government' (Cummings, 2012: 33).

Overall, the planning and implementation process of slum resettlement in millennial Chennai is state-led according to the government's own interests, reflecting asymmetrical power relations, and following a pro-growth agenda rather than a pro-poor agenda.

4. Water Governance and Climate Change Issues in Chennai

4.1. Major water related issues and vulnerabilities and their spatial distribution[45]

Chennai has the lowest per capita availability of water among large cities in India, i.e., 108 litres per capita per day (lpcd) compared to 270 lpcd in Delhi, 260 lpcd in Mumbai, 250 lpcd in Calcutta, and 140 lpcd in Bangalore.[46] However, this average supply figure says nothing about the wide differentials in access to water supply between

geographical zones in the city and between income groups. The poorest and least connected residents suffer most from the water shortage in part because they have less flexibility to find alternative affordable sources of water. In order to zoom in on the key water issues facing Chennai, including climate-related water vulnerabilities, a case study was carried out in the IT Corridor, with an aim to benefit from and contribute to the other research being conducted there within the C2S project.[47]

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45 This section is primarily based on research carried out by Samuel Roumeau, conducted in the framework of WP4. (Cf. Roumeau 2012). With regard to the Pallikaranai Marshland, it draws on the study by Aicha Seifelislam (2013).

46 See Asian Development Bank (2007).

47 Cf. Roumeau 2012. The field research was conducted in Chennai from 6th October to 15th December 2011 as part of an internship at CEIAS (CNRS-EHESS) in the framework of the Chance2Sustain project and in partial fulfilment of Masters Degree in International Cooperation and Development & Risk Management in Emerging Countries at Institut d'Etudes Politiques de Bordeaux.

The IT Corridor is a megaproject that gives expression to Tamil Nadu's economic growth strategy. As such, it requires quality infrastructure and a high level of public services, including water supply and drainage. For this purpose, the Government of Tamil Nadu mandated the water agency in charge of Chennai, Chennai Metro Water Supply and Sewerage Board (CMWSSB) – hereafter 'Metrowater', to implement a special ad hoc project for providing constant '24/7' water supply and efficient sewerage infrastructures to the IT Corridor. Field surveys in one government-sponsored IT Park along the Corridor confirmed that the government offers uninterrupted quality power supply from dual source and uninterrupted supply of water and others utilities, although this can not be generalised for the entire Corridor (cf. infra). Meanwhile, most households in Chennai are limited to 3-4 hours of water a day, which underscores the severe inequalities of access to water prevailing in the metropolitan area. Even if residents are connected to a network, they are required to diversify their sources of water to ensure sufficient supply.

Given this state of affairs, it is particularly relevant to emphasize water vulnerabilities when examining urban development in Chennai. Relatively little attention has been paid to these vulnerabilities, which progressively aggravate tensions between different categories of water users. The development of the IT Corridor is built on fragile wetlands and water bodies such as Pallikaranai Marshlands and Muttukadu Laguna (cf. image 4). Due to encroachment on the wetlands and the destruction of the water catchment areas, heavy rainfalls frequently result in flooding on the IT Expressway, especially during the monsoon (cf. image 9). Furthermore, the site is located only a few kilometres away from the Bay of Bengal, a coastal zone vulnerable to the rising sea level and tsunamis. The proximity to the ocean creates another problem: the groundwater depletion is correlated to saline intrusion in water tables. Given these characteristics, water vulnerabilities along the IT Corridor need specific attention in order to ensure that current development of the built environment is sustainable.

Whereas these vulnerabilities underscore the critical need to improve water governance, the field research indicates that the governance structure is complex and highly fragmented, characterised by a large number of stakeholders, both public and private.

Image 9:   Floodings of link road between Taramani and Kandanchavadi, north of the IT corridor

Source: A. Varrel, Chennai area, November 2011

4.2. Water Governance along the IT Corridor

The fragmented nature of water governance along the IT Corridor can be illustrated by the fact that the public agency in charge of water supply, Metrowater, was not given a clear mandate to service this area. The CMDA's Second Master Plan published in 2008 indicates that 'though Metrowater has jurisdiction over the CMA as per their Act [1978], their area of operation for piped water is limited presently to the CMC area and a few adjoining areas such as Mogappair and the IT Corridor'.[48] However, according to the superintendant engineer of the IT Corridor Water Project (ITCWP)[49], who was evasive on this point, Metrowater was waiting until the entire IT Corridor was included in city limits to supply piped water to the IT Corridor. With the extension of municipal boundaries in 2011, part of the IT Corridor is now included in the CMC, i.e., the stretch from Kottivakkam to Semmencheri. The stretch from Navallur to Siruseri is still outside Chennai Corporation limits but another extension is planned in the near future.

The analysis of the various actors, their mandate, influence, and their power relations helps us to understand the decision-making process regarding water related issues. The actors involved in water governance along the IT Corridor are extremely heterogeneous. They include political and public institutions, private companies, farmers, NGOs, academics, scientific experts, socio environmental associations, and key individuals. Not all of these actors are able to participate in a significant way to the management of water and to environmental issues. The GoTN is the overarching authority that takes all major decisions concerning water management in Chennai, and there is relatively little space for other actors to influence its vision of urban development. However, as the public water authorities do not provide adequate water supply and infrastructures, the private sector also plays a critical role in service delivery. Hence, there is a lack of a holistic vision, encompassing all aspects of water management crucial for a sustainable development. The various actors are briefly presented below:

State actors

The various entities in charge of the decisions over water issues, from the macro to the local scale, include:

1. Government of India, mainly via Ministry of Water Resources, Ministry of Environment and Forests and Ministry of Urban Development.

2. Government of Tamil Nadu (GoTN), Public Work Department – Water resources organisation

3. Chennai Metropolitan Development Authority

4. Chennai Metro Water Supply and Sewage Board (Metrowater)

5. GoTN Department of Municipal Administration and Water Supply

6. GoTN Direction of Town and Country Planning

As indicated above, GoTN is the most powerful actor involved in water governance along the IT Corridor, and has precedence compared to both the Central Government and local governments. The state government has entrusted Metrowater to implement the ITCWP, and it partly funds the project[50].

Parastatal agencies

Metrowater was formed as an independent institution by an Act of the Legislature of Tamil Nadu in 1978. From this date, the state level utility has taken the task of consolidation and is gradually expanding the water supply and sewerage systems inside the limits of Chennai Corporation. In 2011, Metrowater supplied 774 million litres of water a day to residents of the city and the suburbs, approximately 87 litres per person.[51] This is more than the previous year when the daily supply was only 575 Mld[52]. The State Government directs Metrowater to implement water projects in the Chennai Corporation and some special areas such as the IT Corridor. However, our research indicated that Metrowater appears to be overwhelmed by the magnitude of its jurisdiction, and its supply to the IT Corridor is insufficient to meet the needs of people living and working there.

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48 See CMDA (2008): chapter XIII ("Infrastructures investments for CMA").

49 Samuel Roumeau's interview with Mr Mannivannan, Superintendant engineer in charge of ITCWP at Metrowater, Chennai, October 28th 2011.

50 For some specific entities that intend to draw water from a lake or nearby water body, the authority in-charge of sanctioning approval is the Water Resources Organisation in Public Works Department (PWD). Major supply sources in the IT Corridor are Poondi reservoir, Cholavaram lake and Redhills lake, all of which are under the control of the State PWD (Irrigation); further the PWD (Ground Water Cell) is responsible for the investigation of ground water resources within Chennai Metropolitan Area (CMA) to augment supplies.

51 This rough calculation uses the 2011 census data for population of metropolitan area, i.e., 8,917,749.

52 Samuel Roumeau's interview with Ms Madhavi, Managing Director of Pallippattu distribution station, Chennai, November 5th 2011.

The Tamil Nadu Water and Drainage Board (TWAD) caters to the area outside the limits of Chennai Corporation, and it would normally be the agency in charge of IT Corridor, except for the fact that Metrowater was assigned this special jurisdiction (including open water drainage, sewerage, extension of water supply and sewerage networks).

The Tamil Nadu Pollution Control Board (TNPCB) is responsible for setting, monitoring and enforcement of environmental regulations and standards. It is in fact a weak body, whose decisions are not always respected.

As mentioned in Part 2 above, there are three agencies promoting industrial development in the form of IT parks along the IT Corridor: TIDEL in Taramani, ELCOT in Sholinganallur, and SIPCOT in Siruseri. All of these parks have their own water regulation and management.

Private agencies

The failure of the public utility to supply a sufficient quantity of water to the IT Corridor explains why the private sector has emerged as a critical actor in water governance. Private companies supply water through tankers to Chennai and its surroundings: Tamil Nadu counts 400 licensed companies, *which is 50% of the total in India*, and 220 are operating in and around Chennai. During the severe water crisis in 2003-04, the piped supply for the entire city was virtually shut down for a 12-month period. Consumers became dependent on private tanker suppliers trucking in groundwater from peri-urban areas.[53] Packaged water vendors, selling sachets, PET bottles, and cans, have also multiplied.

Farmers

Farmers are an important group of actors in the distribution of water because they sell groundwater directly to private tankers. Many of them have shifted from agricultural activities to water production, as it yields more money than paddy cultivation.[54] According to Professor Janakarajan, the water-selling farmers align themselves with the state and urban stakeholders to make a short-term profit. Other farmers perceive the water sellers as enemies, as they are adversely affected; their wells become dry due to round-the-clock pumping. The latter are a voiceless and powerless group, suffering the brunt of water transport and

other damages to the local environment.[55] Water sellers associations exist and try to strengthen the relation between farmers groups, but in the end, farmers are not organized and not well informed. Private water suppliers via tankers are better organized and much more influential, which allows them to fix prices collectively for customers.

Civil society

There is a multiplicity of NGOs dealing with water and environmental issues in Chennai. Even though they raise awareness about water governance, their influence on decision-making remains limited. Civil society organizations, activists, researchers and media all play a role in fighting against the depletion and pollution of resources in the peri-urban areas but taken together, this set of stakeholders lacks power and does not represent a clear constituency.[56]

Among NGOs active in Chennai is SUSTAIN, an advocacy and educational organization linked to UN-Habitat working to promote sustainable development. The organization seeks to promote resources efficiency, particularly energy and water, organizes conferences and debates, and implements projects such as Green School, Eco-Campus, Eco-Business. Both ExNoRa International (Chennai branch) and Madras Naturalist Society focus on environmental problems in and around Chennai, and engage debates around environmental issues at community level. Other Media's Corporate Accountability Desk works specifically on environmental health and corporate accountability among pollution-impacted communities. Transparent Chennai defines itself as 'a non-profit action research think tank focused on improving government systems and markets capacity to channel finance into sustainable and holistic development'.[57] Water Today is a knowledge-disseminating platform focused on the water and the wastewater industry and organised the international exhibition *Water Expo 2012* in Chennai.

Compared to NGOs, research and academic centres appear to have more credibility and influence on both public authorities and citizens. CPR Environmental Educational Centre is a centre of excellence of the Ministry of Environment and Forests that strives to increase awareness and knowledge among key target groups (school children, local communities, and women) about the environment.

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53   See Srinivasan (2008).

54   See Ruet, Saravanan and Zérah (2002).

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55   Information collected during Samuel Roumeau's interview with Professor Janakarajan, Madras Institue of Development Studies, Chennai, December 2nd 2011.

56   See Janakarajan et al. (2007).

57   See www.transparentchennai/research/water.com

The Madras Institute of Development Studies (MIDS) has some researchers working on the cutting edge of water governance issues in Chennai. The Indian Institute of Technology Madras (IITM) is conducting a research programme on Public Private Partnership (PPP) in Urban Infrastructures with a focus on water and sanitation. The Centre for Water Resources, Anna University is also an acknowledged institution that produces reliable data concerning water.

Limited perspectives for inclusive scenario building

Theories on water governance indicate that in many cases actors operate collectively (organizations and institutions), but in other cases participation occurs in a more individual fashion. That is the case of 'Opinion Leaders' who count on recognition, credibility and citizen support to 'provoke learning and changes in attitudes and practices among people and institutions, in order to encourage processes of reaching agreements around sustainable development'.[58] What is striking in Chennai is the absence of such opinion leaders. Even though some actors could play this role, they are presently not organized and do not constitute 'networks or competency groups'.[59] Such networks can be understood as a change in the political structure of a society more than as a new analytical approach, representing new forms of social organization in response to political problems of coordination. In Chennai – and a fortiori along the IT Corridor

58   Hordijk, Miranda and Torres (2011).

59   Braun and Whatmore (2010).

– this change has not occurred. In that sense, the ambition of building a scenario based on public participation seems to be seriously undermined. It is nonetheless important to note that organizations such as Transparent Chennai or SUSTAIN contribute to more informed public debates and strengthen cooperation in favour of research.[60]
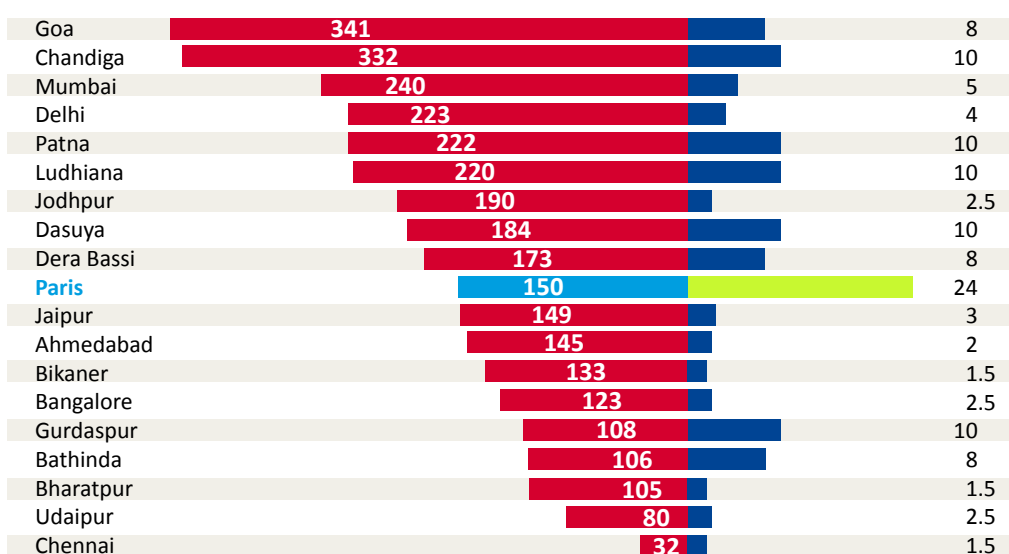
4.3. Policy and specific projects for water supply

It can be recalled, from a global perspective, that world water requirements are projected to grow from 4,500 billion m^3 today to 6,900 billion m^3 by 2030. This is a full 40% above current accessible, reliable supply. One-third of the world's population, concentrated in developing countries, will live in basins where this deficit is larger than 50% (Water resources group 2009). According to a recent study, the demand-supply gap is expected to be around 300 mld for the city of Chennai in the year 2026.[61]

60   Both of them offered to assist in the organization of small conferences and debates for the Chance2Sustain project in Chennai.

61   The study is based on the following consumption of water: 150 lpcd for Chennai Corporation, 125 lpcd for Municipalities in Chennai Municipal Area (CMA), 100 for Town Panchayats, and 80 for village Panchayats. It would appear that the rates of water consumption used in this study are over-evaluated compared to many testimonials from residents. For an alternative perspective, see also the 2007 figures for India cities available here http://www.globalwaterintel.com/pinsent-masons-yearbook/2012-2013/part-ii/15/

Graph 2: Per capita litres per day vs. hours of supply per day

City	Per capita litres per day	Hours of supply per day
Goa	341	8
Chandiga	332	10
Mumbai	240	5
Delhi	223	4
Patna	222	10
Ludhiana	220	10
Jodhpur	190	2.5
Dasuya	184	10
Dera Bassi	173	8
Paris	150	24
Jaipur	149	3
Ahmedabad	145	2
Bikaner	133	1.5
Bangalore	123	2.5
Gurdaspur	108	10
Bathinda	106	8
Bharatpur	105	1.5
Udaipur	80	2.5
Chennai	32	1.5

Source: Data collected from the water boards or utilities; A. Amiraly 2009.

As mentioned, Chennai's piped water supply is one of the worst of all Municipal corporations in India with less than 2 hours of supply per day, on average (see Graph 2). Not surprisingly, the poorest and most marginalised populations of Chennai Metropolitan Area suffer the most from the shortage of water. The wide range of water prices, depending on the type of supply, reinforces inequalities. As far as piped supply is concerned, the government fixes prices for water sold by Metrowater. The prices are determined through a tax of 7% of the annual rental value collected by Metrowater for water supply and sewerage. To encourage water savings, the marginal cost of water increases with the level of consumption. Prices are thus proportionally lower for people who use smaller amounts of water, and there are higher tax rates for industries because of their higher water consumption (and higher capacity to pay). Regarding water carried to unconnected households by tankers, 9000 litres cost an average of 600 rupees for domestic use and 765 rupees for commercial or industrial use. Residents organise themselves to share on an equal basis the costs of using the collective sources of supply. In late 2011, the 25 litres bubbletops cost 25 rupees on the burgeoning market of packaged drinking water. One of the findings of this research is that the lowest income groups consume the lowest quantities of water, at the highest price per litre.

A total of 1954 million litres of water are consumed everyday in Chennai. According to the Centre of Water Resources at Anna University, the three main sources of water supply to Chennai are surface water, ground water, and 'other minor sources' (See Map 5).[62] In addition, the recently built desalination plants at Minjur and Nemmeli transform large amounts of seawater into drinkable water. This controversial source will be further developed in the next section.

4.3.1. Projects for meeting water needs

Desalination plants

Following the first desalination plant built at Minjur (25 km north of central Chennai), the State Government decided to construct a second plant at Nemmeli, to the South of the IT Corridor (45 km south of central Chennai). The project was financed partly through a central government grant and partly through the Metrowater budget. VA Tech Wabag executed the project on a Design Build Operate basis in partnership with IDE technologies, Israel. The plant comprises disc filters, ultra filtration membranes and reverse osmosis membranes.[63] This 100 Mld plant, which cost 1,000 crore rupees (approximately $1.6 million), was inaugurated in February 2013.[64] According to official sources, it will consume around 16Mw of power per day, which will be supplied from a sub-station that the Tamil Nadu Electricity Board will set up. Officially there would be no sludge generated, as no chemicals will be used during the desalination process. The water with heavy concentration of salt will be discharged into the sea as per the specified norms.[65]

The desalination plant in Nemmeli has the following advantages: it is located near the sea on a flat area, and there is adequate availability of electricity for pumping. However, critics from environmental networks and academics highlight three drawbacks of such a project. First, the drinking water produced will be expensive; this source of supply is estimated to be twice more expensive than the current rate for Metrowater supply. This goes against the objective of introducing affordable standards and targeting subsidies to the poor. Second, it is environmentally unsustainable because (i) the desalination plant requires a lot of energy to produce water (every litre of water produced demands 7,5 Kw/h of energy) and (ii) the plant will reject 17 kilolitres per day of extremely salty water in the sea. Third, it is socially destructive because the activity of the plant will deeply affect surrounding fishermen villages who will have to go further out to sea to catch fish. As critics point out, it may make sense to opt for desalination plants in countries such as South Africa, Singapore and especially Qatar or United Arab Emirates where rainfall is far less than 1200 mm a year. However in Chennai, rainwater

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62   For surface water, the main sources are the following: the reservoirs located at Pondi, Cholavaram, Red Hills and Chebarambakkam lakes (227 million litres per day - Mld); Krishna water through Kandaleru reservoir in Andhra Pradesh under Telugu Ganga project from 1996 (837 Mld); Veeranam lake located 228km South of Chennai, from September 2004 (180 Mld); and local sources including Palar river (32 Mld). For ground water: six well fields located in Araniyar & Koratalaiyar river basin adjoining the reservoirs around Chennai (68 Mld). Extractable quantity of local groundwater in the city for other purpose than drinking and cooking; and multiple wells, both owned and hired (240 Mld). For other small sources: Porur Eri, Madhavaram Rethai Eri, Southern coastal aquifer, and Brackish water treatment plants (5Mld).

63   Reverse osmosis is considered the most convenient and effective method of water filtration. It filters water by squeezing water through a semi-permeable membrane, which is rated at 0.0001 micron. It is also the only technology capable of desalinating seawater, making it into drinking water. Non-RO water filters are much less effective, and the pore size of these filter media are much bigger, generally 0,5-10 micron. As a result, water is far less clean and safe compared to reverse osmosis filtration.

64   See "Nemmeli plant: The desalination dilemma", Live Mint & The Wall Street Journal, 23 May 2013. URL: http://www.livemint.com/Politics/FvpXSl7v5JClJIPjyDLejO/The-desalination-dilemma.html, last accessed 20 January 2014.

65   "Israel IDE seeks partners to tap Indian desal market" India Water Review, 23 February 2012. URL: http://www.indiawaterreview.in/Story/News/israels-ide-seeks-partners-to-tap-indian-desal-market/546/1 last accessed 20 January 2014.

Map 5: Sources of water in Chennai
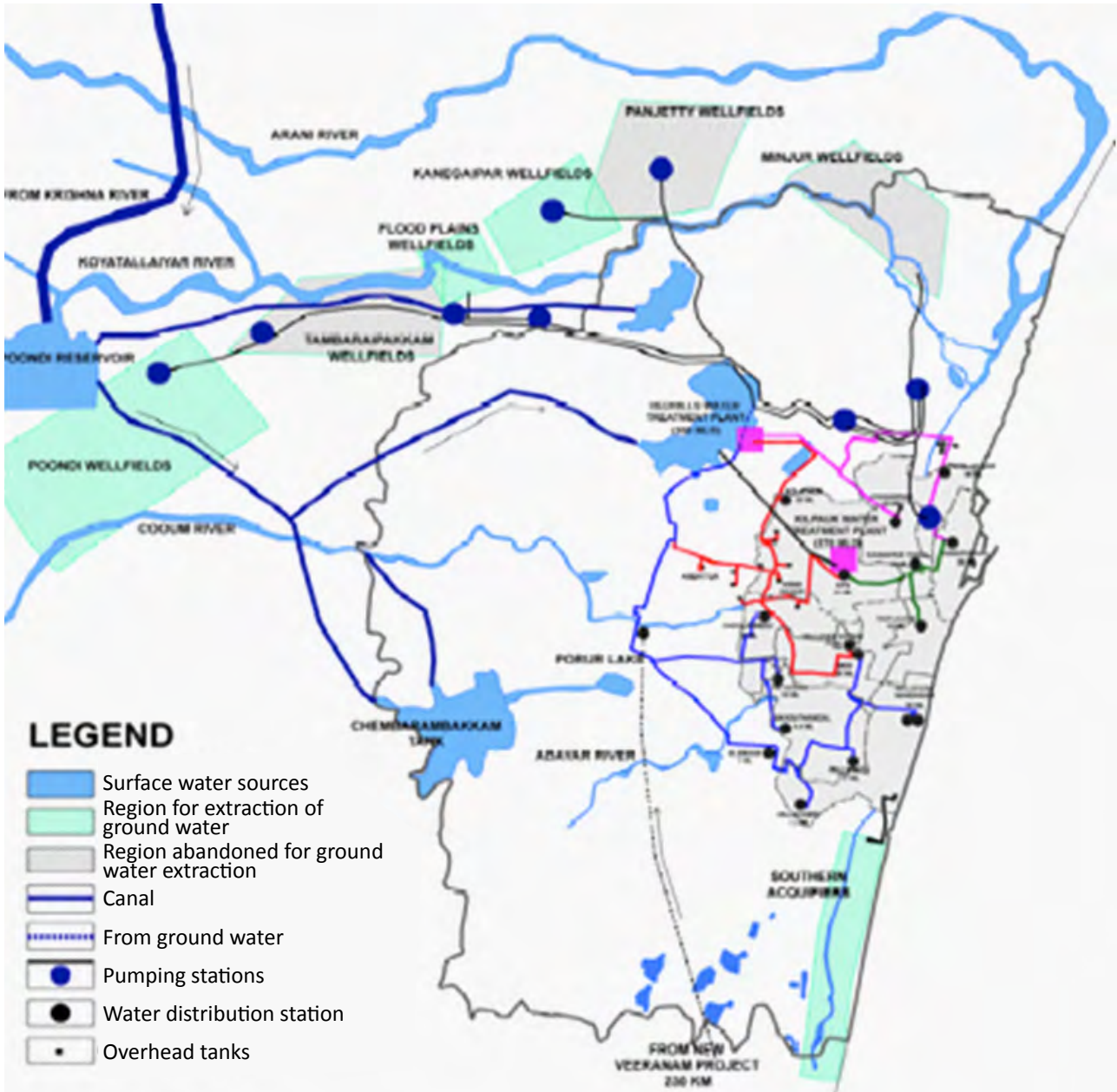
Source: Metrowater, 2010

harvesting and measures based on the dual quality of water would appear to be better, more sustainable options.

Special project for the IT Corridor

In order to cater to fast urban development linked to the economic activities of the IT Corridor, the State government entrusted Metrowater to implement the special project 'Providing water supply and sewerage infrastructures along the IT Corridor and the Rajiv Gandhi Salai'. This policy can be seen to give special treatment to the southern part of Chennai, with an aim to offer guarantees (or at least reassurance) to potential investors in terms of basic infrastructures. It is characteristic of the incentives put in place by the State Government to spur economic growth. At the same time, it deepens already existing social and spatial inequalities, since it targets selected geographical spaces and specific economic actors. The inability of the authorities to achieve an efficient and sustainable water infrastructure system has led to the emergence of adaptive practices that are outside the control of the public sphere. Both companies and residents have become very dependent on private sources of drinking water.[66]

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66 A recent newspaper article evokes the importance of private water suppliers along the IT Corridor: 'Recently, some of the offices had to shut down for a day when tanker owners went on a flash strike, protesting against the seizure of vehicles by revenue for illegal extraction of groundwater for commercial use'. See 'Stalin vows nonstop water for OMR', *Times of India*, April 24th 2010.

Metrowater has been mandated to supply water and sewerage facilities to the IT Corridor area at the cost of 417.7 million rupees (approximately 5.4 million euros). The work commenced in April 2007 and was almost complete in late 2011 (about 90%), at the time of this study. This project focuses on sewerage works (five packages) and supply works (two packages). It mainly consists in building sewerage treatment plants to improve the wastewater management and laying mains to provide piped supply to this area. This strong state support in favour of a very limited space while the entire city suffers from water scarcity and poor sewerage system reveals the particular commitment of the authorities to make the IT Corridor an exceptional space with 'world-class' infrastructure aimed at attracting foreign investment. However, the goal of 24/7 supply remains on paper only and many residents remain unconnected to sewerage and supply networks.

An estimated 60% of the water that Chennai's public uses come from sources other than Metrowater.[67] The table below presents the average litre per capita per day by type of source for a person living along the IT Corridor. These estimated figures were compiled on the basis of a survey conducted with residents of villages located on the IT Expressway. They are an average for the whole sample and should be interpreted accordingly.

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67 Transparent Chennai data: http://www.transparentchennai.com/research/water/background/

Image 10:   Tanker inside Ascendas Tech Park

Source: A. Varrel, Chennai, November 2011

Table 7: Water consumption by sources on the IT Corridor

Year 2011	Lpcd per source
Public sources	
Metrowater piped supply	5
Metrowater individual hand pumps	20
Public taps	2
Metrowater lorries	2
Private sources	
Own well	25
Private lorries	18
Packaged water	2
Total	**74**

Source: S. Roumeau (2012), adapted from V. Srinivasan (2008).

4.4. Vulnerability to climate change impacts

The IT Corridor is a compelling case study to illustrate how the particular natural hydrological topography of this area has been almost completely erased by the artificial landscape of water infrastructure, 'urbanized' to synchronize with the mega-infrastructure project as well as private-led property development. Environmental Impact Assessments are not required for IT development although those projects are not as green or non-polluting as often claimed. Climate change impacts add to the pressure exerted on water resources. Environmental vulnerabilities along the IT Corridor in Chennai are characterised by groundwater depletion, destruction of water bodies, extreme weather events, and the proximity of the sea. Finally, beyond such real and verifiable vulnerabilities, the biased perception and lack of awareness among actors about these vulnerabilities constitute a major factor of risk.

Groundwater depletion and the induced saline intrusion in groundwater tables may be the major source of concern in the IT Corridor area. The overexploitation of groundwater resources correlated to the new development of this area is accelerating the depletion of aquifers and leading to saline intrusion of seawater, making the water unfit for consumption. To regulate and control the extraction, use or transport of ground water and to conserve ground water,

the Chennai Metropolitan Area Ground Water (Regulation) Act, 1987 was enacted. The Tamil Nadu Groundwater Act improved this legislation in 2003.[68] Even if the Groundwater Department is monitoring the general status of the aquifers, exploitation is not managed in a sustainable way. According to a leading specialist of water in Chennai, the legislation on groundwater is not respected and practically anyone can extract water from groundwater without punishment. This observation was corroborated by fieldwork, for instance, for agencies that manage IT parks, for some towns and villages along the IT Corridor such as Sholinganallur[69], and also at the individual level.

The State government has plans to address issues of water quality and availability in Chennai Metropolitan area by constituting a comprehensive groundwater regulatory authority. The objective is to wean the city's residents away from an unsustainable dependence on groundwater and impose strict controls on the use of sub-surface water. According to the engineer in chief at the Water Resources Organisation,[70] 'a bill on groundwater is under the consideration of the government, and a decision will be taken shortly. The practice of digging a hole anywhere and drawing water must stop'.[71] Some of the measures proposed for curtailing the overexploitation of groundwater include: clarifying property rights, introducing extraction charges and limitations, and promoting water conservation policies. At a technological level, mapping and planning optimal use of natural resources through GIS can pave the way to a more sustainable conservation of groundwater.

The development of IT industries and residential properties along the IT Expressway is threatening two large water bodies: the Pallikaranai Marshland and the Muttukadu Laguna.

In addition to water and waste issues, the Pallikkaranai Marshland is being affected and its biodiversity harmfully disturbed. It is being used for garbage disposal, sewage treatment, as well as for drainage (cf. images 12 & 13).

The Perungudi dumpsite, (see image 11), has existed in the Marshland since 1987 (see image 12 for dumpsite location in the Marsh). According to a recent study, the dumping started with 20 ha in 1995 and increased to 44.75

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68   A new law was announced in 2013.

69   See case study on Sholinganallur in Roumeau (2012).

70   S. Kumaresan is engineer in chief at Water Resources Organisation, Public Works Department. His testimonial was reported in the press. See "Groundwater regulatory authority soon", *The Hindu*, 2 May 2011.

71   Some borewells operating without a license reach 100 to 200 metres depth.

ha in 2002. At present the dumping site occupies an area of 78ha with a current waste dumping of 2,450 tons per day (Seifelislam 2013: 14). Because the Perungudi dumpsite is poorly drained, lacks sanitary design, and has direct contact with the underground (Parameswari et al 2012), it very probably contributes to groundwater contamination.

Moreover, treated and untreated sewerage pours into the marshland. According to one source, Metrowater has been letting out 32 million litres of untreated sewage water every year directly into the marshland and a sewage treatment station located next to the Pallikarani releases treated sludge into the marshland (Seifelislam 2013: 19).[72] Some localities on the periphery of the wetland such as Mylai Balaji Nagar directly release untreated sewerage (see images 13 and 14).

Naturally these pollution sources have adversely affected the ecological balance of the marshland. Until a few years ago, the Pallikkaranai Marshland was a functioning percolation system, a key environment for the recharge of underground water: taking the flow of rainwater from the upper catchment areas like St. Thomas Mount and the Pallavaram Hills. Now, the quality of the recharge is threatened because the marshland has been polluted and can no longer be tapped for drinking water. Field interviews and the local press indicate that as recent as 20 years ago, surface water could be consumed without treatment (Seifelislam 2013: 11). Today, various studies of water quality confirm that it has high concentration of TDS (Total Dissolved Solids). A study from the University of Madras indicated that the concentration of the TDS in the Pallikkaranai Marshland is generally higher than the desirable limit of 500mg/L for safe drinking, and that in more than 50% of the samples the a concentration is even higher than 2000mg/L, the amount permissible for agricultural use (Vijayakumar, 2011) (cited by Seifelislam 2013: 17).

One explanation for the waste dumping and raw sewerage inflow, as well as the unhindered property development in the area, is that marshland was classified until recently as 'wasteland' by the government. Various groups, including the 'Save Pallikkaranai Marshland Forum' have been fighting to maintain and protect it. In 2007, the southern part of the marshland was declared, as a Reserved Land under the Forest (Conservation) Act of 1980 and brought under the jurisdiction of the District Forest Officer (Seifelislam 2013: 27). The forest department is now responsible for the marshland and a request to upgrade it

into a highly protected area is on the table of the Chief Minister of Tamil Nadu.[73]

The IT Expressway is a flood prone area.[74] On the basis of discussions with various stakeholders, there appear to be five main causes of floods. First, in addition to monsoons two times a year (June and November), there are extreme rainfall events, which may be correlated with climate change. Second, the increasing level of urbanisation is often correlated with a decrease in forest cover and water catchment areas.[75] (cf. Map 6 representing the shrinking of the Pallikkaranai Marshland, resulting in reduced catchment and groundwater recharge).

Third, the existing storm water drain system is inadequate and inefficient. Fourth, the dumping of waste and garbage restrains the flow of water. Fifth, people's habits such as parking vehicles on road contribute to floods as well.

At the same time, the city of Chennai is also hit by droughts. In 2003, the North Eastern monsoon failed: in the recorded history of 54 years for which data is available, never had Chennai experienced such an acute drought. Two years after the drought, 2005, unprecedented flooding took place during the monsoons. These swinging cycles of flood and drought complicate the water management scenario in a city like Chennai as state institutions prepare for two extreme scenarios year after year.[76]

The sea level has been steadily rising, up to about 1.3mm/year on average on the eastern coast.[77] This higher ocean level is directly linked to salt water intrusion in ground water supplies, threatening the quality and quantity of freshwater access to large population. The Department of Oceanography at Anna University asserts that the sea level has risen by one meter in the past 70 years along the coast of Chennai. Moreover, Chennai city is prone to huge waves. For instance, the tsunami in 2004 reached the shore of the Bay of Bengal killing dozens of people.

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72 This was contested by a Metrowater officer working in the Pallikaranai sewage treatment plant who asserted that the treated water does not flow into the Marshland but into the Buckingham canal (Seifelislam 2013: 19).

73 One proposal, reported by the press, consists in converting the existing dumping yard into an ecopark. Cf. "A giant step towards preserving Pallikaranai marshland", *The Hindu*, 10 Sept 2013, cited by Seifelislam (2013).

74 Floods kill people every year: for instance, over 170 persons died in 2010 in Chennai.

75 According to calculations realized by Aicha Seifelislam, the Pallikarnaai Marshland has diminished from 1339 ha in 2002 to 873 in 2007, and further to 737 in 2010 and 605 in 2013 (represented in Map 6). The catchment area over the years was calculated using googlemaps pictures and the ARC Gis Programme. For the missing years an average amount, based on a constant shrinkage over the time, was used. Cf. Seifelislam (2013).

76 See Arabindoo (2011c).

77 Cf. India Network for Climate Change Assessment (2010).

Map 6: The changes in catchment area of the Pallikaranai Marshland in the past years

Legend

2013 (605 ha)	2010 (737 ha)	2007 (873 ha)	2002 (1339 ha)
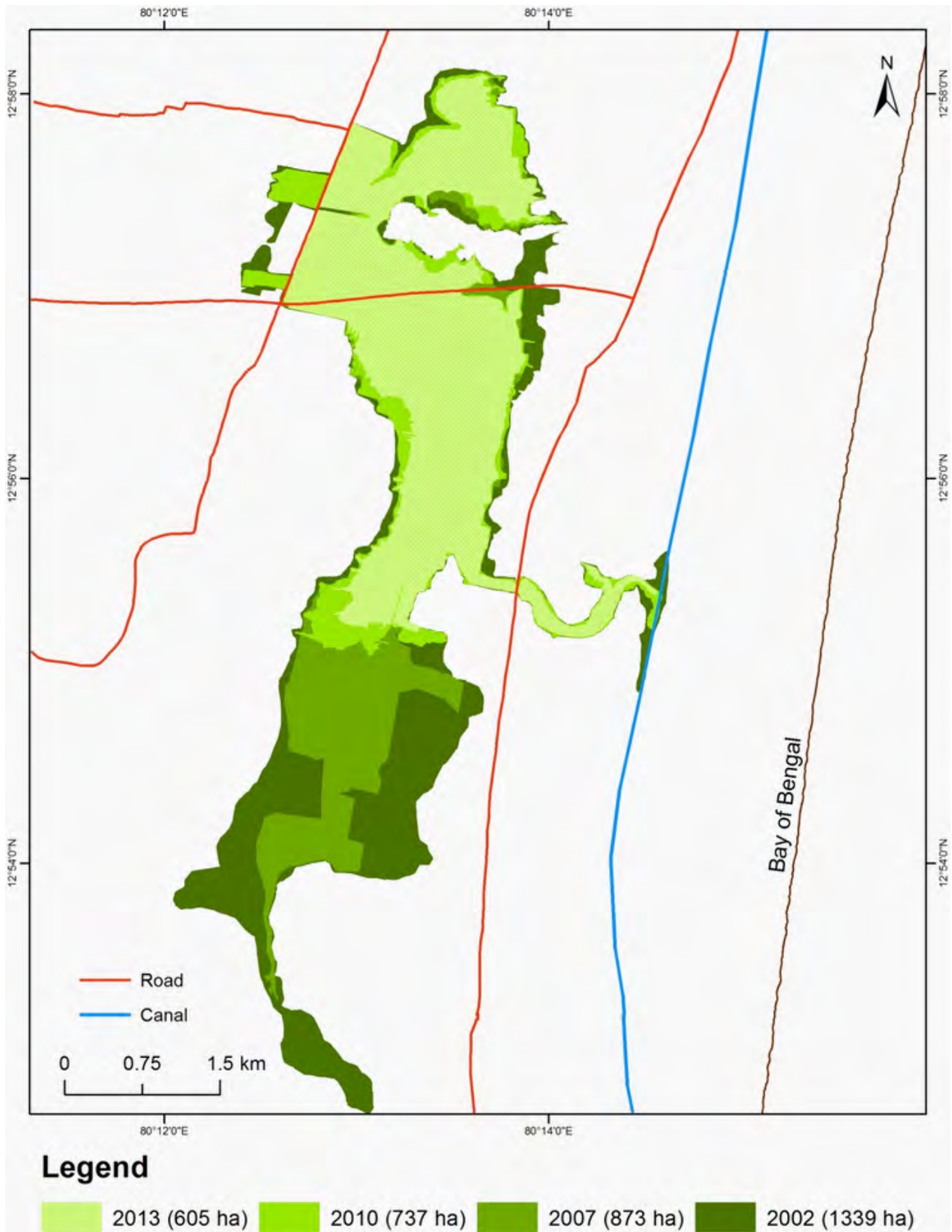
Source: A. Seifelislam, 2013.

4.5. Producing vulnerability analyses and scenarios; spatial perspectives and participation

In the course of discussions with residents, it became evident that there is a crucial lack of awareness regarding the dangers related to climate change. It remains an abstract concept without any concrete application or consequences in the minds of the residents. Awareness among city planners is not necessarily much better. It became evident from interviews on that specific topic that most planners do not realize the very concrete impacts that climate change may have on their lives and on the environment. They perceive it as a vague and distant threat. According to the former chief planner, an IAS officer, 'In Chennai, no one of us, including experts, was conscious of the potential threats of climate change for our city before 2008, date of the Second Master Plan. The process of awareness is very new and evolving slowly'.[78] Two small paragraphs were dedicated to climate change in the chapter on the Environment in the Second Master Plan of Chennai.[79]

The conference on 'Cities and climate change', organised in November 2011 by the Madras Chamber of Commerce & Industry in collaboration with the Citizens Alliance for Sustainable Living (SUSTAIN), was the first of its kind in the city. It took place on World Habitat Day, and attracted experts from academics, as well as participants from the administration, civil society and business groups. The launching of 'Sustainable Chennai Forum' that occurred the same day also illustrates a shift towards the inclusion of climate change aspects in the debate on sustainability. It is meant to be a platform for enhanced dialog and information.

During meetings with members of SUSTAIN and Transparent Chennai, the idea of organizing debates on findings from the Chance2Sustain project emerged, within the broader framework of climate-related water

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78 Quote from the speech made at the Seminar on « Cities and Climate Change » organised in Chennai by the Madras Chamber of Commerce in collaboration with SUSTAIN and UN-Habitat, 9th November 2011.

79 'It is recognized now that climate change due to global warming is going to be an important threat to safety of

millions of people not only living near the coastline but also in the interior because of its impact on changing rainfall patterns and cyclones. Chennai is a flat coastal city subject to regular cyclonic storms and extensive inundation during the northeast monsoon period. Hence it is necessary to take into account ways and means of tackling the effects of climate change in a planned manner. Knowledge on this subject is only gaining ground in recent times. We need to absorb latest information and technology in this discipline not only to cut down green house gas emissions from urban activities but also anticipate the effects of climate change on the economy and life of people to take timely remedial measures'. (CMDA 2008:105-106).

Image 11: The Perungudi Dump site in the Marshland

Source: A. Seifelislam, 2013.

Image 12: Pallikaranai Location in south Chennai
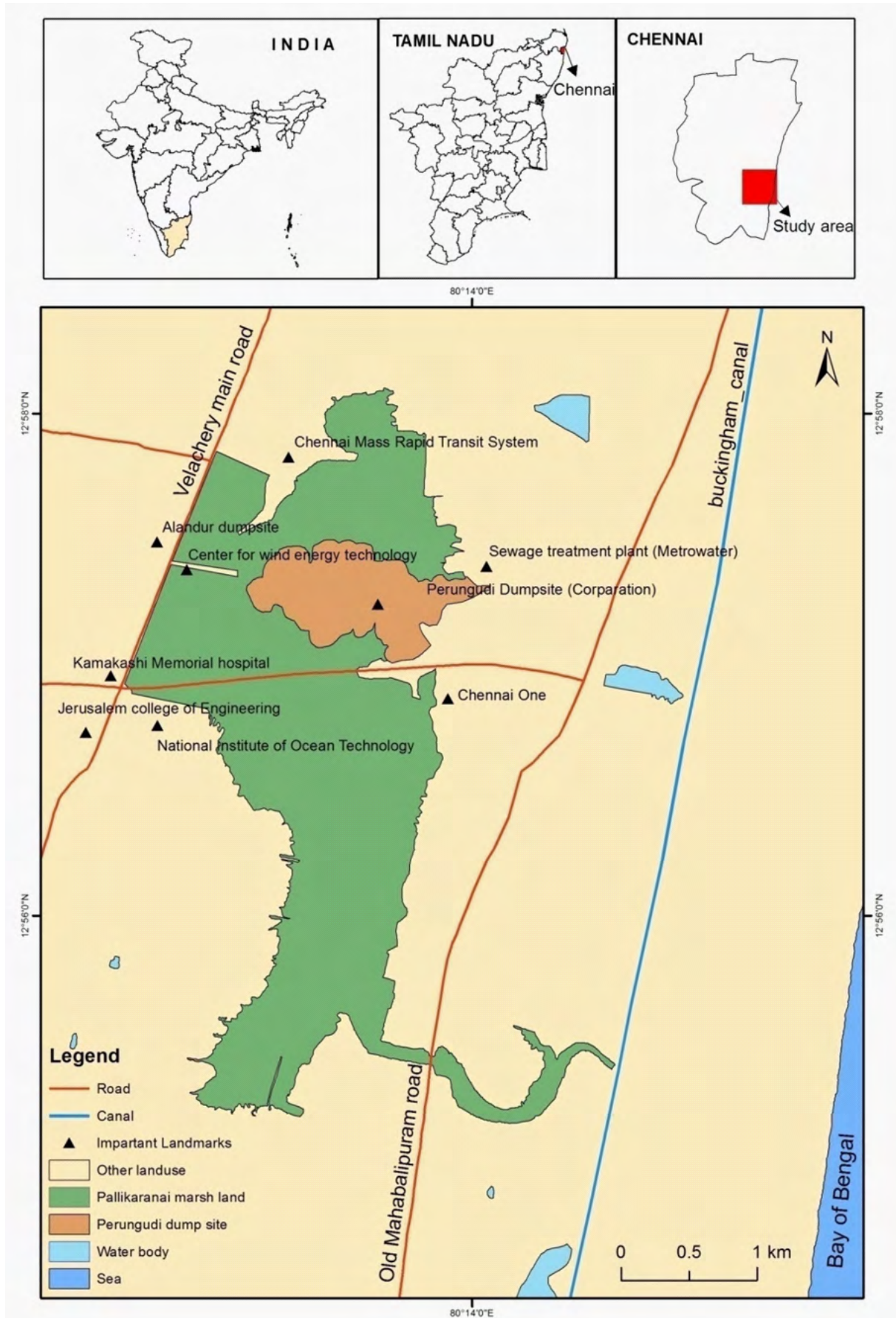
Source: A. Seifelislam, 2013.

Image 13: Sewage canal in MylaiBalji Nagar: Outflow from the living area

Source: A. Seifelislam, 2013.

Image 14: Sewage water inflow to the marshland

Source: A. Seifelislam, 2013.

vulnerabilities. This proves that such events are not merely a pipedream from the research project (e.g. scenario building processes of WP4) but are shared by NGOs and other environmentally committed people.[80]

To summarize, this study has shown the clear commitment from the Government to provide water-related infrastructures along the IT Corridor, and meet world-class standards. In this sense, water infrastructures are part of the overall incentive structure intended to satisfy the expectations of foreign investors. However, this special treatment is not as efficient as expected. Thus far the 24/7 supply remains on paper and in the meantime both firms and ordinary residents have to deal with a limited and unreliable access to water. This requires them to vary their sources of supply from both the public utility and the private sector. Inequalities are strong within the IT Corridor and have also increased in comparison to the rest of the city, where most areas are still limited to 3-4 hours daily supply and poor level of sewerage infrastructures. The question of social justice in access to water remains largely ignored in the debate around water issues in Chennai.

This analysis supports the idea that the alarming water situation in Chennai is not primarily due to insufficient technical or financial means. Funds can be raised and Chennai is the city that counts the most engineering schools in India, so there are sources of knowledge available locally. The fragmented governance structure is the primary cause of water-related deficiencies. Among the various stakeholders, the Government of Tamil Nadu takes all major decisions regarding urban development and water infrastructures, and gives directions to all parastatal agencies to execute the projects in the specified area. At the same time, the influence of private sector actors has increased quickly to compensate for deficient water networks: the system of tankers is one of the main water sources for residents.

Meanwhile the role of NGOs and users' associations in advocacy remains limited, and the empowerment of civil society would be required to strengthen a participatory process. The participation of residents in decision-making supposes broader awareness with regard to climate and water related issues.

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80 The lack of time prevented this idea from moving forward but it could definitely be followed up in the near future.

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5 Spatial Knowledge Management in the City: Spatial Perspectives and Participation in Knowledge Production, Exchange and Use

5.1. Discourses and rationales for introducing ICT-GIS-based knowledge management in urban governance; boundaries, work processes, mapping needs[81]

The discourses on introducing ICT-GIS-based knowledge management vary across organisations in Chennai, focusing mainly on boundaries (individual properties, settlement boundaries, city boundaries) related to issues of revenue collection, slum redevelopment and mandates and work processes (CMDA, CMC, Metrowater), in which digitization and geo-referencing is considered supportive to efficient and effective processes. Implicitly embedded in these discourses are the issues of better monitoring and surveillance against tax avoidance and illicit tapping of municipal services. With regard to marginalized groups, mapping needs are being carried out through the participation of the Tamil Nadu Slum Clearance Board (TNSCB) in the new Rajiv Awas Yojana (RAY) programme, which incorporates slum mapping explicitly from an administrative point of view. Civil society organisations also map needs, across a range of social groups. Using Census data or city data for mapping needs is not done across the city among knowledge producers in general.

Spatial knowledge management is linked strongly to the main mandates of organisations, with an emphasis on administrative classifications and information. This type of technical organisational knowledge remains confined within organisations, with no possibilities of knowledge

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81 This section draws on research conducted under WP5 and is based mainly on inputs from Isa Baud, Eric Denis, Karin Pfeffer, R. Dhanalakshmi, H. Rouanet and Tara Saharan.

exchange across organisations dealing with the city area. Initiatives to collaboratively develop and exchange information among government organisations at local and state level are still ongoing with little progress. Community-based types of knowledge from lived experience of social groups do not seem to be recognized in government organisations, and existing guidelines and rules cannot accommodate them.

5.2. Knowledge construction in Chennai urban planning and management: actors and networks

The use of informatization and spatialization in Chennai urban planning and management varies among the organizations involved with planning and providing municipal services. This discussion focuses on strategic organizations related to the major domains covered in this research project and the major instruments supporting such domains (knowledge management and local financial flows). A network of major organizations dealing with Chennai urban issues was constructed under the auspices of the Department for Municipal Administration; it includes the CMDA, the CMC, Metrowater and the regional office of the National Information Centre (NIC). Although talks went on for about two years about the possibilities of integrating base maps and making databases compatible and accessible, it was found difficult to make much progress on either issue.[82] At the moment, various organizations have continued their own initiatives in this respect (Figure1 in the Appendix).

Organizations in Chennai started initiating informatization from the 1980s onwards, some with the help of WB-funded projects (CMC). Metrowater started informatization in the late 1980s and attempted to introduce integrated enterprise computerization in the early 2000s. The CMC tried introducing integrated computerized systems directly in the late 1990s, but abandoned this attempt in 2004 as too complex, going back to informatization at the department level with the support of NIC. The CMDA has a longer history of using GIS and has an in-house GIS section for mapping land use and topographic information, however focusing less on analyzing trends (private communication by CMDA planner). Initiatives which come under national

programmes working through regional offices include NIC (regional office) which leads the shared basemap programme and is promoting digitization of cadastral information through Collabland (which covers areas within CMDA limits), and a national initiative for slum mapping and residential classification and identification as a basis for need identification, which is being rolled out regionally in eight Municipal Corporations of Tamil Nadu (RAY).

Two other types of actors are important in influencing urban planning and management discussions; the private sector and civil society organizations. The real estate sector appeared to be a major producer and user of spatial knowledge, especially on land-related information like ownership, land size, land tenure status, although very little is known about how these companies work (exception is Rouanet, 2013). In terms of community-based initiatives using and producing ICT-GIS-based information and knowledge, Transparent Chennai is the best known example. It has crowd-sourced information on issues important to citizens in Chennai (to some extent oriented towards the middle class), has mapped them, and uses the information gained in negotiations with local (government) organizations to improve the situations found (cf. Pfeffer et al 2013). Their work is discussed in section 5.4.

Figure 1. in the appendix provides an overview of the organisations included in the discussion of ICT-GIS-based initiatives in Chennai, together with the main issues covered. Here the focus is on the main ICT-GIS initiatives by organisation, followed by a discussion of the main issues emerging from the earlier WP5 Fieldwork Report.[83]

Within the CMC, several Departments have introduced informatization initiatives, e.g., birth and death registration, property tax assessment, and solid waste management (SWM). For birth and death registrations, an external audit from 2006 showed that these databases had serious gaps, making any analysis of population trends in Chennai invalid (CAG, 2006); this included a shortfall of 21 % in birth data and 33% in death data in the city (Audit 2006, Paragraph 2.1.11.1). It is not known to what extent this situation has improved since then, especially with the expansion of the city borders in 2011.

In the property tax assessment department, an audit was held in 2006 as well (CAG, 2006). This tax, an important source of revenue, accounted for 82% of CMC's total tax revenue in 2004-05 (CAG, 2006). Computerization exists since 1998, but several databases exist whose information do not match each other. When the databases on property use (residential or commercial) are compared with those

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82   The issue of the base maps concerns the legality of maps; only those provided by the Survey of India have a legal status. However, the SOI is very slow in providing maps, and security issues prevent maps of coastal areas being provided. This is a major issue for all coastal cities.

83   See http://www.chance2sustain.eu/50.0.html

of the Metrowater and other databases within the CMC, large-scale differences were found. Also updates in the main Register of the property tax department (DCB) lagged behind substantially in the period 1998-2006 leading to a shortfall in tax property collection of more than Rs 52 crore (slightly more than 6.9 million Euro)[84]. Missing assessments led to another Rs. 34 crore. (4.5 million Euro) not being collected in that period (CAG, 2006). The combined Rs 86 crore has meant that the CMC did not receive 31% of collected revenue taxes and 13% of total revenues for that fiscal year. In 2012, a combination of different channels (digital and non-digital) for paying property taxes had improved the situation, so that the Corporation expected to reach its target of 558 crore Rs. in property taxes.[85] Because of the expansion of city borders, digitized payment systems had not yet been extended to the new zones included. Internal validation and process controls were much less of a problem.

In the Solid Waste Management (SWM) Department, early experiences with subcontracting areas of Chennai to private waste collecting and disposal companies (Onyx) led the Department to provide carefully crafted area maps indicating routes of waste collection, intermediary and final disposal descriptions as integral parts of the contract negotiations. These maps are complemented by daily reporting of actual collection and monitoring systems based on mobile phone picture collection by inspectors and GPS tracking of itineraries of garbage trucks, which are then reported to the central office. The major effect of these directive information systems and process controls has been that trouble shooting is delegated to zonal and ward level, leaving the central SWM department time for strategic planning of SWM (personal communication 2012).

Metrowater provides for water supply and sewerage needs of about 651,000 properties in the old Chennai metropolitan area. Its main sources of revenue are water tax and water charges. As mentioned in section 4, water tax is calculated at 7% of a property's Annual Value for properties without a water meter, and collected from all the properties under Metrowater's jurisdiction. Water charges are collected only from such properties that are provided with a water connection, at different rates for domestic and non-domestic consumers (CAG TN, 2010).

Digitization of the internal information of Metrowater started in 1986 in functional and administrative activities, using stand-alone systems. These activities were to be integrated through an ERP (Enterprise Resource Planning)

system procured from Oracle Corporation and implemented through Tata Consultancy Services (TCS). The process commenced with a pilot study conducted from March 2003 to October 2004 and was rolled out in early 2007, after establishing the necessary infrastructure and connectivity.[86] The ERP system works on a wide area network (WAN) connecting Headquarters office with all 161 depots and 10 Area offices. The entire data was stored in a set of central servers placed at the Headquarters office. Computerized activities include 'Billing and Collection', 'Material Management', 'Complaints Monitoring', 'Payroll', 'Provident Fund', 'Pensions' and 'Financial Accounting' (CAG TN, 2010).

The CAG Audit of 2010 found that two areas of activities had not yet been included in the ERP system, namely, the new water connections that are a major activity of Metrowater, and the complaints registration system, because data entry was done manually and time lags from one day to one month. The complaints system now designed to be an online system for both users and for Metrowater employees, was planned with insufficient manpower to maintain the online complaints registration and to respond to complaints within the time limits set. The geo-referencing (CMC number) of complaints received was on an optional basis, so that the resulting database could not provide effective spatially disaggregated information on complaint 'hotspots', nor analyze the type of complaints for spatial insight into problems with the water network. This means that internal monitoring using this database was not possible.

Actual complaints from residents went up from 50,090 in 2011-12 to around 78,000 in 2012-13, of which the vast majority in both years concerned complaints about sewerage blockage and contamination of drinking water.[87]

In terms of the activities included in the ERP, functioning was not yet optimal in preparing the accounts, making inventories of stock, and in billing and collection transactions. The stand-alone digital modules already in use earlier continue to be used instead. The result is a

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84   DCB is Demand, Collection and Balance register. The Rs. calculation was done at 75 INR for 1 euro

85   *Times of India*, Chennai, October 14, 2012.

86   In 2002-06 a GIS was established and a pilot zone experimented for meter with technical assistance from Veolia and support from the WB. Indeed in 2006 the assistance was not renewed and meter tax collection appeared not a success at the pilot level. See Amiraly (2009). Veolia is since very much present with Doshion in 5 BOT and O&M projects for Chennai's water supply, desalinisation and wastewater plant.

87   See 'Sewage tops Chennai's crib list', *Times of India*, June 13, 2013. There is a status of the complaint tool on the website of Metrowater.

substantial loss of revenue for Metrowater with the main issues being as follows;

– Billing at domestic rates for more than 7,000 commercial properties led to a shortfall of Rs 7.67 crore;

– Using a lower annual value rate than the Corporation for calculating water taxes for more than 6,000 properties led to a shortfall of Rs 8.84 crore;

– 13,017 properties were not brought under the tax net of Metrowater, although the Corporation had the necessary information, resulting in a shortfall of Rs. 21.35 crore.

The total resulting losses of the Board were calculated at 42.69 crore Rs. by the audit (CAG TN, 2010).

Metrowater makes use of spatial representations of the water infrastructure, in particular the location of pipelines and associated infrastructure as well as the location of those water users with water meters. Currently these maps are mainly drawn in Autocad, although some information is available within a GIS. There is a move towards using GIS more effectively in producing knowledge on water provision and use. Presently one person at Metrowater is qualified for GIS processing, but other officers have also followed a 4-day GIS training at IIHS in Bangalore acquiring basic GIS skills such as locating geographical coordinates, mapping and querying the information using open source and freely available GIS software. One officer at Metrowater is motivated to use GIS in his daily work because he thinks it can support spatial information and knowledge building currently only available in tacit form among line workers: 'If this information is not laid down in maps, that knowledge will be lost'. He also thinks that GIS can help to locate complaints and analyse the spatial concentration of different types of complaints (sewer blockages and water pollution). GIS could also help identify areas where pipelines come together to avoid accidents in repair works, as updates are currently problematic. There are also plans to incorporate GPS in the routes of water tankers for tracking them in order to monitor water provision and make this means of water supply more efficient.[88]

The TNSCB is currently the nodal agency for the RAY programme, which introduces a combination of spatial mapping of slums (in GIS) with unique identifying systems for household members[89]. The main goals of RAY are

defined as making a situational analysis, and devising curative and preventive strategies for slums, including development plans, investment requirements and institutional arrangements. It is being rolled out across a large number of Indian cities, including Chennai, where several zones have already been mapped and zone-level Plans of Actions are being prepared. Coordination is carried out by private sector consultants in the process, with the help of councillors from each electoral ward in order to identify which slums exist, their conditions, and whether they want to be included in the programme. The process in practice is much fuzzier than the programme goals and plans state, and it is still rather premature to draw further conclusions at the moment (fieldwork still ongoing; see further section 5.4).

Important actors in the private sector producing and providing spatial information to investors are the local and regional real estate developers and international property consultants.[90] They produce spatial and land-related information that is necessary for companies that want to invest in real estate in the city. Such real estate developers do surveys of land ownership, tenure and disputes in order to identify areas where investments can be made. There is still little use of cartography, unless the real estate project is quite large, when partnering is done with GIS companies in order to produce the advisory reports given to companies. The information provided by the real estate developers and international property consultants is a knowledge network independent of government-led urban planning and management. It produces maps of the city that actively promote a new imagined urban space, more in conformity with a transactional vision of the city, e.g., identifying business districts, attractive middle-class and elite residential areas, and attractive areas for companies seeking to locate. These maps leave out the existing urban fabric of small-scale economic units, local shopping markets and less upscale housing areas (for an example, see map 7).

5.3. Spatial knowledge in urban and regional planning

Change in Boundaries and protected areas within extension area

As mentioned above, the Chennai Corporation area was extended in 2011 from 174 sq km to 426 sq km and the metropolitan area will most likely be extended to 8,878 sq

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88 See 'Soon, GPS to track Metrowater tankers', *The Hindu*, March 10, 2013.

89 It is not clear however whether household numbering is associated with a precise geo-reference information.

90 This description is based on a contribution and recent research by Rouanet (2013).

Map 7: An example of how property developers represent urban space and produce spatial knowledge.
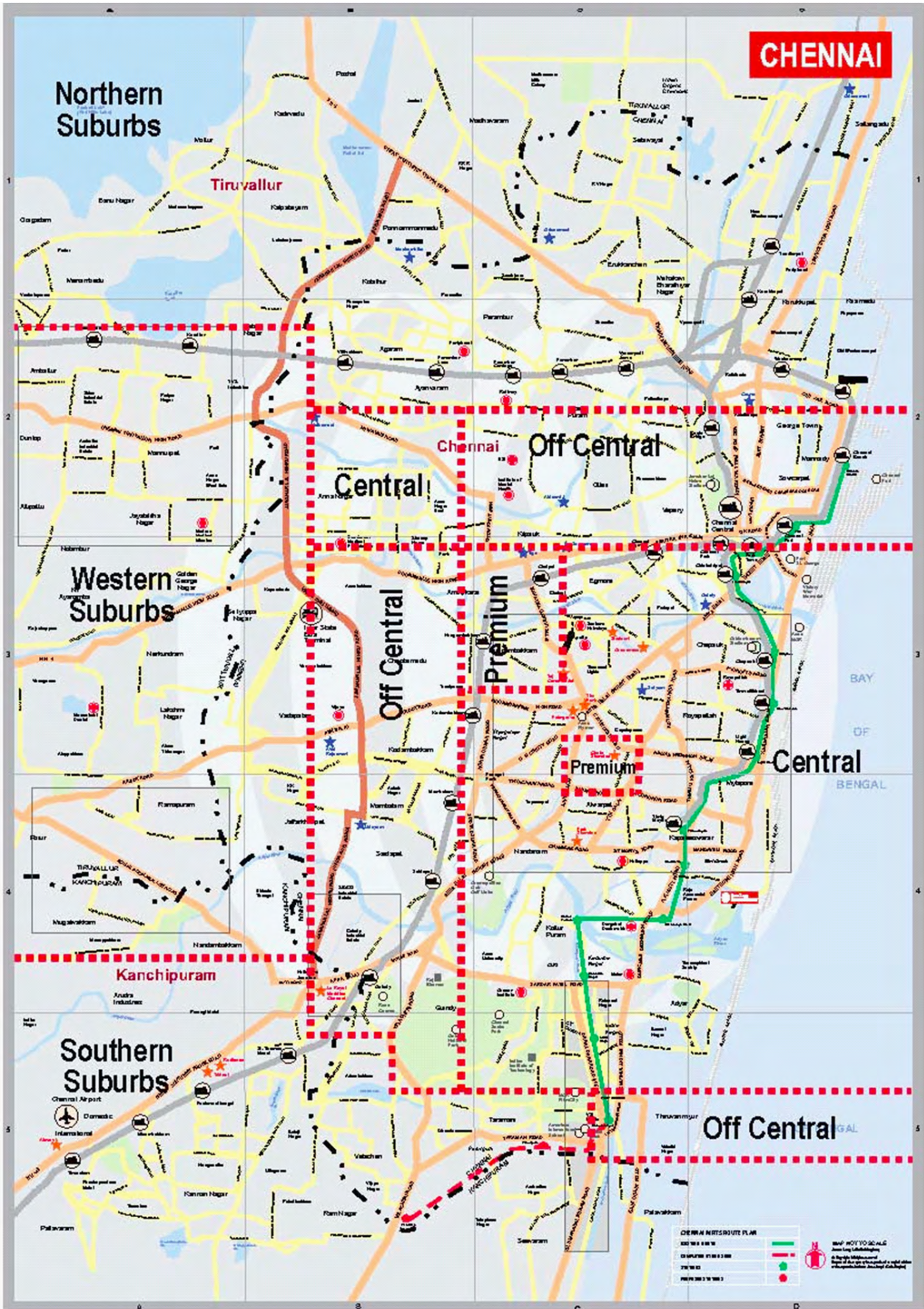
km in the near future. The main purpose of this change in boundaries was to accommodate the growing population and expanded IT Corridor to the South of the city. This has meant that part of the IT Corridor now falls under the Corporation jurisdiction, including revenues and costs for providing infrastructure. New structures of representation through ward councillors rather than local governments have reduced the strength of local populations to negotiate with local government. Within the extended area several lakes exist, which currently are protected from development, at least officially.[91] The catchment of the marshy area in the South connected to the Buckingham canal and providing a link with the sea is 'protected'. However, expanding building developments in the area show that this protection is limited in practice.

The Chennai metropolitan area displays two development lines, a red one (current) and a blue one (future). Within the blue line land use change from agricultural area to urban area will take place; as rain-fed agriculture is no longer profitable under the prevailing climate conditions (e.g. lack of perennial rivers), it is expected that farmers will agree to sell their land.

Use of ICT-GIS based systems in urban and regional planning

The CMDA uses several planning products and instruments incorporating spatial information for urban and regional planning, among which the master plan, a land information system (LIS), the coastal zone regulation act (CZR) and the floor space index (FSI). Since 2008 the 2nd Master Plan is in place, following that of 1974 and projecting developments up to 2026. The Master Plan is a guide for authorities responsible for urban and regional development and infrastructure planning. The section on spatial knowledge construction on the next page elaborates on the design and participatory processes concerning the Master Plan development. The LIS is a GIS-based land management system developed by the NIC, which covers only the layout of the Chennai Port Trust area and provides information about plots, e.g. whether they are vacant, occupied or to whom plots are allotted. The CZR, defined by the National Institute for Oceanography and notified in 2011, takes care of the coastal zone protection and states that developments are allowed up to 500 m from coast. With respect to the FSI, the CMDA expanded its FSI to include a premium FSI in 2009, which makes higher construction possible (GO order 163/2009).

Another GIS-ICT based initiative is the utility mapping project of the Union Planning Commission. It concerns the development of a digital base map on a scale of 1:1,000 to support government departments in formulating schemes and the planning of infrastructure and integration of physical information derived from aerial photographs for greater Chennai from 2007, provided by the National Remote Sensing Agency (NRSA) in Hyderabad and handed over to the Survey of India, which is in charge of the digitization process including attribute information. The CMDA combines this with detailed field surveys to update and to provide information on basic services as well as information with respect to police and fire. However, the utility-mapping project linking various departments and authorities has been in discussion for over two years without much progress. Its usefulness would lie in strategic planning, for instance, for carrying out a new transportation plan.

The relations between the CMDA and CMC reveal some tensions in their cooperation. The CMC had limited interest in participating in discussions on preparing the Master Plan, as its mandate focuses more on daily operations and maintenance of basic services and less with future visioning. Regarding GIS-based mapping activities, collaboration between the two entities is not always smooth. Property information is not shared between the CMC and the CMDA, which has to rely on cadastral information for its work. The CMC has digitized land ownership data (*pattas*), but has not linked these to digitized base maps. CMDA has scanned and digitized existing paper cadaster maps and has used them for detailed Master Plan land use information. Property mapping is also done by the Revenue Department and Survey Office within the district collector's office in Kancheepuram and Tiruvallur. It uses the CollabLand tool developed by NIC at Union level,[92] with a base map validated by the Government of India (GOI/SOI). CMC cooperates with the NIC. NIC for instance prepared the aerial photographs for Chennai city, which should serve as a basis for the digitization of utilities, line features, etc. While CMC relies on the support of the SOI in terms of the base maps, CMDA develops everything in-house, including the training of planning assistants. Employees received GIS training from ESRI India. There is realization of the importance of moving towards a common database with geo-referencing and common base maps within the CMDA,[93] but the organisational networks, competencies and mandates are still posing barriers. The issue of unwillingness to share knowledge is a wider problem in the Indian context.

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91 In the 1970-80s many lakes were reclaimed in favour of housing schemes, established with World Bank funding. Source: personal communication, CMDA planner.

92 Collabland is a software for digitization and mosaicing of survey maps.

93 Interview conducted by Baud, Pfeffer, Dhanalakshmi with CMDA planners and GIS section Chennai, March 24, 2013.

Spatial knowledge construction in preparing the second Master Plan

The construction of the Second Master Plan by CMDA was strongly based on digitized information (in both Autocad and GIS), and training in GIS was provided to senior planners at the Geography Department of Madras University. In order to make the spatial knowledge construction manageable, technically speaking, the CMDA area is divided into 3,500 blocks; the spatial information on land use has been extracted from satellite images (i.e. an Ikonos image), where the land use classification was assigned by the senior planners based on their professional knowledge and experience. As mentioned earlier, for the topography, cadastral maps have also been scanned and digitized in Autocad showing major roads, village settlements, etc. In the GIS department within the CMDA planning assistants prefer to draw maps in Autocad because, according to them, it is easier. However, the detailed development plans are further processed in an ArcGIS platform (after being imported from Autocad). For the detailed development plans a detailed physical survey was carried out with respect to land use. That information was then integrated in the attribute table of the ArcGIS map. The Survey and Settlement Department (state level) provided the cadastral maps and older land use maps, where the latter are paper maps, which have been re-drawn in Autocad to support trend analysis of land use change.

Participation in the construction of the Master Plan

In the preparation for the 2nd Master Plan, the CMDA introduced consultations on local areas plans linked to the Master Plan, in conformity with recent legislation. On Sundays, meetings were organized in the local language, Tamil, in which the Master Plan was presented to local residents, invited through newspaper announcements. The organisation of meetings was done in teams to cover the different geographic areas and spread over seven months. In total, more than 1,500 objections were submitted. Each written objection has been discussed and dealt with by a committee. The outcomes are visible in the final version of the Master Plan. The mains concerns expressed were regarding traffic, parks and playgrounds.

5.4. Mapping slums for redevelopment: the process of RAY in Chennai

Slum mapping and preparation of action plans for slum redevelopment are major dimensions of the national RAY programme. In practice, these are very labour-intensive processes, and the purpose of slum mapping is not entirely clear, if related to the subsequent activities outlined in the programme description. In Chennai, Darashaw, a private consultant,[94] has been given the task of preparing zonal maps of slums and the related Plans of Action for selected zones in Chennai. Preparing these maps consists of: enumerating slums in each zone of the CMC area, conducting a socio-economic survey, preparing manual topographic base maps of the settlement, with geo-referenced coordinates for settlement boundaries, entering the data into a MIS[95] and GIS. Subsequently, data analysis is carried out, using a deficiency matrix to prepare development options showing priorities and phasing, investment requirements and financial planning. Consultation with elected councillors at zonal level meetings, approval of the slum-free zonal Plan of Action from the State-level Review Committee and final sanction from the Central Review Committee follow this process. As of September 2013, zonal maps had been completed for 13 out of 15 zones of the CMC.

A critical analysis of the guideline document for RAY shows that leading NGO/CBOs should be engaged in community mobilization, slum survey and preparation of slum level redevelopment plans. In Chennai, an NGO called Jeva Jyoti was engaged initially for the slum survey, but later called off. For the decision-making process of preferred development models, consultation is limited to zonal meetings held with local councillors and researchers. Leading NGOs of the city such as Asha Niwas, Arunodhya, Nivedan Women's Development Trust, Community Service Educational Society, Action Aid, World Vision, are not aware of the RAY programme in Chennai.

The private consultant, Darashaw, is in charge of most of the work, from data collection to analysis, with some monitoring by the State Level Coordinator, who goes to the field to inspect the process. There was some capacity

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94   Darashaw is a leading investment and banking house from Mumbai, which provides advisory services in City developmental projects and urban infrastructure. Investment planning is the core competence of the consultant, not participation and in situ development.

95   MIS for Management Information System: It refers originally to Online Monitoring System for Slum / Household / Livelihood Surveys, which was implemented before RAY for ULBs under Ministry of Housing and Urban Poverty Alleviation with the support of the Centre for Good Governance. Cf. http://surveys.cgg.gov.in
Apparently, a new MIS is used in Chennai to incorporate biometric information collected. It was developed by Gritsys Technology, a leader in pharmaceutical software solutions.

building for TNSCB staff going on, but given that it is the lead agency for the state in RAY, training for TNSCB staff did not appear to receive adequate attention. The policy guidelines of RAY mandate the use of total station survey for mapping slum infrastructure, but this was abandoned after the first field experiences in Chennai. Residents opposed the consultants' use of the instruments in mapping slum infrastructure, due to the residents' lack of knowledge about the project, and their fear of eviction. Thereafter, the consultants prepared a manual topographic base map of the settlements comprising of housing (by blocks, no individual units mapped or numbered-geo-localized) and related infrastructures. They prepared a basemap for CMC using Quickbird imagery provided by the NRSA (which is not validated by the SOI).

In Chennai, the choice of development model and resettlement for each location surveyed is based on the analysis done by Darashaw and comments from the review committee of TNSCB. There is no participation by the residents for selecting the development model. In some instances, the result of the survey was presented to slum residents, although the majority are unaware of RAY policy. This puts local leaders and councillors in a powerful position because they have the access to knowledge as well as enumerators who come for data collection.

The present survey being conducted for RAY is comparable to the TCG Developments (TCG) study on the slums settlements of Chennai in 2005 (see also section 3). Both were done by private consultants using spatial data analysis and investment planning for future development of identified slums. The RAY survey involves a unique identity number for each household in the slum, which is integrated into the analysis for preparing the slum free development plan. Household level analysis is done for RAY, whereas in the study conducted by TCG, the settlement was the unit for data collection as well as analysis. A total of 1,473 slums were covered in the TCG study of which 242 slums were identified as undeveloped. In the RAY survey 935 undeveloped slum settlements have been reported so far in the 13 zones of CMC. Many of the key concepts that figure in the policy guidelines of RAY are missing from the way the policy is being implemented in Chennai. These include resident participation in decision-making, engagement with local NGO/CBOs and capacity building of local government. Regarding the latter point, as noted above, a State-level agency, the TNSCB, is in charge of overseeing the RAY programme, and not the CMC. In this respect, the local government is bypassed in the implementation of this national slum policy, and is not in a position to build its capacity in this field.

Categorization, in-situ redevelopment, land titling and resettlement

In the core principles of RAY programme, the slum survey is viewed as a preliminary step toward security of tenure, regularization and free delivery of ownership titles (patta). In situ rehabilitation and infrastructure development should be privileged: "bringing all existing slums, notified or non-notified within the formal system and enabling them to avail of the same level of basic amenities as the rest of the town". This inclusive vision is supported by the Draft Model Property Rights to Slum Dwellers Act (2011), not yet passed by Parliament. However, in the existing draft zone report consulted for Chennai, no priority has been given to regularization. Map categories do not refer clearly to titling possibilities for squatters, although land ownership is detailed for each settlement. Secure and unsecure land tenures are also criteria of classification.

The Tamil Nadu Slum Clearance Board continues to consider relocation as the core strategy of its policy for Chennai. Land values of squatted area should be valorized and inhabitants reallocated in peripheries in block apartments where conditional free pattas apply, like in Semmenchery. For instance, the preliminary report for the RAY survey in zone 13 stated that 35% of the slum households (13,551 families) fall under objectionable location category and have to be relocated. NGOs like Transparent Chennai and inhabitants are contesting these statements.

RAY's guideline envisions the "Preparation of legislation for the assignment of property rights to slum dwellers" going hand in hand with the Slum Survey in the preparatory stage, but there is no apparent coordination with Revenue Department or Survey Department and ongoing digital property mapping.

The release of funds under RAY does not take into account the function of the Slum Survey and Plan of Action report, which is supposed to be ratified by inhabitants on the premise that in situ redevelopment should receive priority. In practice, the report is requested as an administrative step, like the survey and consultations step. The reporting has much more to do with land portfolio management than participative development.

In effect, the choice between in situ redevelopment and relocation is made by the consultant when distinguishing between tenable and non-tenable slums (or part of slum?), based on the presence of environmental hazards, risks like flooding and stagnant water, and secondly, on the encroachment close to infrastructure such as roads, metroline or water bodies. Coastal zone regulation (CRZ) also sets limits.

Residents' eligibility for in situ rehabilitation or relocation is limited to "owners" of house structures; tenants are not entitled to RAY. Residents are required to show their ration card as a basic proof of residence for enrolment in the list. Only hut dwellers ("owners") could be enrolled in the scheme, not those living under a tile or concrete roof (20 huts or more). The universal enrolment invoked for a Slum Free City and at the foundation of RAY Vision is limited in practice to the process of listing and entitlement of places, constructions and households.

From the Zonal Survey a plan of action based on a deficiency matrix is prepared - Slum Free City Plan of Action (SFCPoA). It is followed by a yearly phasing, including pilot projects and a financial plan divided between infrastructure and housing costs. First comes the classification between tenable and untenable slums based on environmental parameters, land ownership, land value, dwelling unit density and tenure status. Spatial analysis is central during this initial step. Then slums are situated on a matrix with axes indicating level of infrastructure (% of tap connection, individual toilet, road less than 3 meters wide, sewage connection) and vulnerability (% kutcha houses, BPL households, SC/ST households). Under this framework, in-situ development should occur in tenable slums. Spatial analysis combined with the matrix leads to four broad approaches: slum improvement, slum up-gradation, slum redevelopment and slum resettlement. Delisting is also an option when minimal infrastructure investments are required. Emphasis has been put on the redevelopment option with densification and remunerative use of land. It means public-private partnerships for the redevelopment of the area with in situ re-housing of present inhabitants after dense block constructions partly sold at market prices.

Biometric registration is done at household level within the survey. These biometric camps and household registration are not coordinated with the Unique ID programme Aadhaar. It's a completely separate campaign of identification. At some point in the gray literature we found the intention to merge Aadhaar and RAY, but this does not appear to be the case in Chennai.

In the case of RAY implementation in Chennai, mapping, digital data collection, recording and identification appear as a set of tools providing a scientific/technical rationale for decision-making on upgrading or resettlement. However, the field research suggests it is much more an instrument for profiling and controlling than for shared consultation and decision –making, and participation from NGOs and CBOs has been very limited.

The RAY programme in Chennai is viewed by the TNSCB as an opportunity to build new structures, concrete houses

(pucca) of 270 sq. ft. (24 meters) and obtain a "hut free city" (interview). However, there is confusion on whether it overlaps or merges with a major programme for house improvement promoted by the current Chief Minister Jayalalithaa for all of Tamil Nadu, through the TNSCB (via a grant for house improvement with patta of 2 to 4 lakhs per household supported by GoTN and GOI). Evidently the Union programme (RAY) has to be adjusted to existing schemes and legal provisions for the urban poor, house provision and slum rehabilitation in Tamil Nadu. Zonal Reports by Darashaw reflect their efforts to match regional schemes and the national RAY programme. This point raises the crucial question of regional and local (municipal) implementation of Union Schemes; the three tiers decentralization implies several negotiation/adaptations of the national project and discussions on mandates within the frame of Union, State, and Concurrent lists. For instance, land and land tenure are on the List II or State list, same for Local governments, Land revenue and land records, but for transfer of property other than agricultural land, the deed registration is on the Concurrent list and Survey of India on the Union List (List I). RAY can apply only to certain types of Poramboke (common land) where legal mechanisms already exist to convert them in Natham and deliver individual free pattas or site pattas. RAY scheme cannot escape the legal procedure of land delivery and legalization as a preliminary step to any in-situ redevelopment. Houses cannot be constructed without achieving the prerequisite of clear property title. Due to such overlapping competencies on land titling, granting property to squatters remains a very long process, which does not fit into the frame of redevelopment programme working to provide improved housing on a more urgent basis.

5.5. Spatial knowledge produced through citizen participation processes

Transparent Chennai (TC) is a leading local NGO that collects and disseminates data and research on urban planning, governance and civic issues. It has four main fields of work involving public participation and advocacy: 1) participative and voluntary web-mapping where citizens can introduce information like grievances or where community collected information can be diffused; 2) reporting on public hearings, planning activities, organising community meetings and conference and advocating a more inclusive, pro-poor and participative city in the press; 3) conducting, with a network of NGOs and volunteers, its own surveys on civic issues (garbage collection, sanitation, public toilets, right to walk, neighbourhood planning...); and 4) leading

participatory mapping in low-income neighbourhoods concerned by upgrading or resettlement, including through the conception of a toolkit for slum community mapping[96].

TC works with a network of local NGOs and larger intercity alliances and is supported by the Centre for Development Research, Institute for Financial Management and Research (IFMR) of Chennai.[97] Its survey campaigns have succeeded in mobilizing a large community of volunteers (young engineers, up to 200) and in providing a rich set of geo-referenced data on bus road, public toilets, and homelessness hotspots. They are mobilized through various social media.

TC's initiative called 'Map Your Bus Route', which uses My Tracks Google Android platform, allows volunteers to report on their phone and progressively build a map of Chennai's bus lines, a facility that was not hitherto available.[98]

This approach of data, information and knowledge production challenges the lack of accurate and updated public information in the city. It makes it possible for TC to criticise the data and maps provided in-house or through consultant reports used currently by CMC and others producing geo-referenced information, who fail to incorporate and disseminate to the general public accurate and up-to-date geospatial information. Information produced and made available by TC can also be used to evaluate and monitor government actions and investments.

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96   http://www.transparentchennai.com/that-thing-called-community-participation/

97   A major bank, the Industrial Credit and Investment Corporation of India(ICICI) bank is associated to IFMR trust.

98   http://www.transparentchennai.com/map-your-bus-route/

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6 Fiscal Decentralisation, Participatory Processes and Inclusive Development

Fiscal decentralisation in Chennai[99]

Fiscal decentralisation was introduced as part of the 74th Constitutional Amendment in 1992, which provided for more substance to the third tier of government at the local level. More recent introductions of mandatory participatory processes in determining City Development Plans and Local Area Plans are designed to contribute to more inclusive development processes within cities.

The methodology adopted for the city case study includes secondary data collection: mapping the institutions associated with various development of the city, fund flows, followed by primary surveys of officials, elected representatives, and ward council and standing committee members.

Chennai is the foremost corporation in the country set up in 1919 by the British under the Chennai City Municipal Corporation Act, 1919. Chennai Municipal Corporation (CMC), functions directly under the municipal administration and water supply department of the state Government of Tamil Nadu. Unlike other states in India (except in the case

of Delhi – a city state), in Tamil Nadu each municipal corporation has its own Governing Act.

The decision to expand the area of CMC was enacted in the state assembly in 2011 (see Map 8). This was based on a three-member committee set up under the chairpersonship of the Chennai Metropolitan Development Authority (CMDA) vice-chairperson in 2007. The area increased from 174 sq. km. to 424.45 sq. km. The decision to merge adjoining villages and municipalities was taken in a participatory way as per the government notification of December 2012.
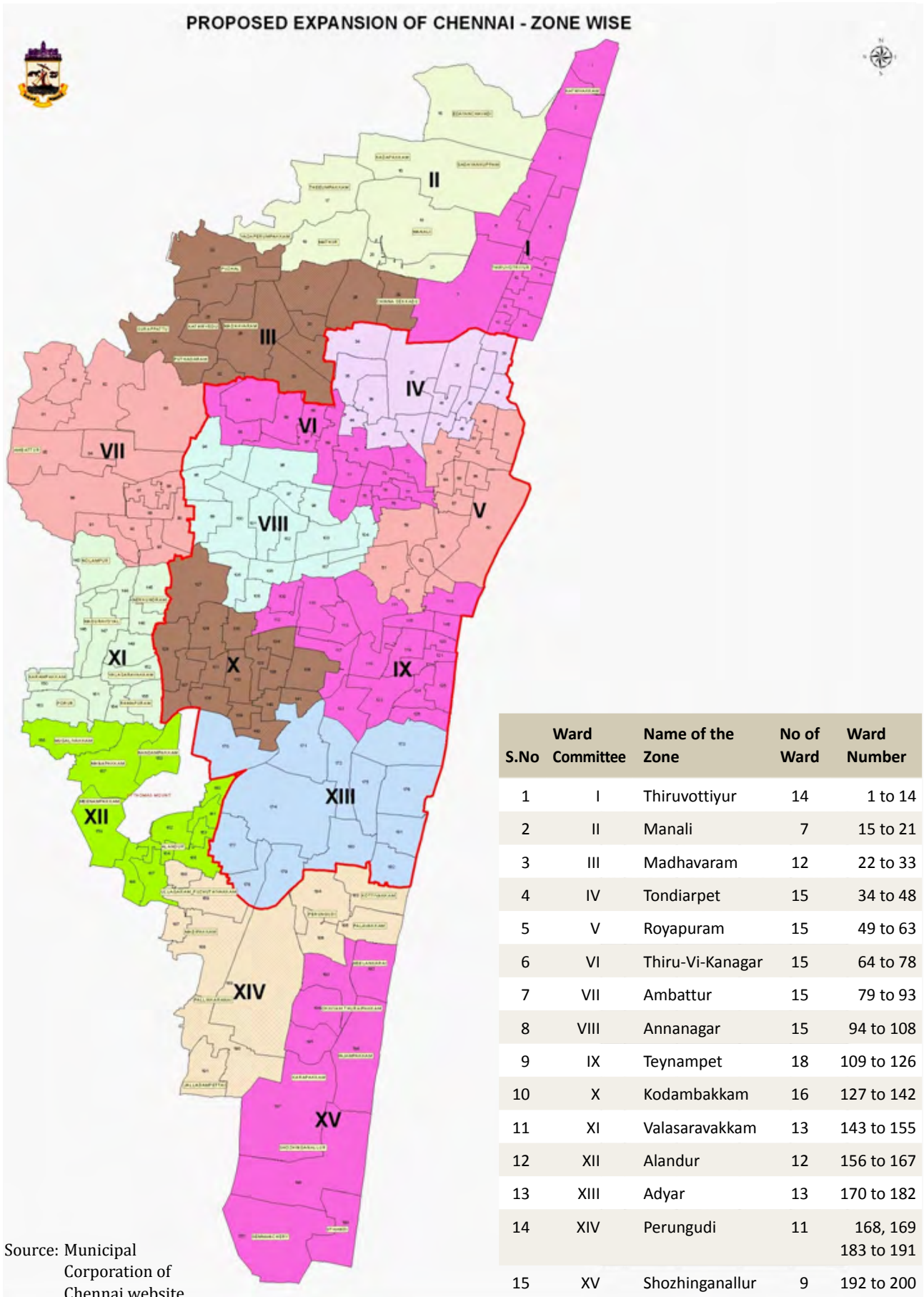
It explains that expansion was needed to provide water & sewerage system, solid waste management as well as roads, streetlights, etc. The resolutions by various municipalities submitted to the state government indicated that participatory consultations were held to arrive at the merger decision in which the general public, elected representatives from various levels, administrative staff and commissioners participated.

There have been efforts towards improving the Fiscal decentralisation patterns in the CMC. The sources of funds for CMC are State Government releases to the Corporation based on recommendations of the State Finance Commission

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99   Extracted from the WP6 Combined Fieldwork Report, coordinated by N. Sridharan. Available online: http://www.chance2sustain.eu/55.0.html

Map 8: Administrative divisions in the Municipal Corporation of Chennai and the 2011 expansion

PROPOSED EXPANSION OF CHENNAI - ZONE WISE

S.No	Ward Committee	Name of the Zone	No of Ward	Ward Number
1	I	Thiruvottiyur	14	1 to 14
2	II	Manali	7	15 to 21
3	III	Madhavaram	12	22 to 33
4	IV	Tondiarpet	15	34 to 48
5	V	Royapuram	15	49 to 63
6	VI	Thiru-Vi-Kanagar	15	64 to 78
7	VII	Ambattur	15	79 to 93
8	VIII	Annanagar	15	94 to 108
9	IX	Teynampet	18	109 to 126
10	X	Kodambakkam	16	127 to 142
11	XI	Valasaravakkam	13	143 to 155
12	XII	Alandur	12	156 to 167
13	XIII	Adyar	13	170 to 182
14	XIV	Perungudi	11	168, 169 183 to 191
15	XV	Shozhinganallur	9	192 to 200

Source: Municipal Corporation of Chennai website

(SFC). Loans and grants are released for various schemes (Govt. of India grants) on the basis of SFC's recommendation, for implementing specific schemes, including poverty alleviation programmes. In addition, CMC receives the Collector's development fund (2nd Finance Commission) since 2007, and the MLAs' constituency development fund. Of the total money received by CMC, 10% of the money allocated for CMDA should go to CMWSSB.

The 3rd SFC of the State of Tamil Nadu (TN) provided the following recommendations:

1. Rural – urban sharing of revenue (vertical sharing) in the ratio of 58:42.

2. A horizontal sharing in the following proportions: 30% for municipal corporations, 41% for municipalities, and 29% for town panchayats.

3. An incentive fund of 5% out of the total devolution under pool b (own source funding of the TN Govt.).

4. The loan deduction from urban local bodies should not exceed 25% of gross devolution.

5. The state should take up the matter of amending Article 285 of the constitution for empowering the local bodies to levy service charges for the central government buildings in view of the Supreme Court judgement.

6. Using GIS for tax mapping, as in the case of Bangalore Municipal Corporation, to assess un-assessed and under assessed properties for improved exploitation of available property tax resources (see further next section).

Knowledge Construction around the Budget

As mentioned in the section on SFC recommendations, the 3rd SFC suggested computerisation and e-governance (Panruti Model) for tax administration with the help of the Third Tamil Nadu Urban Development Project (TNUDP III) assisted programme. It was suggested that the earlier abolished taxation appeal tribunal be reincorporated in the Tamil Nadu Urban Local Bodies Act, 1998 with the provision of full remittance of tax dues pending disposal of the appeal by individuals. It also proposed, reintroduction of vacant land tax. The Chennai metropolitan water supply and sewerage board was allowed to increase its charges by 30% from 2007 onwards with an increase of 5 to 10% annually. In fact, the CMWSSB has been given blanket powers to fix the water rates in such a way that it could meet not only its revenue expenditure but also create surplus for investing in capital requirements. Hence there have been efforts towards bridging the revenue deficits with increasing tax collection efficiencies (with Information technology playing a vital role).

Fiscal Responsibility, Audit mechanism and Community Participation

Though there is a Fiscal Responsibility Management Act at the national level, in Tamil Nadu there is no such Act to regulate the public expenditure programme. The 3rd SFC suggested Fiscal Responsibility and Budget Management (FRBM) legislation for urban local bodies to take the structural reforms down to the third tier of the government. It suggested analysis of credit worthiness of the local body by reputed credit rating agencies and also suggested fixing a ceiling for borrowing by urban local bodies. Suggestion of concurrent auditing through e-mode to reduce the burden on local fund audit Directorate was made by the SFC. Following the neighbouring state of Andhra Pradesh, the Tamil Nadu SFC suggested Community Participation Law with area sambas represented by Resident Welfare Associations, (RWAs), self-help groups (SHGs) and NGOs to meet twice a year to review the budget and scheme implementation. It went on to suggest project planning to be done by area Sabhas. The financial power delegation being followed in CMC is as follows:

Table 8: Financial power delegation in TN

Financial limit (in lakh rupees)	Sanctioning authority
< 1	Ward committees (in total 15)
1- 35	Commissioner
35 - 40	Standing committees (sc) except sc taxation and finance
40 - 45	sc taxation and finance
45 - 50	Council
> 50	Government
	Powers for issue of technical sanctions
< 2	Assistant executive engineer
2 - 5	Executive engineer
5 - 25	Superintending engineer
> 25	Chief engineer

Source: Local Fund Audit Department (2006), Audit report of the urban local bodies for the year ended March 2005. GoTN, Chennai.

The Third SFC strongly suggested constitution of Chennai Metropolitan Planning Committee (CMPC) and functioning of CMDA as a secretariat of CMPC and that the present system resource sharing from the local bodies within CMDA for CMDA should be dropped. It advised 75% of development charges to be passed on to respective urban local bodies within CMDA, and 0.25% of collected revenue income for CMDA should be abolished. The *most important recommendation is to declare the entire CMDA area as an urban area by merging all the villages to nearby municipalities* (emphasis added). To make the budget more participatory, it suggested abolishing the Collector's Development Fund.

MLA constituency development schemes should come from the projects identified by the urban local bodies and not on ad hoc basis, and 30% of the fund should be for core civic services. However, participation took a back seat when the merger of surrounding municipalities and villages with the CMC occurred. A Government Order (GO (Ms.) No.136 dated 12th September 2011) came out with setting up a ward committee in each of the Zones combining several wards, ranging from 7 to 18 wards in one committee. The total number of wards and zones in the erstwhile Corporation area reduced to seven zones and 107 wards against 10 zones and 155 wards earlier; thereby increasing the area under governance per zone and ward (see Map 8 on page 56). In the newly merged areas, which had separate municipalities with their own budgets such as Ambattur, a whole municipal area was merged into one ward, leaving little scope for political participation in the budget-making process. In fact, the community's fiscal capacity is restricted by the new municipal structure that allows no incentives for spatial competition (Karuppusamy & Carr: 2012). Erstwhile municipalities such as Alandur had a history of participator community funding (now being advocated by the Central Government through its Community Participation Fund), which cannot now be used because of the new municipal structure within CMC[100].

Of the total 200 councillors 30 councillors were surveyed in Chennai to know their views on decentralisation, participation and also about the Millennium Development Goals (MDGs) and sustainability. In fact, none of the Councillors are aware of the MDGs and they all revealed that there is no ward level budgeting process in CMC. Not many are aware of the new City Development Plan (CDP) which suggested allocating a total amount of Rs.123, 207 million for the year ending 2026 on various projects. They are also not aware of the per capita expenditure of Rs. 22,184/- suggested by CDP. In fact, they were furious about the question of how the CMC would pay back this amount as this is mostly funded

by the Central Government. Similarly many of the councillors are not aware of their own roles and responsibilities.

TC's analysis of participation by the 200 councillors shows that on an average the councillors participated and raised issues only 16 times from 2007 to 2011 (Transparent Chennai: 2012) bringing out low levels of 'political participation' in Chennai's budget making process. Under the new State regime that comes out with frequent threats of dissolving the Municipal Corporation (See The Hindu: June 20, 2012) the Councillors were afraid to discuss anything openly. But they agreed with the Chief Minister about the corruption and transparency issues that she raised.

An analysis of Councillor and Mayor funds by TC (Meryl 2011) showed that out of the total allotted amount of Rs.108.5 million, 70% was used. Each councillor was allotted Rs. 0.7 million in 2007 which was increased to Rs.1.5 million in 2008-9 during which period the total expenditure was reduced to 63.5%. In 2009-10, councillor funds were increased to Rs.2.5 million and the spending fell to 41%. However, the study observed that spending increased to 63% in 2010-11, due to elections. In the case of Mayor Funds, the study observed that out of Rs.5 million, only Rs.1.84 and Rs.1.3 million were spent during 2007-8 and 2008-9. This decreased to Rs.0.9 million when the actual allotted funds increased to Rs.20 million in 2010-2011 (Ibid, 2011).

An analysis of the CMC budget shows that Chennai's per capita average capital expenditure was Rs.1204/- and per capita revenue expenditure was Rs.2461/- as compared to that of Mumbai's Rs.3433 and Rs.9888/- respectively during the period 2007-2010 (Sridhar, K: 2012). Wages that accounted for 49% of the total revenue expenditure in 2003-4 are slowly coming down to near 30% in 2009-10 (CMC Budget 2011-12). Chennai received around 21% of centrally sponsored project funds, and 19% of the State sponsored funds for various infrastructure projects during the same period. Central Finance Commission's fund (13th CFC) to the tune of Rs.270.14 million was allocated to CMC during the year 2012. These were based on City Development Plan (CDP) projects and did not emanate from residents through participatory processes as envisaged in the 3rd State Finance Commission.

The city's strategy of bringing larger areas under the Corporation may not lead to efficient participation in the long-run though it might increase the overall revenue of the Corporation due to an increase in the property tax base. Ward Committees that were formed are yet to be effective in planning and monitoring various projects. The capacity of the councillors needs to be built around budget formulation from the grass-root level and to address issues of the MDGs. Considering the low resource mobilisation capacity of the CMC, future projects need to be self-sufficient but the element of equity will still remain.

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100 see also Baud, I.S.A., Dhanalakshmi, R. (2007). Multi-actor arrangements in urban environmental Services: New forms of Governance in Indian Mega-cities, in: *Cities*, **42**, 2, 133-147.

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List of maps (cf. Appendix)

List of images (cf. Appendix)

6 References

List of abbreviations

CMWSSB – Chennai MetroWater Supply and Sewage Board

CMC – Chennai Municipal Corporation

CDP – Chennai City Development Plan

CMDA – Chennai Metropolitan Development Authority

CTS – Cognizant Technology Solutions Corporation

GIS – Geographical Information System

GoI – Government of India

GoTN – Government of Tamil Nadu.

ICICI – Industrial Credit and Investment Corporation of India

ICFMR – Institute for Financial Management and Research

IIHS – Indian Institute for Human Settlements

IT-BPO – Information Technology-Business Process Outsourcing

ITES – Information Technology Enabled Service

JNNURM – Jawaharlal Nehru National Urban Renewal Mission

MRTS – Mass Rapid Transit System

NRSA – National Remote Sensing Agency

OMR – Old Mahabalipuram Road

RAY – Rajiv Awas Yojana programme

SFCPoA – Slum Free Cities Plan of Action

SIPCOT – State Industries Promotion Corporation of Tamil Nadu

SWM – Solid Waste Management

TCS – Tata Consultancy Services

TNRDC – Tamil Nadu Road Development Company

TNSCB – Tamil Nadu Slum Clearance Board

Appendix

Figure 1: IT initiatives per organisation in Chennai

IT issues	CMDA internal; utilities mapping project (nodal agency)	Corporation: SWM dept.	Corporation: Property tax assessment, collection *	Water Board 1)	Slum Clearance Board, RAY survey	Community-based initiatives	Private sector	Revenue Dept., Collabland, property tax assessment
Discourses and rationales	Strategic planning; integrating data	effective monitoring of ppps in SWM; process monitoring	Efficiency, effectiveness; digital registration of property with their archives (proof. pattas, etc.)	make operation more efficient and effective in tax collection	Curative and preventive strategies for slums; use of mapping for situational analysis	Basis for stronger negotiation with other organisations; providing up-to-date info for citizens; generate a counter-expertise on urban planning; make the perspectives of subaltern community audible.	Analysis of interesting areas for investment	More efficient and effective revenue collection, reducing corruption: The tool for conclusive property
Knowledge construction and management Actors and networks	in-house GIS section, with own Capabilities, for Master Plan preparation	ppp in SWM, using maps and truck tracking; photo and mobile phone reporting methods	intended integrated system for 41 functions, changed to stand-alone systems after 7 yrs, lack of software controls to Identify properties, lack of Property Tax assessments less** !	Modules produced for various processes, and an integration of modules programme (ERP); worked with private sector company	GIS based slum mapping; slum profiles and hhs surveys with identifications; SCB, private consultants, councillors, hhs	Identifying issues: crowd sourcing information from citizens; Diffusion and analysis of official presentation in urban planning; collection of community based information in collaboration with NGOs; field surveys	Real estate mapping	Technical difficulties in the map projection; Issues in the coordination between Revenue office and Survey office
Knowledge use, contestation, and exchanges			Database with info residential or commercial property classification not with CMC, but other organisation. Cross-checking limited, so CMC database not up to date, losing revenues because of this	Resistance to use of digital modules and ERP	Self-exclusion, slum quality assessment process by consultants; lack of information on the ground among councillors and hhs about RAY	Presence in meeting and public hearing in urban planning, slum development…; reporting on website; cooperation between NGOs; organization of public meeting, Press communication		
Spatial knowledge produced by citizens	Only now included through local area development discussions with selected citizens (as part of preparing new MP)		Property owners indicate whether they have residential or commercial properties - but this IS not checked sufficiently	Residents can call in with complaints; on line complaint registration is supposed to be possible, but in 2010 was still not being registered properly at the Water Board, nor being responded to by employees there	Hhs have to produce info on their situation for inclusion in classification	Participatory mapping with local communities affected by development project (advocacy); general public online contribution through webmapping		Interactions with citizens occur at the time of the chain survey, on the field to delineate property.
Effects of ICT_GIS knowledge production being introduced	Although slum locations are known internally, not included on official maps when on government land	Dpt head can work strategically in stead of constant trouble shooting; monitoring more direct on daily basis	Integrated On-line Information Processing System initiated in 1997 could not be implemented; abandoned in 2004 after spending Rs 1.60 crore; In correct property classifications led to short-assessment Property Tax; properties not Included In database led to shortfall in taxes collected	*database not up to date, contains wrong information; *too little match with manual database in organisation *lack of data transfer from CMC to Water Board led to shortfall in revenue collection (properties valued at domestic levels rather than commercial)				

1. Source: CAG]N, (2010), *Audit Report (CIVil) for the year ended 31 March 2010 for Chennal Metropolitan Water Supply and Sewerage Board*, Comptroller and Auditor General. Tamil Nadu, Chennai,
2. ** source: CAG, Audit Report (Local Bodies) for the year ended 31 March 2006, (2006), Comptroller and Auditor General. Delhi.
3. * This concerns digitization of existing archival material, not digitized mapping,

Chance2Sustain examines how governments and citizens in cities with differing patterns of economic growth and socio-spatial inequality make use of participatory (or integrated) spatial knowledge management to direct urban governance towards more sustainable development.

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