SFD Report

Tirupati
India

Final Report

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SFD Report Tirupati, India, 2016

Produced by:

Roeder, L. (GIZ)

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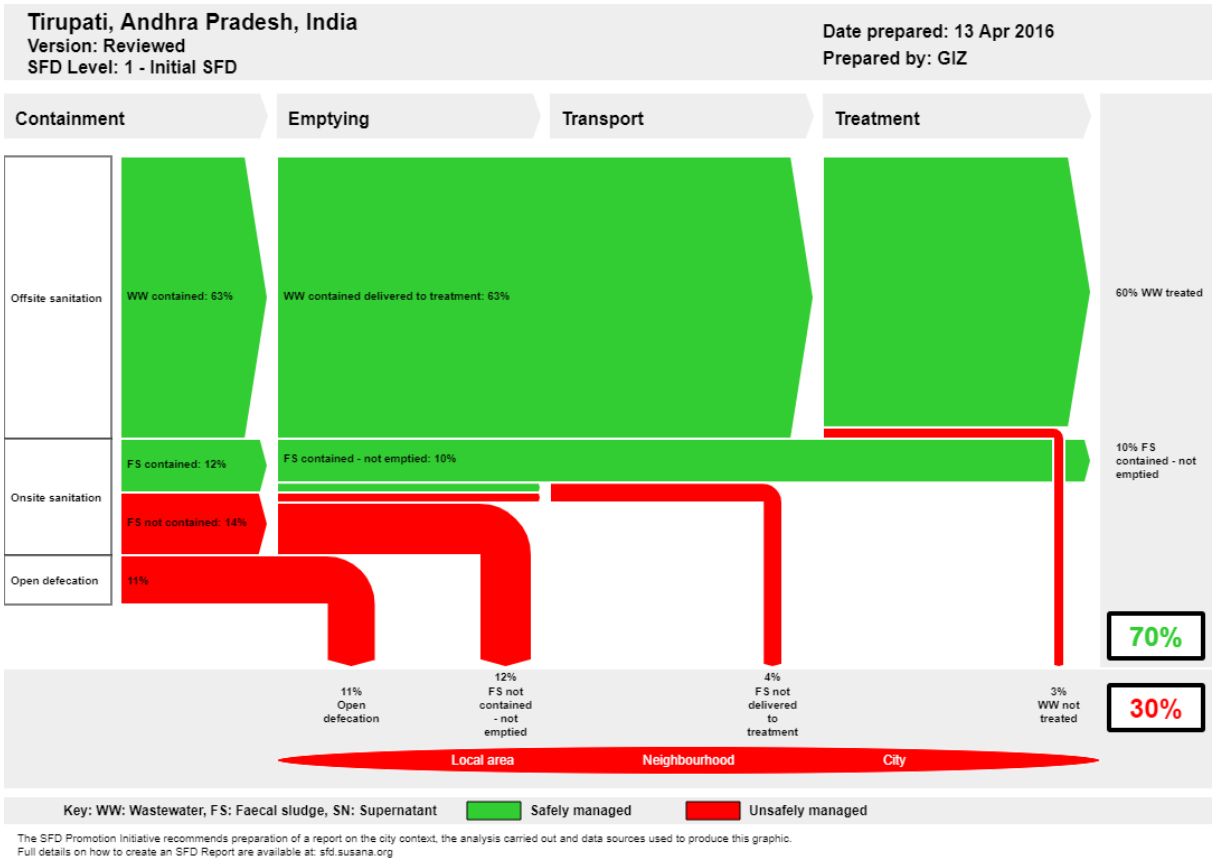
1. The Diagram



The SFD Promotion Initiative recommends preparation of a report on the city context, the analysis carried out and data sources used to produce this graphic.
Full details on how to create an SFD Report are available at: sfd.susana.org

2. Diagram information

SFD Level:

This is a level 1- Initial SFD report.

Produced by:

This SFD is prepared by Lasse Roeder with the support from Rahul Sharma, Varsha Venugopal and Kanchi Nagasreenivas (all GIZ).

Status:

This is a final SFD report.

Date of production:

16/01/2016

3. General city information

Tirupati is situated in Chittoor district in the southern of the state of Andhra Pradesh. The town is administered by the Municipal Corporation of Tirupati (MCT) and is divided into 36 wards.

The city covers an area of about 27 km^2 with a total population of just under 375,000 (Census, 2011; GIZ, 2014). The current decadal growth rate lies at 26 %, which results in a population growth of 2.3% per year (GIZ, 2014). The town is a pilgrimage centre and attracts a total diurnal floating population of about 55,000. During religious festivals, the diurnal floating population exceeds 100,000 (MCT, 2011).

Most trade and commerce activity in the city is related to pilgrims and tourists entering the town. Other economically important sectors are: textile manufacturing and agriculture (GIZ. 2014).

Annual rainfall in Tirupati is about 1,000mm with a peak in the monsoon season from July to October.

4. Service outcomes

The Census of India from 2011 was the first census to include a section on household sanitation facilities. The questionnaire focused on the containment technologies present in the households and did not take into account the floating population. However, also connections to the central sewer system were noted. The diagram on page I of this summary shows numbers including the diurnal floating population of about 55,000.

- Containment: According to census, 96% of all households have private toilet facilities, from which about 72% have direct connection to the sewer network, 19% have septic tanks installed, and 6% rely on pit latrines or other containers (i.e. buckets), equalling 24% of households relying on onsite sanitation systems (Census, 2011). All public toilets (1%) are pour- or flush-toilets (GIZ, 2014) and are reported to be under poor maintenance (MCT, 2011). 3% of the population relies on open defecation.
- Emptying: Three agencies are estimated to be active in the business with 6m^3 trucks (MCT, 2011). Standards concerning cleaning intervals, techniques of emptying and safety practices are not complied with. Also, no records of cleaning sessions are maintained. The households are charged around 1,000 to 1,500 Rs. (US$ 14 to 22) per service. A survey from 2011 suggests that a majority of the households do the emptying of their septic tanks themselves. The survey also suggests the demand for less costly emptying services (MCT, 2011).
- Transport: MCT operates a sewer network with a total capacity to service a population of about 450,000 people (GIZ, 2014). No total sewer coverage is achieved. Only about half of the city area is covered and several wards rely on onsite sanitation, on public facilities or on open defecation. City topography partly complicates the extension of the existing sewer network.
- Treatment: MCT operates a Wastewater Treatment Plant (WWTP) situated 10 km south-west of the city which comprises stabilization and facultative ponds (GIZ, 2014). The capacity of the plant is adequate to serve about 450,000 people (50,000 m^3 daily). Enough land around the WWTP is available to allow further expansion (MCT, 2011). Service Level Status Reports and surveys show adequate treatment quality. No treatment facility exists for the treatment of septage deriving from onsite sanitation facilities.
- End-use/ disposal: The treated wastewater is used for irrigation purposes on agricultural lands in the downstream of the WWTP (MCT, 2011). About 10% of treated wastewater is being reused by local industry as of 2014, (GIZ, 2014). Collected septage from onsite sanitation facilities (mostly septic tanks) is discharged of on open ground in peripheral areas (MCT, 2011).

Two surface water bodies represent Tirupati's main water sources: the Kandaleru reservoir and the Kalyani Dam reservoir, 32km and 17km north from Tirupati, respectively. Several bore wells contribute little to the total of 76,000 m^3 supplied daily. Raw water is treated in rapid sand filters and distributed in the absence of flow meters.

The SFD graphic shows that 70% of the total excreta generated is safely managed while 30% is unsafely managed.

5. Service delivery context

The National Urban Sanitation Policy (NUSP) was launched 2008 by the Ministry of Urban Development (MoUD). The extensive framework supports the cities' development towards generating public awareness about sanitation, achieving open defecation free (ODF) status and an integrated, city-wide sanitation system. It concedes financial support to the states and the cities for the preparation of State Sanitation Strategies (SSSs) and City Sanitation Plans (CSPs) respectively, also including decentralized onsite sanitation solutions, to first look on septage management as of importance for public health.

The Andhra Pradesh Municipalities Act of 1965 handles the functional domain of ULBs in the state. In 2007, the Municipal Corporation of Tirupati (MCT) was formed. The transfer of responsibilities and functions is however not complete and appropriate resources are not assigned (GIZ, 2014).

6. Overview of stakeholders

The Indian constitution classifies questions concerning the water and sanitation sector as state subjects.

Table 1 shows an overview of the key stakeholders.

Table 1: Key Stakeholders (GIZ 2014).

Key Stakeholders	Institutions / Organizations /
Public Institutions	Municipal Corporation of Tirupati, Public Health and Engineering, Department (PHED) of the Government of Andhra Pradesh (GoAP)
Private Sector	Three private agencies operating faecal sludge suction trucks

The Public Health and Engineering Department (PHED) of the Government of Andhra Pradesh (GoAP) is responsible for planning and financing of the water supply and sanitation sector. It provides technical support and guidance to the Urban Local Bodies (ULBs). Operation and Maintenance (O&M) is part of the accountability of MCT as is the tariff fixation and the collection of user charges (GIZ, 2014). Public toilets are planned, constructed and built by different agencies and contractors, depending on their place and purpose. Table 2 shows an overview over the institutional framework.

Table 2: Institutional framework sanitation sector for Tirupati (GIZ 2014).

	Planning	Execution	O&M	Tariff Fixation & Collection
Water Supply	PHED	PHED	MCT	MCT
Sewerage	PHED	PHED	MCT	MCT
Public and Comm. Toilets	Multiple Agencies	MCT/private contractors	MCT/private contractors	MCT/private contractors

7. Credibility of data

Data sources:

Data concerning the containment facilities in Tirupati were drawn from the Census of India 2011. Data concerning the further steps of the sanitation chain (emptying, transport, treatment and disposal / reuse) were collected from official reports (like the Service Level Status Report), secondary literature review and the outcomes of Key Informant interviews that were already conducted during the revision of the City Sanitation Plan. These data have to be regarded as mostly qualitative. No additional Key Informant Interviews and Focus Group Discussions were conducted.

Assumptions:

- Census 2011 data were regarded as correct.
- The treatment in the existing plants is meeting the standards.
- All septage deriving from the emptying of onsite sanitation facilities is dumped on open ground or directly into water bodies.
- The proportion of faecal sludge in onsite sanitation facilities is 50%.

Annotations:

The Census 2011 was the first census to collect data relating to the household sanitation situation (only containment-data). It is expected that, because of limited experience and technical know-how from the surveyors, the resulting data are expected to be differing from the actual situation. Cross-checking with other data sources was only possible for single numbers. A comparison of the data concerning the offsite sanitation systems supported the assessment of credibility.

Some of the issues and challenges are listed below:

Data gaps:

- The major data gap identified concerns the management of onsite sanitation systems. No regular monitoring is in place, so that only vague assumptions could be made.
- No reliable data on the amounts of waste water entering the treatment plants were available.
- Hydrogeological data are required for the assessment of the risk of groundwater pollution, although the hilly conditions in Tirupati do not seem to favour contamination.

8. Process of SFD development

This SFD graphic is based on data derived from outcomes of the Census of India from 2011 and a thorough literature review. Wherever possible, Census data were cross-checked with data from secondary sources such as the City Sanitation Plan, its review and the City Development Plan.

No additional Key Informant Interviews were conducted for this SFD report.

The online Graphic Generator was used to calculate the variables needed for the composition of the diagram.

After completion, the report was sent to MCT for review. However, it was not possible to gather input from TMC officials.

Limitations of the SFD graphic:

In circumstances where groundwater is a relevant environmental media that is prone to contamination, detailed groundwater maps need to be used to precisely determine affected parts of town.

Further Key Informant Interviews and field-trips to sites of interest within the city have to be conducted in order to judge the compliance with the reality of the city.

9. List of data sources

Below is the list of data sources used for the production of this SFD report:

- Published reports:
  - Census in India 2011. HH-8: Households by Availability of type of Latrine Facility.
  - GIZ 2014. City Sanitation Plan Updation – Status Report Municipal Corporation of Tirupati.
  - Ministry of Urban Development 2010. Rank of Cities in Sanitation 2009-2010 (National Urban Sanitation Strategy).
  - Ministry of Urban Development 2012. Service Levels in Urban Water and Sanitation Sector – Status Report (2010-2011). First Edition, January 2012.
  - Ministry of Urban Development 2014. Guidelines for Swachh Bharat Mission (SBM). December 2014.
  - Municipal Corporation of Tirupati 2011. Draft City Sanitation Plan Volume 1 – Main Report

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Abbreviations

GoAP	Government of Andhra Pradesh
MCT	Municipal Corporation of Tirupati
MoUD	Ministry of Urban Development
O&M	Operation and Maintenance
PHED	Public Health and Engineering Department
TCM	Thousand Cubic Metres
SBM	Swachh Bharat Mission
SLB	Service Level Baseline
SLSR	Service Level Status Report
ULBs	Urban Local Bodies
WWTP	Wastewater Treatment Plant

1 City context

Tirupati is situated in Chittoor district in the southern of the state of Andhra Pradesh. The town is administered by the Municipal Corporation of Tirupati (MCT) and is divided into 36 wards. Figure 1 shows the outlines of Tirupati and the ward boundaries. It also shows the population densities within the wards.

Tirupati covers an area of about 27 km^2 with a total population of just under 375,000 (Census 2011; GIZ 2014). The current decadal growth rate lies at 26%, which results in a population growth of 2.3 % per year (GIZ, 2014).

The town is a pilgrimage centre and attracts a total diurnal floating population of about 55,000. During religious festivals the diurnal floating population exceeds 100,000 (MCT, 2011).

Economically, Tirupati mainly relies on tourism and pilgrimage. Most trade and commerce activity in the city is related to pilgrims and tourists entering the town. Other economically important sectors are: textile manufacturing and agriculture (GIZ, 2014).

Annual rainfall in Tirupati is about 1,000 mm with a peak in the monsoon season from July to October. During the last years the region faced a decline in rainfall and less predictable heavy rainfall during the monsoon period (MCT, 2011).

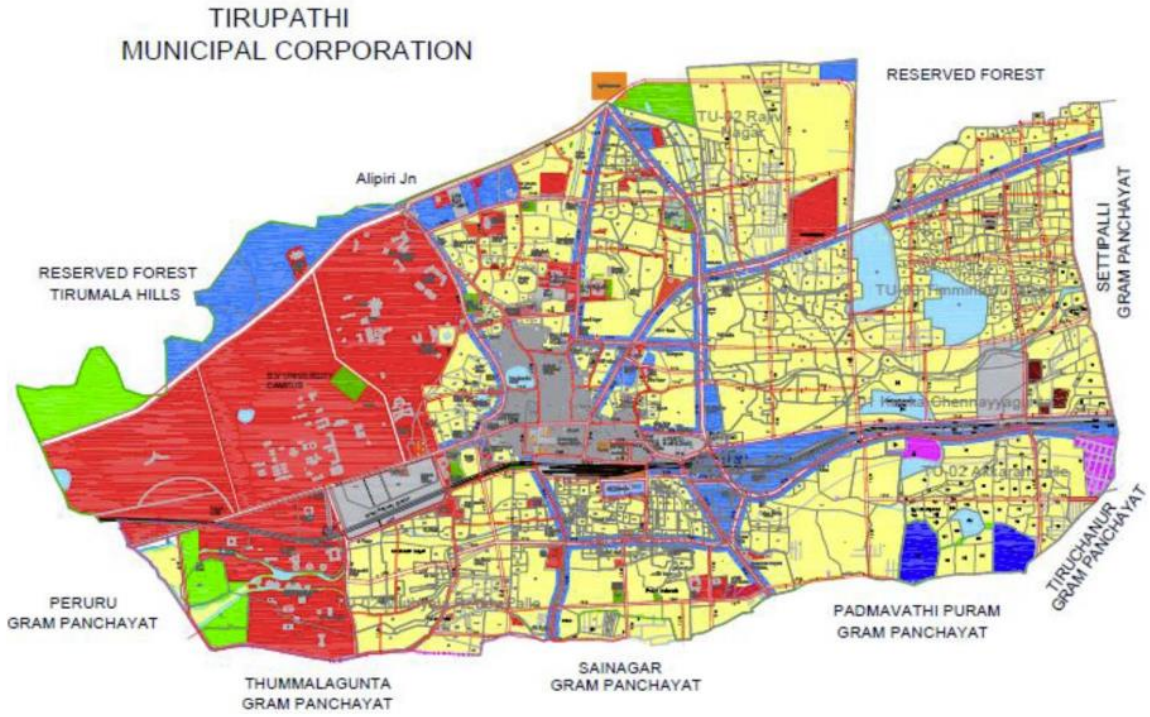

Figure 1: Map of Tirupati Municipal Corporation area (GIZ 2014).

2 Service Outcomes

2.1 Overview

This SFD report is conducted as a desk-based-assessment of the sanitation situation in Tirupati, Andhra Pradesh, India. This SFD report resorts to the City Sanitation Plan for Tirupati from 2011, its Review from 2014, the service level status report 2010-2011, and the Indian Census data from 2011. The Census 2011 data is regarded as correct.

The objective of the present SFD report was to strictly follow the methodology of the BMGF-financed SFD promotion project and thereby provide the possibility to compare outcomes and conclude on improvements. An overview over the sanitary situation is provided in the following.

The Ministry of Urban Development, Govt. of India, conducted a country-wide sanitation ranking as provided by the NUSP in 2010. With 423 cities and towns being assessed, Tirupati ranked 117th with 39 out of 100 possible points. The score corresponds to the black category, highlighting 'Cities needing considerable improvement in urban sanitation situation'. The lowest score as per percentage of the maximum score was reached in the category for 'Output', covering Open Defecation (OD) issues and the service delivery along the sanitation chain (MoUD 2010).

Table 1 shows the distribution of access to toilet facilities for households in MCT (for the old city boundaries). About 19 out of 20 households have toilet facilities within their premises, only 1% relies on public latrines and 2% on open defecation (see appendix 7.3 for a map of open defecation prone areas). This table does not take into account the high numbers of diurnal floating population in the city. This group of people relies on public toilets and because of a lack of public toilets on open defecation.

Table 1: Access to sanitation facilities for Tirupati households (Census 2011, rounded).

Origin category	unit	Value
Households	%	96
Public toilets	%	1
Open defecation	%	3

The following numbers apply to the residents of Tirupati, not to the floating population. See chapter 2.2 for numbers including the diurnal floating population.

Containment: Out of the 96% of the households with private facilities, about 72% have direct connection to the sewer network, 18% have septic tanks installed, and 6% rely on pit latrines or other containers (i.e. buckets), equalling 24% of households relying on onsite sanitation systems (Census, 2011).

All public toilets are pour- or flush-toilets (GIZ, 2014). Public toilets are reported to be under poor maintenance (MCT, 2011). No clear numbers concerning the containment systems of public toilets are available.

Maintenance and emptying of onsite sanitation systems is not managed by ULBs but serviced by private agencies through mounted vacuum-based collection tanks. About three agencies are estimated to be active in the business with mostly 6 m^3 trucks. A survey from 2011 suggests that a majority of the households do the emptying of their septic tanks themselves (MCT, 2011). Standards concerning cleaning intervals, techniques of emptying and safety practices are not complied with. Also, no records of cleaning sessions are maintained. The households are charged around 1,000 to 1,500 Rs. (US$ 14 to 22) per service. The survey also suggests the demand for less costly emptying services (MCT, 2011).

Transport: MCT operates a sewer network with a total capacity to service a population of about 450,000 people (GIZ, 2014). No total sewer coverage is achieved. Only about half of the city area is covered and several wards rely on onsite sanitation, on public facilities or on open defecation. City topography seems to partly complicate the extension of the existing sewer network.

Treatment: Collected wastewater is conveyed to the Wastewater Treatment Plant (WWTP) operated by MCT. The WWTP is situated 10 km south-west of the city and comprises of stabilization and facultative ponds (GIZ, 2014). The capacity of the plant is adequate to serve about 450,000 people (50 Thousand Cubic Metres (TCM) daily). It is not clear when the current capacity will be reached by the sewerage generation. However, enough land around the WWTP is available to allow further expansion (MCT, 2011). Service Level Status Reports and surveys show adequate treatment quality. BOD-values of the effluent range between 49 to 89 mg/L, meeting the Central Pollution Control Board (CPCB) norm of 100 mg/L for irrigation discharge as of 2011 (MCT, 2011). The national standard for discharge into surface sources of 30 mg/L is not met though (CPHEEO, 2012). No facility exists for the treatment of septage deriving from onsite sanitation facilities.

End-use / disposal: The treated wastewater is used for irrigation purposes on agricultural lands in the downstream of the WWTP (MCT, 2011). About 4 TCM daily of treated wastewater are being reused by local industry, corresponding to more than 10% of the wastewater treated, as of 2014, (GIZ, 2014). Collected septage from onsite sanitation facilities (mostly septic tanks) is discharged into open ground in peripheral areas (MCT, 2011).

2.2 SFD Matrix

The information for this SFD report is mainly derived from the Census of India 2011 data, the City Sanitation Plan, its review and the Service Level Status Report. Data from the Census are regarded as correct and is used for the compilation of the SFD graphic. In the following, assumptions made in order to produce the SFD graphic are explained along the sanitation chain. As Tirupati shows a relatively high diurnal floating population (mostly pilgrims, 15% of the local population) the real sanitary situation may look different. Public latrines can only service 1/3 of the diurnal floating population of 55,000 (see section 3.1.4). As no data concerning sanitary facilities for the rest of the floating population is available, it is assumed that 2/3 relies on open defecation. Figure 2 shows the sanitation selection grid.

List A: Where does the toilet discharge to? (i.e. what type of containment technology, if any?)	List B: What is the containment technology connected to? (i.e. where does the outlet or overflow discharge to, if anything?)									
	to centralised combined sewer	to centralised foul/separate sewer	to decentralised combined sewer	to decentralised foul/separate sewer	to soakpit	to open drain or storm sewer	to water body	to open ground	to 'don't know where'	no outlet or overflow
No onsite container. Toilet discharges directly to destination given in List B		T1A1C2			Significant risk of GW pollution Low risk of GW pollution					Not Applicable
Septic tank					Significant risk of GW pollution T1A2C5			T1A2C8		
Fully lined tank (sealed)					Significant risk of GW pollution T1A3C5			T1A3C8		
Lined tank with impermeable walls and open bottom	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution					Significant risk of GW pollution Low risk of GW pollution
Lined pit with semi-permeable walls and open bottom	Not Applicable									Significant risk of GW pollution Low risk of GW pollution
Unlined pit										Significant risk of GW pollution Low risk of GW pollution
Pit (all types), never emptied but abandoned when full and covered with soil										Significant risk of GW pollution Low risk of GW pollution
Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil										
Toilet failed, damaged, collapsed or flooded										
Containment (septic tank or tank or pit latrine) failed, damaged, collapsed or flooded										
No toilet. Open defecation	Not Applicable							T1B11 C7 TO C9		Not Applicable

Figure 2: Selection grid.

2.2.1 Containment

Figure 3 shows the SFD matrix.

Tirupati, Andhra Pradesh, India, 13 Apr 2016. SFD Level: 1 - Initial SFD
Population: 342035
Proportion of tanks: septic tanks: 50%, fully lined tanks: 50%, lined, open bottom tanks: 50%

System label	Pop	W4a	W5a	F3	F4	F5
System description	Proportion of population using this type of system	Proportion of wastewater in sewer system, which is delivered to centralised treatment plants	Proportion of wastewater delivered to centralised treatment plants, which is treated	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated
T1A1C2 Toilet discharges directly to a centralised foul/separate sewer	63.0	100.0	96.0			
T1A2C5 Septic tank connected to soak pit	11.0			35.9	0.0	0.0
T1A2C8 Septic tank connected to open ground	11.0			35.9	0.0	0.0
T1A3C5 Fully lined tank (sealed) connected to a soak pit	1.0			47.5	0.0	0.0
T1A3C8 Fully lined tank (sealed) connected to open ground	3.0			17.4	0.0	0.0
T1B11 C7 TO C9 Open defecation	11.0					

Figure 3: SFD matrix.

According to the Census 2011, 72% of all households in MCT have toilet facilities within their premises that are directly connected to the piped/ underground sewer system. It is assumed that all interfaces and all sewer connections are fully functional. Including the diurnal floating population, the ratio of the population serviced by offsite sanitation systems decreases to 63% (population using system T1A1C2 set to 63%).

18% of households have, as per Census, septic tanks on their properties. An additional 1% of the households rely on public toilets, which are all equipped with pour- or flush-toilets (GIZ, 2014). Assuming that 1/3 of the diurnal floating population relies on public toilets and further assuming that all public toilets are connected to septic tanks, the total ratio of the population relying on septic tanks increases to 22%. No information regarding the state of private septic tanks is available. Public toilets are reported to be under poor maintenance and partly represent pollution hotspots in the city (MCT, 2011).

Additionally, 2% of households have pit latrines or other safe containment facilities on their premises (Census, 2011). As per lack of information, it is assumed that 50% of all septic tanks and pit latrines are connected to soak pits (and all modelled as system T1A2C5, 11% of the population) and 50% to the open ground (and all modelled as system T1A2C8, 11% of the population). This share does not change substantially by including the diurnal floating population.

Latrines without pit but with direct disposal in open drain or with a bucket that is emptied manually (called ‘Night soil’ and ‘service latrines’ in the Census) are regarded as not containing the faecal sludge and account for 3% of the population and were modelled as fully lined tanks (sealed) connected to open ground (T1A3C8). The remaining 1% of the population rely on fully lined tanks (sealed) connected to a soak pit (system T1A3C5).

The Census states an open defecation rate of 3%. With 2/3 of the diurnal floating population practising open defecation a total of 11% account for this share (system T1B11 C7 TO C9).

2.2.2 Emptying

There is no information available on private or public septic tanks being connected to the sewer system. It is therefore assumed that 50% of the septic tanks are connected to soak pits and 50% to the open ground. MCT does not operate suction trucks for servicing onsite facilities and does not monitor the sector. Three private agencies are reported to be active in MCT area, operating suction trucks with volumes of 6m^3 each (MCT, 2011). An estimated 3,000 cleaning sessions are conducted per year. That means that septic tanks are cleaned only every 4 years on average (assuming about 12,000 septic tanks stated in the census). A high percentage of septic tanks are cleaned individually by the owners (MCT, 2011). No information regarding septic tanks connected to soak pits is available. As per lack of more precise data, it is assumed that 50% of the septic tanks are emptied by private agencies and 50% by individuals. The percentage of faecal sludge which is emptied from onsite systems was estimated as 35.9% for systems T1A2C5 and T1A2C8, 47.5% for system T1A3C5 and 17.4% for system T1A3C8. All these values were obtained from the data sources consulted during the production of this report, which are included in the reference section at the end of the report. The proportion of faecal sludge in onsite sanitation facilities is assumed to be 50% (step two of the Graphic Generator).

2.2.3 Transport

Collected wastewater is conveyed to the centralized WWTP south-east of the city. The capacity of the sewer network is currently adequate and has a total length of about 120 km (including main sewers, sub-main sewers, branch sewers, lateral sewers and sub laterals sewers) (GIZ, 2014). It was assumed that all wastewater is transported to treatment (variable W4a set to 100%), as stated in section 2.2.1.

For onsite sanitation systems, no facility exists for the treatment of septage, as stated in section 2.1. Therefore, no faecal sludge is transported to treatment and hence, variable F4 for systems T1A2C5, T1A2C8, T1A3C5 and T1A3C8 was set to 0%.

2.2.4 Treatment

The current treatment capacity of 50 TCM daily is adequate to meet the sewerage generation projected until 2021. The quality of the treatment is reported to be 96% (GIZ, 2014) and variable W5a set to 96%, accordingly.

For onsite sanitation systems, no facility exists for the treatment of septage, as stated in section 2.1. Therefore, variable F5 for systems T1A2C5, T1A2C8, T1A3C5 and T1A3C8 was set to 0%.

2.2.5 End-use / disposal

The treated wastewater is used for irrigation purposes on agricultural lands in the surroundings of the WWTP (MCT, 2011). About 10% of the treated wastewater is being reused by local industry (GIZ, 2014). Collected septage from onsite sanitation facilities (mostly septic tanks) is discharged of on open ground in peripheral areas (MCT, 2011).

2.3 SFD graphic

Figure 4 shows the SFD graphic, where it outlines that 70% of the excreta is safely managed while 30% of the excreta is unsafely managed.

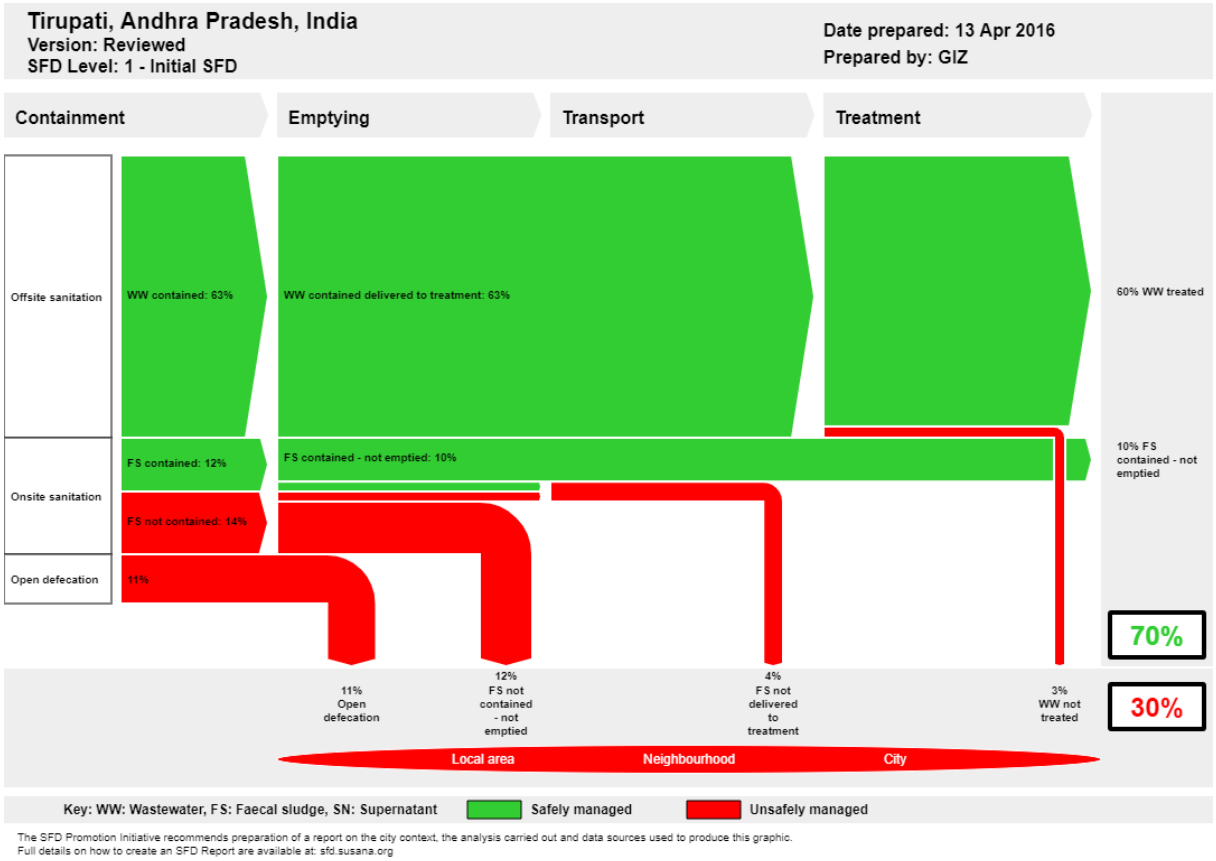

Figure 4: SFD graphic.

The 70% of the excreta properly managed originates from: wastewater contained delivered to treatment and treated (60%) and faecal sludge contained - not emptied (10%). The 30% of the excreta unsafely managed is distributed as: wastewater delivered to treatment but not treated (3%), faecal sludge not delivered to treatment (4%), faecal sludge not contained - not emptied (12%) and people practising open defecation (11%).

3 Service delivery context

3.1 Policy, legislation and regulation

3.1.1 Policy

The recognition of the right to sanitation as part of the fundamental right to life under Article 21 of the Indian Constitution gives a strong mandate for sanitation in India. India has committed itself to meeting the Millennium Development Goal for sanitation.

The Water (Prevention and Control of Pollution) Act from 1974 and the Environmental Protection Act (EPA) from 1986 together allow the government to take appropriate measures to enforce efficient management of sewage and sewerage and also to introduce guidelines and standards for sewage effluents and septage (GIZ, 2015). Most of the states of India have, however, not used the provisions of the EPA to introduce specific rules for sewage effluents and septage (GIZ, 2015).

Under the Water Act and the EPA, the Indian Central Government supports programs for wastewater management in order to limit environmental pollution:

The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in 2005 focused (in terms of the sanitation sector) on investments in large scale centralized sewer systems. Septage management and onsite sanitation in general were not covered.

Septage management in India is traditionally mainly regarded as a ‘private provision’ and not as concern for public health and for city-sanitation with relevance for the ULBs (GIZ, 2015). The consequence is a lack of holistic planning along the sanitation chain.

It was the National Urban Sanitation Policy (NUSP) from 2008 that concedes financial support to the states and the cities for the preparation of State Sanitation Strategies (SSSs) and City Sanitation Plans (CSPs) respectively, also including decentralized onsite sanitation solutions, to first look on septage management as of importance for public health.

The Swachh Bharat Mission (SBM), launched in 2014, supports the goals expressed in the NUSP financially with a focus on the needs of the urban poor.

3.1.2 Institutional roles

The Seventh Schedule (Article 246) of the Indian constitution classifies ‘Public health and sanitation […]’ and ‘Water, that is to say, water supplies, irrigation and canals, drainage and embankments […]’ as state subjects (List II, Entry 6 and List II, entry 17, respectively).

The Andhra Pradesh Municipalities Act of 1965 handles the functional domain of ULBs in the state. In 2007, the Municipal Corporation of Tirupati (MCT) was formed.

The transfer of responsibilities and functions is however not complete and appropriate resources are not assigned (GIZ, 2014). Table 2 shows an overview over the institutional framework.

When it comes to the water supply and sanitation sector the Public Health and Engineering Department (PHED) of the Government of Andhra Pradesh (GoAP) is responsible for planning and financing. It provides technical support and guidance to the Urban Local Bodies (ULBs). Operation and Maintenance (O&M) is part of the accountability of MCT as is the tariff fixation

and the collection of user charges (GIZ 2014). Public toilets are planned, constructed and built by different agencies and contractors, depending on their place and purpose.

Many Tirupati households rely on onsite sanitation systems, mainly septic tanks. Emptying and cleaning is not centrally organized but serviced by private agencies (MCT 2011).

Table 2: Institutional framework sanitation sector for Tirupati (GIZ, 2014).

Urban Service	Planning	Execution	O & M	Tariff fixation and collection
Water Supply	PHED	PHED	MCT	MCT
Sewerage	PHED	PHED	MCT	MCT
Public and Community Toilets	Multiple agencies	MCT /other agencies/ private contractors	MCT / private contractors	MCT / private contractors

3.1.3 Service provision

MCT provides water and sanitation services. MCT operates a sewer system and a treatment plant with a capacity to serve about 450,000 people (50 TCM daily) (GIZ, 2014). Appendix 7.3 shows a map with the sewer network coverage as of 2011. The treatment consists of stabilization ponds followed by several facultative lagoons. No data is available regarding onsite sanitation systems connected to sewerage system. There is also no monitoring of possible involvement of private agencies engaged in the septage business.

Two surface water bodies represent Tirupati's main water sources: the Kandaleru reservoir and the Kalyani Dam reservoir, 32 km and 17 km north from Tirupati, respectively. Several bore wells contribute little to the total of 76 TCM supplied daily. Raw water is treated in rapid sand filters and distributed in the absence of flow meters (GIZ, 2014).

Table 3: Water and sanitation services in MCT (GIZ, 2014).

	Description	unit	value
Sewerage	Length of sewer network	km	224
	Number of sewerage connections	-	20,995
	Properties connected to sewer line	-	
	Treatment capacity	TCM daily	50
Water Supply	Length of water network	km	270
	No. of total water connections	-	22,257

3.1.4 Service standards

The Service Level Status Report (SLSR), issued by the Ministry of Urban Development (MoUD), gives an overview over the compliance of the sanitation system of a city with the Service Level Benchmarks (SLBs). SLBs do only include aspects of offsite sanitation service chain. Onsite sanitation aspects are not part of the report, apart from the coverage of toilets.

Generally, the physical status of the sanitation interface (containment) is regarded as private matter and no monitoring is conducted.

Offsite sanitation

Table 4 shows the outcomes of the Service Level Status Report (MoUD 2012) and additional performance data for the following years that was collected for the review of the CSP in 2014 (GIZ, 2014). Several villages from the adjoining area have been added to MCT limits in 2013 (Venugopal, 2015). The numbers shown refer to the MCT limits before the municipal extension.

According to the latest stated status report, the SLB of the parameters for collection efficiency and for adequacy of sewerage treatment capacity are met. The performance regarding the coverage of the sewer network shows particular need for improvement. Appendix 7.3 shows a thematic map with ward wise sewerage coverage as of 2011 (MCT, 2011).

Onsite sanitation

No monitoring program for onsite sanitation systems is in place in MCT (GIZ, 2014). Thus, performance data concerning onsite sanitation systems was only available from unofficial sources.

The physical condition of septic tanks is not monitored but seems to be weak in large parts of the city (MCT, 2011). Infiltration of septage into the ground and septage entering open drains and water bodies as effluent occurs.

Emptying and cleaning of septic tanks is either done by the household individuals or by private agencies operating faecal sludge trucks on demand and very irregularly. Private agencies active in the business of septic tank emptying are reported not to comply with safety practices such as the Manual Scavengers and Construction of Dry Latrines (Prohibition) Act. 1,000 to 1,500 Rs. (US$ 14 to 22) are charged per cleaning (MCT ,2011).

No treatment facility for collected septage is available in MCT. Instead, dumping of septage on open (and partly agricultural) land outside the city area is currently in practice.

Floating population

The diurnal floating population is estimated to be 55,000 people, which are mostly pilgrims. Supply only covers about 1/3 of the facilities needed when the SBM norm of 250 pilgrims per toilet seat is applied (GIZ, 2014; MoUD, 2014). A survey from 2011 shows poor general maintenance of public toilets, independent from the operating agency / contractor (MCT, 2011). Public and community toilets are all flush toilets (GIZ, 2011). No information regarding the connection ratio of public toilets to the sewer system is available.

Table 4: Service standards for sanitation and water supply sectors (MCT, 2011; GI,Z 2014).

	Description	unit	SLB	SLSR 2011	Status 2011-2012	Status 2012-2013
Sewage Management	Coverage of toilets	%	100	82	76	76
	Coverage of sewer network services	%	100	42	45	45
	Collection efficiency of the sewerage network	%	100	80	88	100
	Adequacy of sewerage treatment capacity	%	100	-	100	100
	Quality of sewerage Reuse and recycling	%	20	0	5	0
	treatment	%	100	100	93	96
	Cost recovery	%	100	69	69	84
	Efficiency of collection of charges	%	90	21	60	82
Water supply	Coverage connections	%	100	40	39	51
	Per capita supply	lpcd	135	129	88	89
	Metering of connections	%	100	4	4	9
	Non-revenue water (NRW)	%	20	17	32	45
	Continuity of supply	hours	24	1	1	1
	Quality % treatment	%	100	95	90	89

4 Stakeholder Engagement

4.1 Key Informant Interviews

Two key informants have been interviewed via mail: Kanchi Nagasreenivas, Varsha Venugopal (both working for GIZ India). Aim of the interview was the validation and the actualization of data derived from the reports. Additionally, the two informants commented to a first draft version of this report. The comments have been incorporated in this report.

5 Acknowledgements

This SFD report is dedicated to the citizens of Tirupati. The author would like to thank Naga Sreenivas Kanchi, Varsha Venugopal, Rahul Sharma and Dirk Walther (all GIZ India) for the support.

6 References

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7 Appendix

7.1 Appendix 1: Stakeholder identification

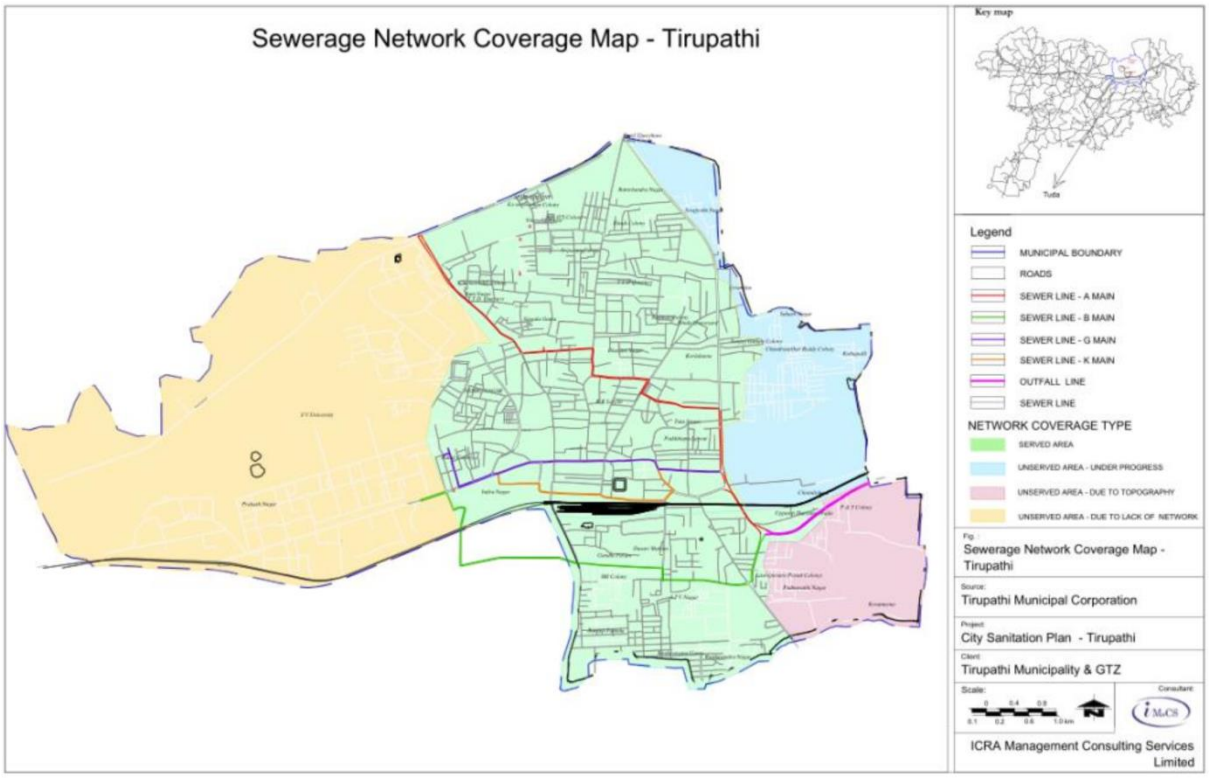
Additionally to the key informants mentioned in chapter 4.1, city officials from MCT have been contacted via mail in order to get more up-to-date and precise data to work with and in order to discuss findings of this report. However, it was not possible to get feedback from the contacted city officials.

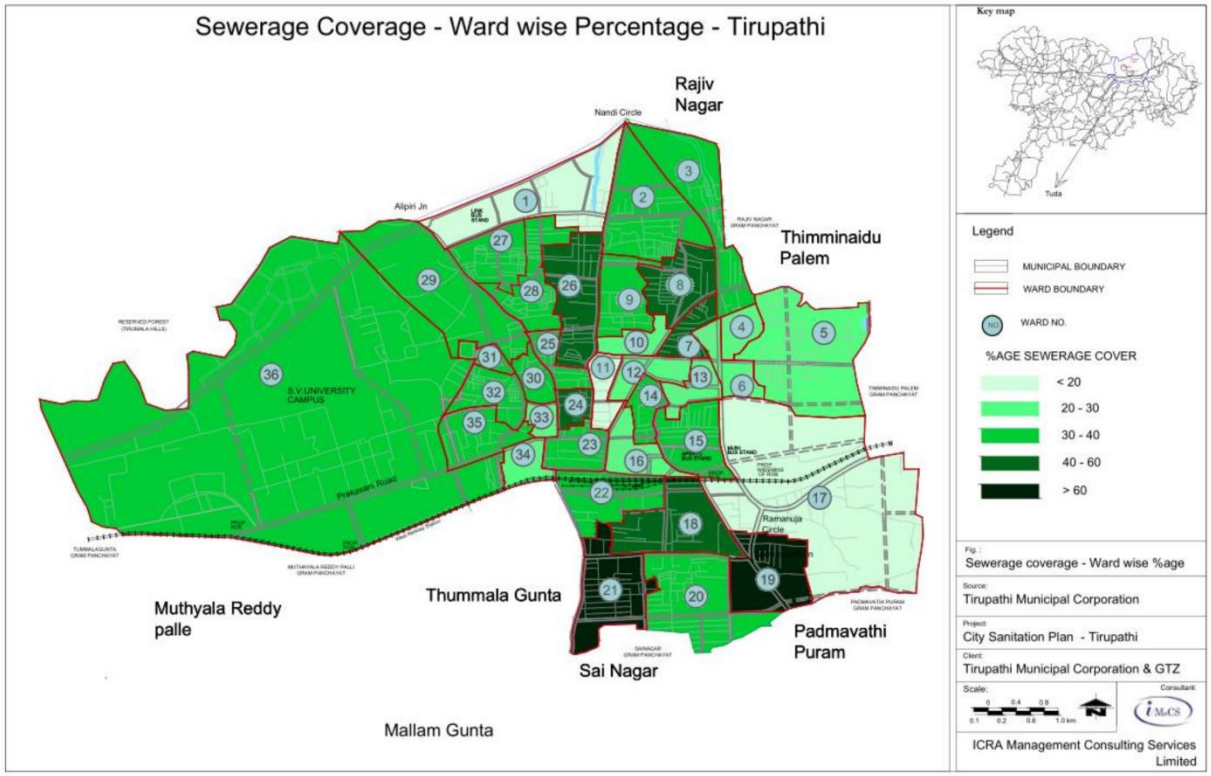
7.2 Appendix 2: Tracking of Engagement

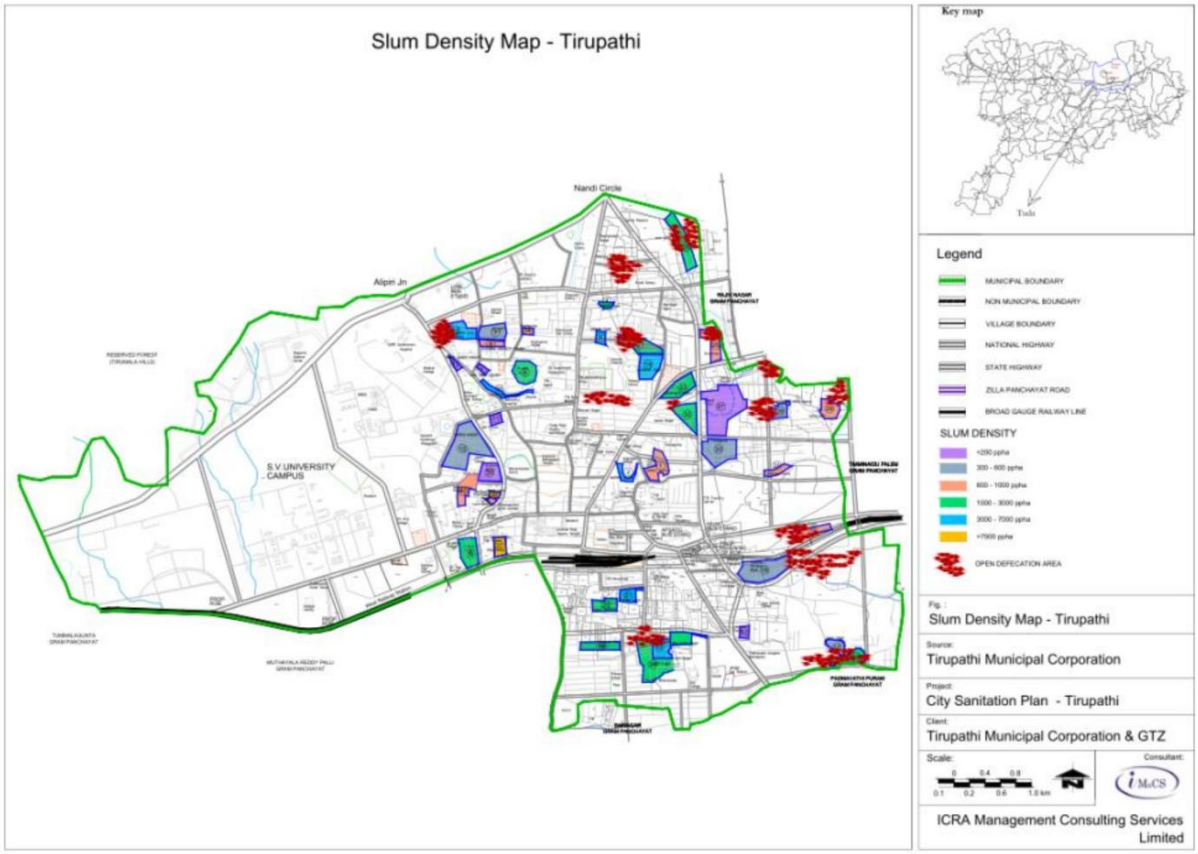
The key informants have been contacted via mail on 14th of October 2015. The main outcomes were:

- The area of Tirupati has been expanded by merging several villages in 2013.
- Concerning the policy chapter, several initiatives such as Basic Services for Poor (BSUP) and Rajiv Awas Yoiana (RAY) have been pointed out.
- The treatment plant present in Tirupati is situated at Tukivakam and consists of a stabilization pond and several facultative lagoons. The treated water is discharged into storm water canals.

7.3 Thematic maps (old city border)






Slum Density Map - Tirupathi
Nandi Circle
Alipiri Jn
S.V UNIVERSITY CAMPUS
Key map
Legend
MUNICIPAL BOUNDARY
NON MUNICIPAL BOUNDARY
VILLAGE BOUNDARY
NATIONAL HIGHWAY
STATE HIGHWAY
ZILLA PANCHAYAT ROAD
BROAD GAUGE RAILWAY LINE
SLUM DENSITY
OPEN DEFECATION AREA
Fig :
Slum Density Map - Tirupathi
Source:
Tirupathi Municipal Corporation
Project:
City Sanitation Plan - Tirupathi
Client:
Tirupathi Municipal Corporation & GTZ
Scale:
Consultant:
ICRA Management Consulting Services Limited

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