SFD Lite Report

Mysuru

India

This SFD Lite Report was prepared by:
Eawag and CDD Society

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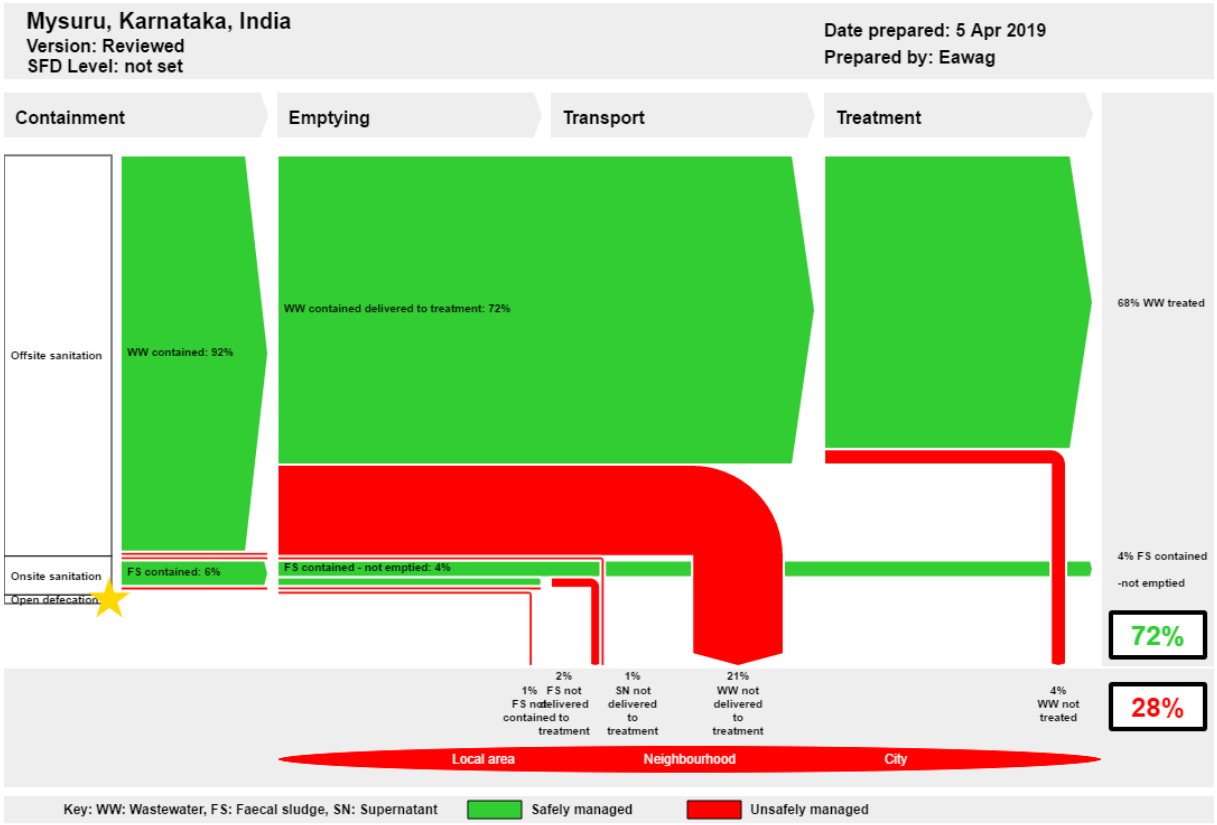
1. The SFD Graphic



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. SFD Lite information

Produced by:

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- This report was compiled as part of the SFD Promotion Initiative within the Citywide Inclusive Sanitation project funded by Eawag - Swiss Federal Institute of Aquatic Science and Technology Switzerland. We would like to thank Mr. Suresh G.R. (Deputy Development officer, MMC), Mr. Ranjeet Kumar, (Technical operator, Rayankere STP), for their help in interviews.

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3. General city information

Mysuru City is situated in southern part of the state at 770 m above sea level at latitude of 76 42'E. The city is located at a distance of about 135 km from Bangalore, capital of State. Mysuru City is the Headquarters of Mysuru Administrative District (MCP, 2019). The district is one of the southern districts of the state and is bordered by Kodagu district in the west, Cannanore district of Kerala state in the south west, Chamarajanagar district in the south and south east, Mandya district in the north and Hassan district in the north west (CGWB, 2019). Nagarhole National Park lies partly in Mysuru district and partly in adjacent Kodagu district (MCP, 2019).

According to the census 2011, the population of Mysuru was 893,062 and number of households (HH) were 209,650 with the population density of 476 persons per km^2. The projected population currently stands at 1.5 million in the total area of 34.68 km^2 (Census, 2011). The study area of this report is the boundary of Mysuru Muncipal Coorporation (MMC) which comprises of a total of 65 administrative wards. Table 1 outlines the population growth rate pattern of Mysuru City (Census, 2011).

Table 1: Population growth rate.

Census Year	Population	Increased Population	Growth rate (%)
1981	479,088		
1991	653,345	174,257	36.37
2001	785,800	132,455	20.27
2011	914,819	129,019	16.41

The topography of the Mysuru City is characterized by a series of well-defined natural valleys which radiate from a ridge on high ground and falls gradually in all directions extending beyond the MCC and also, in certain cases, even beyond Mysuru Urban Development Authority (MUDA) boundary. The general slope of the city is from north to south. The general ground elevation of the city varies from both north-west to north-east portion (with the difference of 40 m) and north to south (with the difference of 25 m). The city comprises of ponds, ditches, low-lying areas and water bodies which serves as retention basins in reducing the flood intensity and controlling the flood damages during heavy rainfall (DMAK, 2019).

Mysuru district receives an average rainfall of 776.7 mm. There are 53 rainy days in the district. On an average, about 50% of annual rainfall occurs during the south-west monsoon period. The rainfall generally decreases from west to east (CGWB, 2019). The average minimum and maximum temperatures varies from 34 to 21.4 ^{o}C in April to 16.4 to 28.5 ^{o}C in January (CGWB, 2019). The city is famous as a historical, rich heritage and tourist spot comprising of palaces, monuments, gardens, hills, art galleries, zoo, museums, etc., attracting tourists from all around the world.

During September and October, there is annual ten-day Dasara festival which is celebrated as a traditional festival since the olden kingdom of Mysuru (DMAK, 2019).

4. Service outcomes

Table 2 shows the SFD Matrix and the data used to prepare the SFD Graphic. Overall, the SFD Graphic depicts that 72% of excreta is safely managed while 28% is discharged untreated to the environment.

Wastewater through sewer systems is generated by 92% of the total population of the city. About 78% of this wastewater is reaching the treatment plants, resulting in 68% of treated wastewater. 21% of the wastewater is not delivered to treatment and close to 4% of the wastewater is delivered to treatment but not treated.

Supernatant from septic tanks that goes into open drains is assumed to be 1%, which is attributed to 1% population using septic tanks. Faecal Sludge (FS) not contained - not emptied is assumed to be 1%. 6% corresponds to FS contained, 4% is FS contained - not emptied and therefore considered as safely managed. Finally, 2% is FS which is emptied but not delivered to treatment and 1% is FS not contained and not emptied, both considered as unsafely managed FS.

Table 2: SFD Matrix.

Mysuru, Karnataka, India, 5 Apr 2019. SFD Level: not set
Population: 893062
Proportion of tanks: septic tanks: 50%, fully lined tanks: 50%, lined, open bottom tanks: 50%

System label	Pop	W4a	W5a	W4c	W5c	F3	F4	F5	S4e	S5e
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 wastewater in open sewer or storm drain system, which is delivered to treatment plants	Proportion of wastewater delivered to 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	Proportion of supernatant in open drain or storm sewer system, which is delivered to treatment plants	Proportion of supernatant in open drain or storm sewer system that is delivered to treatment plants, which is treated
T1A1C2 Toilet discharges directly to a centralised foul/separate sewer	92.0	78.0	95.0							
T1A1C6 Toilet discharges directly to open drain or storm sewer	1.0			0.0	0.0					
T1A2C6 Septic tank connected to open drain or storm sewer	1.0					70.0	0.0	0.0	0.0	0.0
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	3.0					70.0	0.0	0.0		
T1A6C10 Unlined pit, no outlet or overflow	3.0					69.0	0.0	0.0		

Overview on technologies and methods used for different sanitation systems through the sanitation service chain is as follows:

4.1. Offsite sanitation systems

4.1.1. Containment

The sewerage network serves approximately 92% of the total population of the city (MC, 2019) and 1% of the population of the city does not have any type of containment and discharges wastewater directly into the open drain or storm sewer, while the remaining 7% of the population is majorly dependent on onsite sanitation systems (OSS).

4.1.2. Transport

Sewage is conveyed to Sewage Treatment Plants (STPs) through sewer and pumped through Sewage Pumping Stations (SPSs). The Mysuru City Corporation is responsible for water supply and sewage treatment in Mysuru. The present water supply demand of the city is 182 MLD which is met by River Cauvery and Kabini. The present underground drainage system in Mysuru City is around 100 Km^2. The quantity of sewage generated in 2014 by the city is 146 MLD, from 65 wards. Out of 146 MLD generated, 105 MLD are collected and treated in the three STPs. The city is divided into five drainage districts namely A, B, C, D and E based on the topography of the city (CPCB, 2014).

4.1.3. Treatment and End Use/Disposal

Mysuru City is equipped with three STP based on aerated lagoon wastewater treatment system technology with treatment capacity of 187 MLD. The STP receives sewage from four Main Pumping Stations (MPS) (KII3, 2019). As per the data which are collected by interviewing the officials, approximately 157 MLD is the total wastewater generated by the population living within the municipal boundary of Mysuru. Therefore, it is assumed that the STP is running under capacity. Table 3 shows the list of STPs and technology associated with each STP.

Table 3: Details of Sewage Treatment Plants, Mysuru.

S.No.	Location of the STP	AREA	Established capacity (MLD)	Technology Used
1	A and D	Rayanakere H.D.Kote road Mysuru	60	Facultative aerated lagoons
2	B	Sewage farm Vidhyarangapuram Mysuru south	67.65	Facultative aerated lagoons
3	C	Kesare Village Mysuru	60	Facultative aerated lagoons

The drainage districts A and D covers the drainage are of about 54 km^2 and the wastewater is treated in the common STP located in Rayanakere, with the capacity of 60 MLD. District B drainage covers an area around 34 km^2 and wastewater is treated in a STP with a capacity of 67.65 MLD capacity located at Vidyaranyapuram. District C drainage covers an area of around 30 km^2 and wastewater is treated in the 30 MLD capacity STP located at Kesare, near ring road. The drainage district E covers an area of 11 km^2 and is not connected to any STP. Now, there is a proposal to provide STP under AMRUT scheme.

At present, the sewage generated from the drainage district E is let out into storm water drain which ultimately joins the nearby tank. All the sewage treatment plants are based on old technology (facultative aerated lagoons) (FO, 2019). Small industries have their own wastewater treatment plant. After the treatment, the effluent is discharged into the Kaveri River and agricultural lands. The sludge is dumped in the STP premises (KII5, 2019). In 2014, around 60% of the sewage generated was being connected to the STPs and the remaining 40% had not been connected to the STPs and was left into the storm water drains which ultimately reaches the natural valley (AAP, 2014). In 2018, around 74% of wastewater is treated through STPs (KII2, 2019).

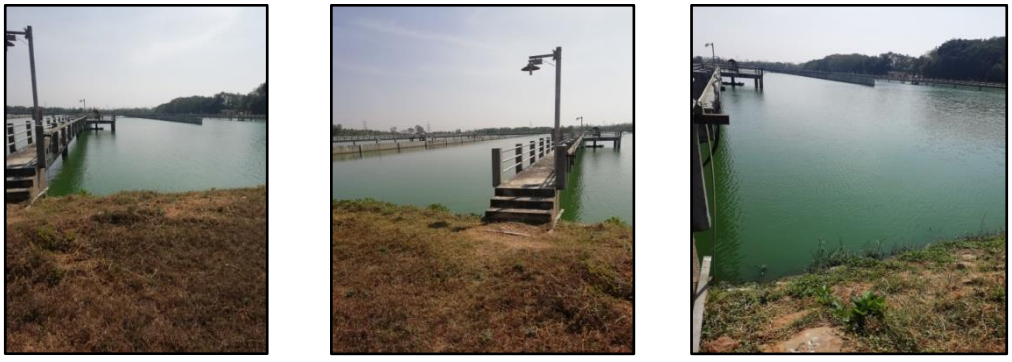

Figure 3: Three different views of the 60 MLD STP based on facultative aerated lagoon pond technology in Rayanakere H.D.Kote road, Mysuru.

Table 4 describes the sanitation systems prevalent in the city, based on which the SFD Graphic has been developed. The details of population dependent on these sanitation systems has been provided in section 6.2. The description of these sanitation systems in city context has been provided in section 6.3.

Table 4: Sanitation technologies as per Census of India and corresponding terminology of SFD-PI.

	Sanitation technologies and systems as defined by:		SFD Reference variable
S. No.	Census of India	SFD Promotion initiative	
1	Piped sewer system	Toilet discharges directly to a centralised foul/separate sewer	T1A1C2
2	Night soil disposed into open drain	Toilet discharges directly to open drain or storm sewer	T1A1C6
3	Septic tank	Septic tank connected to open drain or storm sewer	T1A2C6
5	Pit latrine with slab	Lined pit with semi permeable walls and open bottom with no outlet or overflow	T1A5C10
6	Unlined pit	Unlined pit no outlet or overflow	T1A6C10

4.2. Onsite sanitation systems (OSS)

4.2.1. Containment

As per field surveys and observations in Mysuru, 7% of the total population is dependent upon OSS out of which 1% of the total population of Mysuru has septic tanks in their respective households with outlet connected to open drain or storm sewer (T1A2C6), 3% of the total population has lined pits with semi permeable walls and open bottom without any outlet or overflow (T1A5C10) and 3% has unlined pits with no outlet or overflow (T1A6C10).

Any kind of lined tanks (with outlet) connected to toilets are locally called septic tanks irrespective of whether it adheres to the design specifications prescribed by Bureau of Indian Standards (BIS) or not. The size of the containments is usually decided on the basis of space availability and affordability of the households. No standardization is followed while constructing the containment system; few households have constructed their containments large in capacity irrespective of household size.

The groundwater is more than 10 m deep and majority of the population relies on piped water from surface sources, so the vulnerability of aquifer is low since the rock type is fine sand.

4.2.2. Emptying

Emptying frequency differs widely across the city, depending upon the type of OSS and the size of household. 6% of the total population of Mysuru is dependent on lined or unlined pits. It was found during the survey that the average emptying frequency is 10-12 years. Emptying of pits is generally carried out by the private emptiers which are operating in Mysuru. Mysuru City Corporation uses only a jetting machine to clean the chocked sewer of the city and they do not have any emptying vehicle (KII4, 2019).

4.2.3. Transport

Faecal sludge is discharged by private emptiers into open drains or other water bodies, since no co-treatment is practised and there are no dedicated faecal sludge treatment plants.

4.2.4. Treatment and End use/Disposal

There is no treatment of the FS collected since it is discharged directly into the drains, reaching the environment, untreated.

4.3. Open defecation

There is no open defecation (OD) in Mysuru (KII1, 2019; Mastylecare, 2016). At present, the MMC has declared 65 out of 65 wards open defecation free (ODF) (KII2, 2019) .The city achieved (ODF) status in June 2018. MMC has constructed 41 public toilets , 21 community toilets and 14 E-Toilets under the Swacch Bharat Mission (SBM) (KII3, 2019).

5. Data and assumptions

The availability and accessibility of data:

- Two key sources of data are used: Census of India (2011) and published documents of relevant departments. Most of the data are then updated by Key Informant Interviews (KIIs), Focused Group Discussions (FGDs) and field observations.
- Data on containment are available in the Census. Data on emptying and transport are collected by KIIs. However, most of the data are qualitative.
- Data regarding the households connected to sewerage network is availed from Mysuru Nagar Palika Parishad.

Data insufficiency and non-availability:

- No data available on how many septic tanks are connected to open drains and how many fully lined tanks are connected to open drains.
- No data for how much SN is discharging from households to sewers and open drains.
- Accuracy: discrepancy observed between Census data and actual ground situation.

Assumptions followed for preparation of SFD Graphic:

- Data provided by Census for the population are correct.
- Data provided by Census on average number of persons per household are correct.
- 70% of the people gets their tanks emptied when full.
- Volume of wastewater generated is 80% of water supplied.

Assumptions of the variables used:

Offsite sanitation systems:

- 93% of the total population of Mysuru City is having offsite sanitation system. Breaking the percentage further, 92% of the population have their toilets connected to the centralized foul/separate sewer system (T1A1C2) with the transport efficiency assumed to be 78% due to the marginally better maintenance practices in the city (variable w4a set to 78%).
- The sewer system is connected to the MPS which finally pumps the sewage into STPs. It is reported that the STPs have treatment efficiency of 95% (variable w5a set to 95%).
- 1% of the total population does not have any type of containments and discharges the wastewater directly into the open drain or storm sewer (T1A1C6). Wastewater generated by this 1% of the population is not treated (variables w4c and w5c both set to 0%).

Onsite sanitation systems:

- 7% of the total population of Mysuru is having OSS, out of which 1% of the total population of city is having septic tanks with the outlet connected to open drain or storm sewer (T1A2C6), 3% of the total population of city is having lined pits with semi permeable walls and open bottom

without any outlet or overflow (T1A5C10) and 3% of the total population of city is having unlined pit with no outlet or overflow (T1A6C10).

- There is no clear differentiation between the volume of effluent and solid FS generated from septic tanks and fully lined tanks, hence to reduce the maximum error, it is assumed to be 50% each.
- It is also reported that 70% of the population (dependent on onsite systems) gets their system emptied when full (variable F3 set to 70%). For unlined pits, variable F3 is set to 69%.

6. List of data sources

Below is the list of all data sources used for the production of the SFD Lite report.

Reports and literature

- AAP, 2014. MONITORING OF SEWAGE TREATMENT PLANTS IN KARNATAKA. PROJECT HEAD-VI (26) OF AAP 2014-15CPCB.
- Census, 2011. https://www.census2011.co.in/census/city/452-mysore.html
- CGWB, 2019. Central Ground Water Board. http://cgwb.gov.in/District_Profile/karnataka/MYSORE_BROCHURE.pdf
- CPCB, 2014. Karnataka report 2014.
- DMAK, 2019. Directorate of Municipal Administration, Karnataka. http://www.municipaladmn.gov.in/sites/municipaladmn.gov.in/files/CSP_Mysore.pdf
- FO, 2019. Field observation.
- Mastylecare, 2016. http://www.mastylecare.org/mysuru-first-major-indian-city-to-be-declared-open-defecation-free/
- MC, 2019. Reports procured from Mysuru Municipal corporation.
- MCP, 2019. Mysore City Corporation. http://www.mysorecity.mrc.gov.in/en/Geographical%20Information
- SS, 2019. Swachh Survekshan 2019. https://swachhsurvekshan2019.org/

Key informant interviews

- KII1, 2019. KII with development officer, MMC.
- KII2, 2019. KII with Mr.Suresh G.R. Deputy Devlopment. MMC.
- KII3, 2019. Interview with Junior Engineer, Mysuru.
- KII4, 2019. KII with Deputy development officer. Mysuru Muncipal Coorporation.
- KII5, 2019. STP operator.

Focus group discussions

- MPS operators.
- Sanitary supervisors and workers.
- Residents.

6.1. Tracking stakeholder engagement

S. No.	Name Of Organization	Designation	Date of Engagement	Purpose of Engagement
1	Mysuru Municipal coorporation	Deputy development officer MMC	12/1/2019	KII
2	STP Mysuru	Junier engineer,	13-01-2019	KII
3	MPS	Operators and staff	13-01-2019	KII

6.2. Data source and data assumption

Sanitation Systems	Census of India, 2011	Final percentages used in graphic generator	Remarks
Piped sewer system	80.5	92	This percentage is derived from the data available from MMC report by Deputy development officer.
Night soil disposed into open drain	0.7	1	Field observation and KIIs.
Other system	0.5	0	No such cases found.
Septic tank connected to open drain or storm sewer	2.1	1	. This percentage has been decided in accordance with KIIs, FGDs and observations.
Fully lined tank (sealed) connected to an open drain or storm sewer	0	0	
Unlined pit no outlet or overflow, general situation	10.2	6	. This percentage has been decided in accordance with KIIs,
Service latrine	0.1	0	No such cases found.
Public latrine	1.3	N/A	. The CTs and PTs have been incorporated in 'septic tank connected to open drain'. This is also in line with the FGD conducted with MMC officials.
Open defecation	4.6	0	Under SBM construction of IHHL, Community Toilets (CTs) and Public Toilets (PTs) are going on a good pace. Till now, 98% construction has already been done. This percentage is derived from the data we got from SBM website and approved by the concerned members.

6.3. SFD Terminologies

System Type	Variables	Description (City context)	Percentage of population
Offsite	WW contained	Wastewater from offsite sanitation technology (T1A1C2) which is discharged directly to centralized foul/separate sewer	92
	WW not contained	Wastewater from offsite sanitation technology (T1A1C6) which is discharged directly to open storm water drain	1
	WW contained delivered to treatment	Wastewater from offsite sanitation technology (T1A1C2), which is delivered to STPs for treatment	72
	WW not delivered to treatment	Wastewater from offsite sanitation technology (T1A1C2) which represents transportation losses and (T1A1C6) which is from the not-intercepted open drains, that is not discharging to STPs	21
	WW treated	Wastewater from offsite sanitation technology (T1A1C2) which gets treated at STPs	68
	WW not treated	Wastewater from offsite sanitation technology (T1A1C2) that is delivered to treatment but not treated.	4
	SN not delivered to treatment	Supernatant from the onsite sanitation technology (T1A2C6) discharging to open drains, which is not intercepted by sewerage system and thus not delivered to STPs.	1
	FS contained	FS from the onsite sanitation technology (T1A5C10 and T1A6C10),	6
	FS not contained not emptied	FS not contained and not emptied represents the remaining population whose FS is never emptied from the onsite sanitation technology (T1A2C6)	1
	FS not delivered to treatment	Emptied FS, i.e. disposed in any low-lying area/drains and does not undergo any treatment.	2

6.4. Future Plans

Mysuru has historically had sewer-based system that was initiated by the King in 1905. They have continued that legacy to stay as one of the cleanest city in India, placed among the top 3 every year under the Swachh Survekshan results in SBM Urban (SS, 2019). It is also a tourist place which has a large number of floating population that is increasing every year, so the demand for water and public sanitation systems are becoming a challenge. Small Scale STPs are upcoming in tourist spots that are run by NGO initiatives tapping into water reuse options. As per the discussion with the officials of Mysuru City Corporation and water works department (Vani Vilas), every small area of Mysuru that is left without sewer facilities, the process of lying the sewerage network has been started to bring 100% coverage.

In Mysuru, there are 3 sewage treatment plants based on facultative aerated lagoon and sedimentation basin. However, only 74% of the wastewater generated is treated. Internal reports also say that plants are to be expanded in the next 2 years to take in additional load with about 5 more STPs planned and over 42 km of sewer lines under construction already. Around 25% of the excreta generated corresponds to wastewater currently being disposed off untreated into agriculture land and rarely onto water bodies outside of city limits. Newer technologies are being considered to improve reuse options to cater to nearby industries and large corporate centres. The AMRUT funds have been allocated to begin work on all the proposed infrastructure. Mysuru has been a city with sewer-based solutions only, and with the expansion of sewers to all newly added areas and topographically challenging areas, the goal of 100% sewerage is very much possible to attain. Therefore, the primary challenge will be increasing treatment capacity through STPs. With steps being taken in network and treatment infrastructure, Mysuru will be able to attain over 90% safely managed excreta when the proposed facilities are constructed.

SFD Promotion Initiative

SFD Mysuru, India, 2019

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This Executive Summary and the SFD Report are available from:

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