Environmental Audit

Audit

- **Audit** is a planned and documented activity performed by qualified personnel to determine by investigation, examination, or evaluation of objective evidence, the adequacy and compliance with established procedures, or applicable documents, and the effectiveness of implementation.

- Auditing is defined as a systematic and independent examination of data, statements, records, operations and performances (financial or otherwise) of an enterprise for a stated purpose. In any auditing the auditor perceives and recognizes the propositions before him for examination, collects evidence, evaluates the same and on this basis formulates his judgment which is communicated through his audit report.

Source: en.wikipedia.org/wiki/Audit

Environmental Audit

Environmental Audit is a systematic, documented, periodic and objective process in assessing an organization's activities and services in relation to:

- Assessing compliance with relevant statutory and internal requirements
- Facilitating management control of environmental practices
- Promoting good environmental management
- Maintaining credibility with the public
- Raising staff awareness and enforcing commitment to departmental policy
- Exploiting improvement opportunities
- Establishing the performance baseline for developing Environmental management system

The benefits of auditing

- Ensuring compliance, not only with laws, regulations and standards, but also with company policies and the requirements of an Environmental Management System (EMS) standard;
- Enabling environmental problems and risks to be anticipated and responses planned;
- To demonstrate that an organisation is aware of its impact upon the environment through providing feedback;
- Increased awareness amongst stakeholders;
- Efficient resource use and financial savings.

- ✓ Conducting an environmental audit is no longer an option but a sound precaution and a proactive measure in today's heavily regulated environment.

- ✓ Evidence suggests that EA has a valuable role to play, encouraging systematic incorporation of environmental perspectives into many aspects of an organisation's overall operation, helping to trigger new awareness and new priorities in policies and practices.

PLANNING AN ENVIRONMENTAL AUDIT:

- Any premises that wishes to conduct an environmental audit must have a clear idea of the objectives of the exercise and the steps required to achieve it.

Define Audit Scope and Audit Site(s) :

To include:

Audit site and boundary

Audit objectives

Area of audit

Audit objectives typically are:

- Verification of legislative and regulatory compliance
- Assessment of internal policy and procedural conformance
- Establishment of current practice status
- Identification of improvement opportunities

Areas of audit :

- Material management, savings and alternatives
- Energy management and savings
- Water management and economy of use
- Waste generation, management
- Noise reduction, evaluation and control (internal and external)
- Air emissions and indoor air quality
- Environmental emergency prevention and preparedness
- Transportation and travelling practices
- Staff awareness, participation and training in environmental issues
- Public enquiry and complaints response
- Environmental management system set up, suitability and performance

Assemble An Audit Team :

An Audit Management Committee (AMC) established by management at Directorate level, is responsible for:

- Overseeing the audit process
- Appointing an Audit Team Leader to be in charge of the audit
- Securing the necessary resources and funding
- Reviewing the Audit Report
- Reporting to the Organisation Directorate

The AMC in conjunction with the Audit Team Leader to:

- Appoint Audit Team Members
- Assess requirement for external assistance to ensure thoroughness and objectivity of audit
- Confirm availability of Audit Team members
- At each audit site, Site Facilitator(s) is/are selected to provide local support to the Audit Team in gathering the necessary information and assistance during the audit.

Before commencing an environmental audit, the following requirements must be fulfilled

- Commitment Obtain:
  - Commitment at the Directorate level
  - Communicate commitment to personnel at all levels

CONDUCTING AN ENVIRONMENTAL AUDIT :

An environmental audit is typically undertaken in three phases:

- Pre-audit
- On-site audit
- Post-audit

Each of these phases comprises a number of clearly defined Objectives, with each objective to be achieved through specific Actions, and these actions results in the form of Outputs at the end of each phase.

Pre-audit

Objectives

- To develop an audit plan for the on-site activities
- To make the necessary preparation and arrangements for the on-site audit

Pre-audit

Actions

- 1. Develop an Audit Plan

  The Audit Plan should address:

  – Where: audit site & boundary with overview
  – What: scope & objectives
  – How: site personnel interview, site inspection, audit protocols; site logistics and administrative arrangement
  – Who: audit team and site facilitation arrangement
  – When: audit schedule and milestones

Pre-audit

Actions

2. Prepare Pre-Audit Questionnaire

To prepare questionnaire and document checklists on:

- Overall environmental management
- Procurement policy
- Energy management
- Materials management
- Water and wastewater management
- Waste management
- Noise monitoring and control
- Air quality monitoring and control
- Transportation and travelling
- Staff awareness and training
- Publicity of environmental information
- Response to public enquiries and complaints

The questionnaire and checklists are to be forwarded to the relevant site personnel for completion.

Pre-audit

Actions

3. Review Background Information
   - To gain familiarity with audit site through review of:
     - Site layout plan(s)
     - Site history, use and activities
     - Blue prints/as built drawings
     - Organisational structure at audit site(s)
     - Internal environmental policies, procedures and guidelines

Pre-audit

Actions

4. Review Operational Information

Review of:

- Operational activities and process descriptions
- Management system policies, procedures and program documentation
- Relevant records (compliance, monitoring, training, maintenance, calibration etc.)
- Other relevant information pertaining to environmental management practices

Pre-audit

Actions

5. Conduct Initial Site Visit

To arrange with the site facilitator(s) for an initial visit during normal operation of audit site to:

- Meet with officer-in-charge to explain purpose of audit
- Assess whether background information gathered is up to date and accurate
- Follow-up on the list of preliminary audit impressions
- Identify and request additional site information as necessary
- Confirm thoroughness of audit scope
- Establish adequacy of resources for audit

Pre-audit

Actions

6. Develop On-Site Questionnaire and Audit Protocols

To develop a series of step-by-step questions and evaluation criteria to assess:

- Compliance with pertinent legislative and regulatory requirements
- Conformance with internal environmental policies, procedures and guidelines
- Status of current environmental practices
- Staff awareness of internal environmental policies, procedures and guidelines

Pre-audit

Actions

7. Review Audit Plan and Arrange Logistics

All documents and arrangements should be updated or revised to reflect current knowledge and conditions.

Key points to review include:

- Audit scope
- Audit schedule
- Audit protocols
- Allocated resources

Pre-audit

Output

- Audit Plan
- Package of background information
- Completed Operational information
- Audit Checklists
- On-site Questionnaire and Audit Protocols

2. On-Site Audit Activities

- Objectives
- The on-site audit objectives should reflect those of the environmental audit

2. On-Site Audit Activities

Actions

1. Opening Meeting/Kick off meeting

- Introduce audit team members
- Present audit scope and objectives
- Outline the audit approach and methodology
- Address questions or concerns of site personnel

2. On-Site Audit Activities

Actions

2. Document Review

Audit Team member to undertake a review of relevant document such as:

- Management policy
- Management system documentation
- Operational procedures
- Records (utility, inventory, monitoring, calibration, transportation, training etc.)
- Previous audit reports
- Green management team meeting minutes
- Green suggestions

2. On-Site Audit Activities

Actions

3. Detailed Site Inspection

Conduct detailed site inspections with aid of on-site audit protocols to look for evidence on:

- Compliance with legislative and regulatory requirements
- Conformance with internal policies, procedures and guidelines
- Status of operational practice
- Staff participation in management system implementation

2. On-Site Audit Activities

Actions

4. Staff Interview

To obtain information on

- Actual practices (current and past)
- Compliance with/or deviation from statutory and departmental requirements
- Awareness of requirements and expectations
- Ideas to do it better
- Comments and suggestions

2. On-Site Audit Activities

Actions

5. Review Audit Evidence

Ensure adequacy of audit evidence at the conclusion of on site audit by:

- Reviewing information gathered
- Collecting additional information as needed
- Substantiating audit findings
- Summarising and documenting all findings and observations
- Identifying issues requiring immediate attention/mitigation
- Noting outstanding issues requiring follow-up
- Preparing debriefing material for the Closing meeting

2. On-Site Audit Activities

Actions

6. Closing Meeting on site

- On completion of the site investigations, the audit team should present their preliminary findings in a formal exit meeting.
- This meeting will discuss any matters which have been resolved or for which information is unavailable.
- The audit team shall provide a general review of the findings and indicate when the final report will be completed.
- All documents collected during the audit should be returned to the management of the organization or activity.

2. On-Site Audit Activities

Output

- Documented audit findings and supporting evidence
- Basis for evaluating conformance status in relation to statutory and internal requirements
- Basis for assessing performance status and improvement recommendations

3. Post-Audit Activities

Objectives

- To produce an Audit Report with audit findings and recommendations
- To contribute towards formulation of an Action Plan for continual performance improvement

3. Post Audit

- **Actions**

1. Issue draft audit report to site management

- The audit team should prepare a comprehensive written report on the results of the audit.
- The report should include presentation of an action plan for addressing the issues identified.
- The report should state factual findings, particularly compliance with standards, policy and legal requirements where relevant.
- The report should include recommendations for remedial or improvement actions.

3. Post Audit Actions

- **Actions**

2. Revise and issue final report

- After reviewed by management

3. Action plan

- An action plan should be developed from the report.
- There must also be a process to self-check against audit recommendations

Confidentiality of Audit report

- Internal audit reports are the confidential property of the organization or activity that has been audited and often contain a disclaimer.

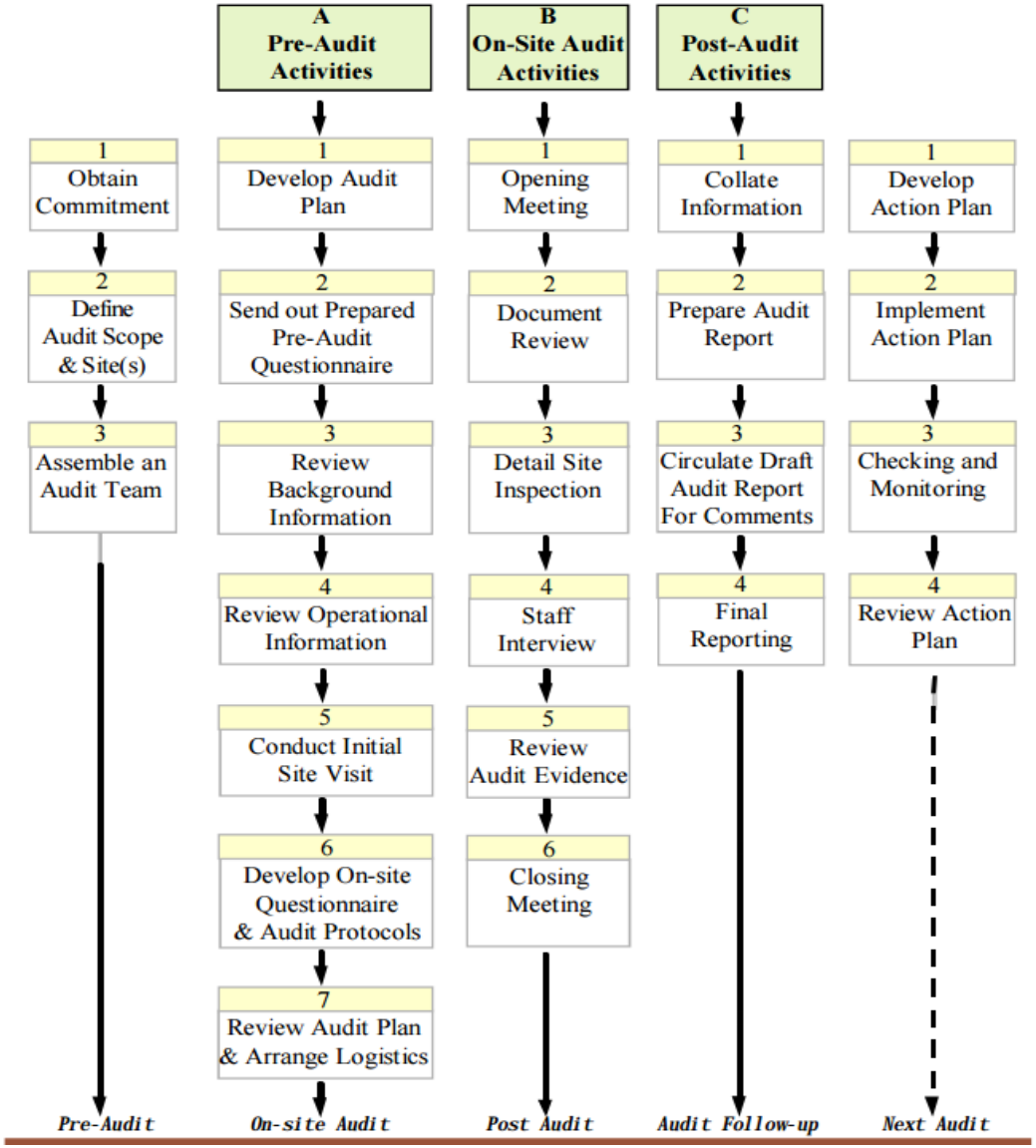
3. Post Audit Actions

Output

Final Audit Report addressing:

- Environmental Legislation compliance status
- Departmental environmental policies, procedures and guide lines conformity status
- Status of current environmental performance
- Recommendations for performance improvement

Environmental audit



Environmental Audit India

- Introduced in India by MoEF on March 1992
- Applies to all industries, operation or process requiring consent to operate under section 25 of the Water Act or section 21 of the Air act or section 29 of the Environmental protection act.
- Amended on April 1993: 'Audit Report' replaced by 'Environmental Statement'

Environmental Audit Scheme in Gujarat

Adopted from the presentation of

HARDIK SHAH, Member Secretary

Gujarat Pollution Control Board

At

56TH Conference of Chairmen & Member Secretaries of SPCBs/Committees, New Delhi

31st August, 2010

1. Environment Audit Scheme :

– An outcome of the judgment of Hon. High Court of Gujarat

Environmental Audit Scheme

- An outcome of the landmark judgment of Hon'ble High Court of Gujarat in SCA 770/95
  - Need was felt for strengthening of the environmental monitoring and environmental infrastructure
  - Difficulties in regular monitoring of thousands of industries scattered over the entire state due to shortage of man-power and infrastructure
  - Environment Audit scheme - **modification of Rule 14** of the Environment (Protection) Rules 1986

Principles of Environment Audit Scheme

- "Polluter Pays"
- Scheme is based on the principle of "Continual Improvement"

ENVIRONMENT AUDIT SCHEME

- Introduced in December 1996 with a view to :
  i. Enforce discipline amongst industries;
  ii. Arm GPCB as well as the associations of industries with required data; &
  iii. Do regular monitoring of various industries from different angle
- Qualified technical professionals would become a link between the individual industries on one hand and GPCB as well as associations of industries on the other hand with vital element of accountability

SALIENT FEATURES OF EA SCHEME

- Classified industries in to two schedules (I & II) according to their pollution potential - Industries with more pollution potential classified in schedule I
- The industries are audited by the auditors recognized by the Board as per the qualifications and experience prescribed
- Scheme applies to all industries manufacturing and/or processing any one or more of the products mentioned in the Schedule- I or Schedule-II
- Schedule-I industry shall carry out EA through Schedule-I Auditors and Schedule-II industry shall carry out EA through Schedule-II Auditors recognized by the GPCB

SALIENT FEATURES OF EA SCHEME

- Schedule-I auditors are credible institutes with high technical capabilities like Academic & R&D Institutes
- Schedule-II auditors are agencies / consultants having technical capabilities
- Both Schedule-I and Schedule-II auditors are recognized – constituted a committee – officers from Board, Government and experts / professionals
- Reporting formats are standardized & defined - uniformity

SCHEDULE – I

No.	Classification of industries	Products
1	2	3
I	**Dyes-Intermediates**	
A)	Naphthalene based intermediates (irrespective of effluent going to CETP or not)	• H-acid • Diazo Napthayl Sulphonic acid • Beta Napthol • Alpha Napthyal Amine • C-acid • Kale acid/European acid
B)	Naphthalene derivative based intermediates (if effluent not going to CETP)	• Bon Acid • K-acid • J-acid • N-M-J acid • Gamma Acid • Sulpho tobias Acid • Tobias Acid • Schaefers acid • Bronners acild
C)	Mediates	
(I)	Aniline based inter (irrespective of effluent going to CETP or not)	• Vinyl Sulphone • Acetyl Sulphonyl Chloride (ASC)
(I)	Aniline based intermediates mediates (If effluent not going to CETP)	• DASA (Manufactured using chlor-Sulphonation process)
II	**PIGMENTS**	
	Metal Pthalo Cyanine based (If effluent not going to CEPT)	• CPC Blue • CPC Green • Alpha Blue
III	**Common effluent treatment plants (CETPS), TSDFs, all Bio medical Waste incineration facilities**	—
IV	**All industrial plants manufacturing products/involving processes mentioned in column no.3 and discharging effluent in quantity 1 lac ltr/day or more (if effluent not going to CETP**	• Fermention including Distillery • Sugar • Fertilizers • Oil refinery • Caustic soda • Petrochemicals • Formulation and/or mfg. of pesticides and/or insecticides • Formulations and/or mfg. of basic drugs and pharmaceuticals • Dyes/Dyes intermediates/pigments • Agrobased pulp and paper • Manufacturing units • Tanneries
V	**All industrial plants mentioned in column 3**	• Cement plant (with horizontal shaft kilns) • Thermal power plant • Integrated iron & steel plant • Zinc smelter • Copper smelter • Aluminum smelter

SCHEDULE – II

No.	Classification of industries	Products
1	2	3
I	**Dyes-Intermediates**	
a)	Naphthalene derivative based intermediates (if effluent ~~not~~ going to CETP)	• Bon Acid • K-acid • J-acid • N-M-J acid • Gamma acid • Sulpho tobias acid • Tobias acid • Schaefers acid • Bronners acid
B)	Benzene based (if effluent not going to CETP)	• 4-CAP • PAABSA • PABA
C)	Nitrochloro benzene based (if effluent not going to CETP)	• Anthranilic acid • NADPSA • APDA • ONCBSA
D)	Aniline based	
(I)	If effluent not going to CETP	• FC Acid • DABSA • DASDA • NAPSA • OAPSA • OPDA • SPCP • DASA (if manufactured from ASC)
(II)	If effluent going to CETP	• DASA (if manufactured from chloro sulphonation process)
II	**Dyes**	
	If effluent not going to CETP	
i)	Direct Dyes (CPC Based)	• Direct Turquoise Blue
ii)	Reactive Dyes (CPC Based)	• Reactive Turquoise Blue
iii)	Vat Dyes	• Vat Dye • Vat indigo

SCHEDULE – II

III	**Pigment**	
	Metal pthalo cyanine based pigments (if effluent going to CETP)	• CPC Blue • CPC Green • Alpha Blue
IV	All industrial plants (Except those mentioned at item IV in Schedule-I) discharging effluent one lac litres per day or more (irrespective of effluent going to CETP or not)	
V	Textile processing industries with carbonizing units	
VI	Textile processing industries having daily effluent discharge of one lakh ltr. Per day or more	
VII	Stainless steel rolling and rerolling Mills	
VIII	All industrial plants manufacturing products mentioned in Ct 3 of Item IV in Sch-1 discharging effluent less than one lac lts buy more than 25,00 lac per day (if effluent not going to CETP)	

IX	Lead recovery units from scrap	
X	All Industrial plants manufacturing/plants/involving process mentioned in column No. 3 and discharging effluent quantity one lakh liter per day or more.(If effluent going to CETP)	• Fermentation including Distillery • Sugar • Fertilizers • Oil refinery • Caustic Soda • Petrochemicals • Formulation and/or manufacturing of pesticides and/or insecticides • Formulation and/or manufacturing basic drugs and pharmaceuticals • Dyes/Dyes Intermediates/Pigments • Aerobased pulp and paper manufacturing units * Tanneries

SALIENT FEATURES OF EA SCHEME

- In addition to adequate laboratory facilities, the Auditors must have at least 4 technical team members
- Each team of auditors shall comprise of :
  - a person possessing a degree in Environmental Engineering or a degree in Civil Engineering with specialization in Environmental engineering
  - a person possessing a degree in Chemical Engineering/Technology
  - a person possessing a degree in Chemistry or Environmental Science
  - a person possessing a degree in Micro Biology/Bio-Chemistry
- Provisions of random back checks

Auditors Recognized & Industries Covered

- At present there are 24 Schedule-I auditors (institutes) and 45 Schedule-II auditors (consultants) recognized by GPCB
- Total No. of Common facilities and industries covered under the EAS are 1111
  - Schedule I : 205
  - Schedule II : 906

Other Provisions of EA Scheme

I) If the EAR is incorrect, the industry shall be subject to directions including the closure

II) If an Auditor submits incorrect data in EAR, auditor shall be de-recognized

III) Non-compliance to be viewed seriously

IV) GPCB is empowered to issue directions for closure to the unit if it fails to submit the EARs

V) GPCB is empowered to add products in either schedules depending upon pollution potential

Advantages of EA Scheme

- Increased monitoring - complimentary to existing regulatory mechanism
- Overall assessment of environmental performance by an industry
- Better compliance - adequacy of the EMS ascertained
- Element of voluntary compliance - encourages industry to think beyond the compliance
- Recommendations given by the Auditors lead to Good / Green practices
- EA Reports provide important technical inputs to Board
- Environment Auditors are hold responsible for the false / misleading reporting – blacklisting

Limitations of EA Scheme

- Repetitive in nature - stereo type reporting in a long run
- Auditors are appointed by industries
- Competition amongst the auditors results into reduced auditing fees – poor quality
- Auditors monitor the industries for grab samples
- Auditors rely upon the data supplied by the industries
- Does not apply uniformly in entire country – most of the industries feel that its burden
- Need for further strengthening and R&D to make it more effective

Legal Framework for Environmental Audit

- To have modified version of the Gujarat Scheme under the Rule 14 of Environment (Protection) Rules by integrating and subsuming the concept of the Environmental Statement

Or

- To have separate Rules under Environment (Protection) Act in lines with the EIA Notification – Auditors to be registered like the EIA consultants which are recognized by QCI or in line with Chartered Accountants

Case Study

Environmental Audit of Municipal Solid Waste Management

Source: Ramachandra T.V. and Bachamanda S.

Int. J. Environmental Technology and Management, Vol. 7, Nos. 3/4, 2007

Different types of audits

- Compliance audit. To check if the current waste management process is being carried out as per the legislation.
- Pollution prevention audit
- Resource management audit. To check the optimal utilisation of water, energy and material resources.
- Occupational risk audit. To verify the measures of occupational safety.

Objectives

- To identify and bring out the lacunae and the loopholes in the current system with respect to the **compliance with environmental regulations, resource management, pollution prevention systems and occupational health and safety.**

Bangalore city statics

- Population: 4,292,223 accounting for 75.5% of the total population of Bangalore Urban Agglomeration
- Waste generated: 1700 -2300 MT/day
- The Bangalore Metropolitan Area divided into **100 Revenue wards** under the jurisdiction of **Bangalore Mahanagara Palike (BMP)**.
- BMP is responsible for the SWM policy, setting up targets and objectives.
- Revenue wards are further divided into 294 health wards for proper management of the sanitation functions.
- **112 wards are managed by BMP**, while 182 wards have been **assigned to private agencies on contract basis**.

Physical characteristics of Bangalore MSW

Table 2 Physical characteristics of Bangalore MSW

Organic waste (%)	60
Dust (%)	5
Paper (%)	12
Plastic (%)	14
Glass (%)	4
Metal (%)	1
Bio Medical Waste (%)	1
Card Board (%)	1
Rubber (%)	1
Miscellaneous (%)	1

Source: BMP

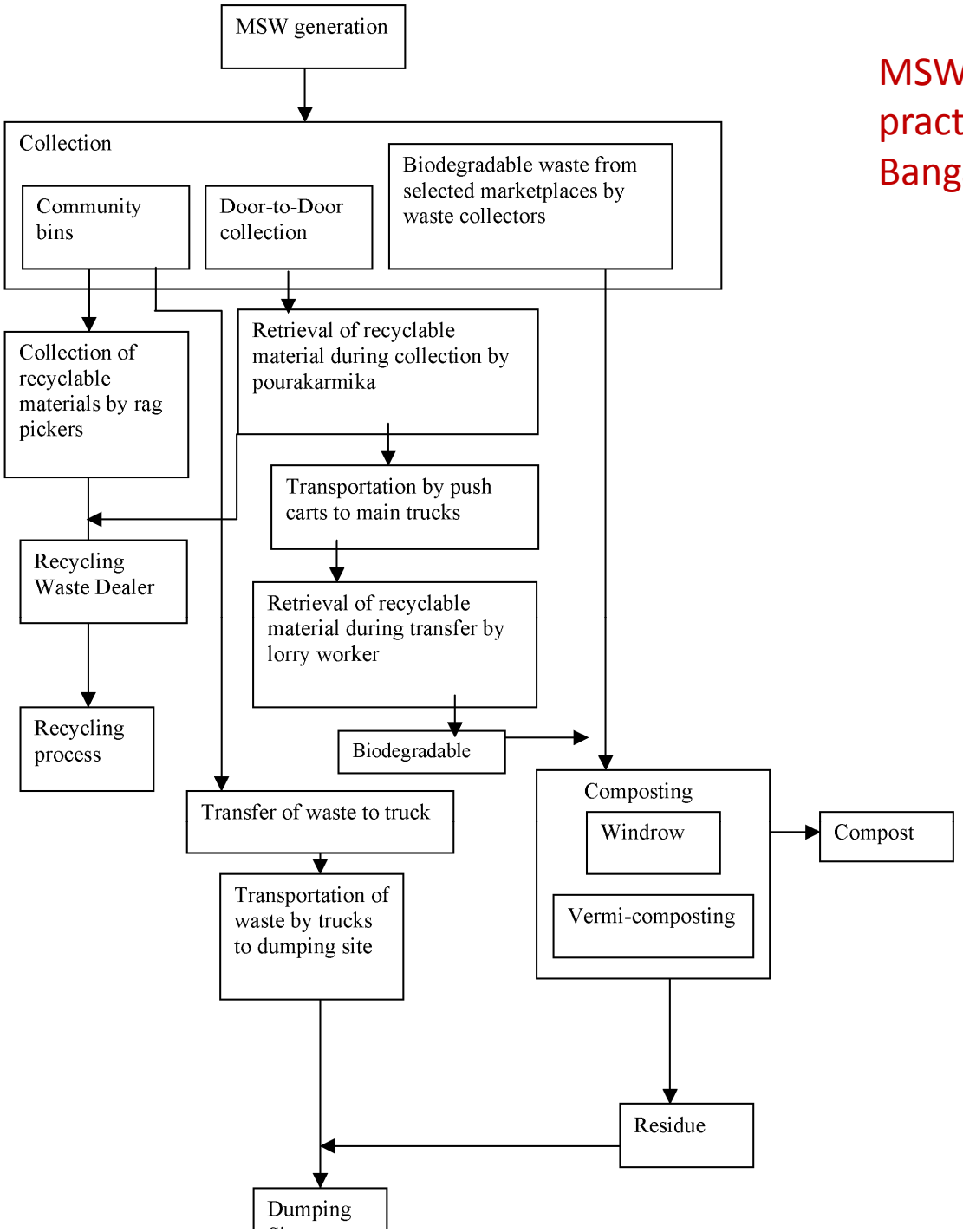
Methods-Approach

- Qualitative approach
- Information was gathered using Data collection methods included: document/literature review, semi-structured interviews, checklists and observation.

Methods-Description

- Site survey was done in seven representative sample wards (Shivajinagar, Malleswaram, Koramangala, Indian Institute of Science campus (IISc), Hindustan Machine Tools colony (HMT), Airport Road and Chikpet).
- A checklist was prepared prior to the visit to check the presence or absence of techniques used, safety measures adopted, compliance with regulatory measures, and the pollution prevention system adopted.
- Interviews with health Inspectors, workers and lorry drivers were done at the ward level.
- Discussions with range health officers, zonal health officers, the chief health officer and the special commissioner helped in understanding the structure and management of the system
- The site surveys and ward level interviews helped to verify the process and to identify the lacunae in each functional element.
- Site visits to the Karnataka Compost Development Authority, Terra Firma Biotechnologies, Betahalli dump yard, K.R. Puram dump yard and the quarry site in Bomanhalli were done during the study to understand waste processing and disposal.

MSWM practice in Bangalore city



Collection

- Door-to-door collection, followed by community bin collection
- As per the BMP, all wards in the city are supposed to have door-to-door collection and all the community bins have been removed
- Many of the wards still have community bins that are in a very dilapidated state
- A large quantity of organic waste is generated from 12 commercial vegetable markets. This waste is collected using separate trucks every morning and evening.
- The waste is transported to the disposal site by means of a large capacity tipper truck, and in a few wards by a small capacity tipper truck or dumper placers.
- No transfer stations for intermediate storage of waste and intermediate segregation of waste

Processing of wastes

- In 2002, the capacity of composting: 150 tons/day.
- Currently the units process 250 tons/day of mixed waste, plus 50 tons/day of market waste

Disposal

- City waste is disposed off at Betahalli (Mavallipuram) dump yard situated 18 km north west of Bangalore city.
- The waste is brought in by the municipal and contract lorries. This waste is dumped in the yard in the form of a heap.
- There are three JCB's (Front End Loaders) in the dump yard for waste levelling.
- The waste is sprayed with Effective Microorganisms (EM) solution, covered with a 10 cm layer of debris and sprayed with water after levelling.
- The solution used for spraying is prepared by mixing 4 litres of EM solution with 8 kg of molasses or jaggery and 150 litres of water.
- The EM stock solution consists of actinomycetes, photosynthetic bacteria, and yeast, Lactic acid bacteria (*Lactobacillus sp., Streptococcus sp., Streptomyces sp., Rhodopseudomonas sp., Saccharomyces sp., Propionibacterium sp.), which speed up the* degradation process and reduce the volume, the flies and the odour.

Observations on Betahalli (Mavallipuram) dump yard

- A large number of rag pickers collect recyclable waste from the landfill and pay a small amount to have access to the waste
- A recycling dealer in the dump yard who buys the recyclable material from the rag pickers and one dealer on the way to the dump yard who buys the recyclable waste from the lorry driver
- The levelling of MSW after dumping is not carried out efficiently due to fewer number of front-end loaders
- The foul odour was strong and could be inhaled at long distances
- Large number of flies, birds and stray dogs
- Emission of methane gas from the dump yard, due to which the waste can be easily set on fire
- Always a queue of at least 5–10 Lorries waiting to unload; this is due to the lack of number of front-end loaders to level the MSW
- Dump yard has no fencing, weigh bridge or no proper approach roads.

Private formal sector

- 182 wards have been given out on a private contract.
- This includes the functions of collection of waste, transfer of waste to trucks, transport of waste to the specified dump yard.
- The dump yards that are currently being used are all owned by private entities.
- They have the responsibility of disposing of the waste by alternative layering of waste and soil, spraying it with EM solution and water.

Processing of wastes

- Karnataka Compost Development Corporation (KCDC), which is a government-aided organisation. This carries out the function of composting (windrow and vermicomposting)
- Terra Firma Biotechnologies, which is a private organisation that carries out vermicomposting
- Ramky Consultants, which is a private consultancy proposing to set up a sanitary landfill site in Bangalore
- Srinivas Gayathri Resource Recovery, which is a private consultancy proposing to set up a waste to energy plant and a sanitary landfill site in Bangalore

Private informal sector

- The informal sector in the city is very large and plays a very vital role in the MSWM.
- It comprises the rag pickers who retrieve recyclable waste from the community bins and landfills, the people who buy recyclable waste from households usually called as ‘batli wallas’, the middlemen who buy waste from the rag pickers and ‘batli wallas’ and sell it to either bigger dealers or to recycling factories.
- Municipal workers like the pourakarmika collect waste from the households and retrieve the recyclable waste; even the lorry workers retrieve the recyclable waste before transferring the waste into the lorry.
- The waste retrieved by them is sold to the informal sector.

Donor agencies.

- *Development corporation of Norway (DCN), Deutsch Gesellschaft* fur Technische Zusammenarbeit (GTZ) and World Health Organization (WHO) are a few of the international organisations that have sponsored projects in Bangalore.
- WHO has sponsored large scale composting plants all over India and DCN has sponsored decentralised plants all over Bangalore.

MSWM in Malleswaram (Ward 7)

(Population- 37760, Area- 1.69263 sq km)

Function	*Shortcoming*	*Suggestion*
Storage		
The waste is stored in households and in shops until it is collected by the door to door collector	–	–
Collection		
Door-to-Door method – Adopted in the whole ward, for residential and commercial areas	Seventy percent of drums are not painted as per the regulations of green for biodegradable, white for recyclable and black for mixed	Painting of drums at regular intervals to make it more convenient to workers
	Segregation not carried out by worker nor householder, though separate bins are provided	Workers accept only segregated waste from households
The recyclable waste is retrieved by the worker and sells it separately to the informal sector	PET bottles and thin plastic bags are not retrieved. The soiled recyclable material cannot be retrieved	
	Waste heaps found near commercial areas	Placement of large community bins in commercial areas (in commercial area there is a possibility of sudden generation of a large quantity of waste that cannot be stored in the shop till the next day)
		Small litter bins should be provided for the pedestrians in commercial areas and bus stands

Function	*Shortcoming*	*Suggestion*
Sweeping	The dirt is pushed into the drains which blocks the drains	The workers educated on the affects of blocked drains and regular inspection of drains
	Workers do not use the gloves and footwear that are provided for protection	Mandatory usage of the protection gear provided
Transfer and transport		
The waste collected in pushcarts from narrow lanes and meet at a synchronisation point at a specified time. The waste is transferred from the pushcart to the truck	The waste even if segregated by the workers and stored in separate drums, the waste gets mixed during transfer from pushcarts to lorry. This is because there is no facility in the lorry for separate storage of waste	A small capacity truck and a large capacity truck can be assigned for the collection of dry and wet waste respectively. A better option is to have a partition in a single truck for the collection of segregated waste
The lorry worker retrieves recyclable material during transfer of waste from push cart to lorry	PET bottles and thin plastic bags are not retrieved. The soiled recyclable material cannot be retrieved	Only segregated waste should be accepted to be filled into the lorry
BMP truck – 3 large capacity tipper	Mesh covering – 5 trucks, No Polythene covering – 1, Partial Polythene covering – 2 trucks, Complete polythene covering – 2 trucks	Trucks completely covered with polythene to prevent scattering of waste and foul odour
Contract truck –1 large capacity tipper	There is leakage of wet waste from truck during transportation	Provision of proper enclosure
Trip truck – 1 large capacity tipper	Foul odour emitted from the waste during transportation	Regular inspections
	The waste is not segregated at an intermediate level and is directly transported to the disposal site	Transfer stations to be provided where waste can be further segregated and higher efficiency for transportation can be achieved by increasing the number of trips made by each truck
	Long distance from ward to dump site, hence only one trip a day is made by each truck	
	Manual transfer of waste	Mechanical loading collection vehicles or proper equipment for transfer of waste
Process	No processing carried out prior to disposal	Recycling of the recyclable material retrieved from waste
		Composting
		High quantity of yard waste generated in the ward and also high quantity of organic waste generated from the market and households

Function	*Shortcoming*	*Suggestion*
Disposal		
Dump yard in Betahalli	Foul odour, flies and bird menace	Usage of higher quantity of EM solution
	Stray dog nuisance	
	Waste burnt emitting toxic fumes and causing air pollution	Waste burning should be prohibited and strict action should be taken if still continued
	Waste is dumped in heaps causing scattering	Usage of front end loaders for levelling and use soil cover
	Soil contamination	
	The lorry workers and drivers are exposed to diseases	Provision of masks and safety gear
Rag pickers retrieve the recyclable material from the landfill	High exposure to diseases	Provision of masks and safety gear
		Closure of dumpsite and replacement with sanitary landfill

Ward wise Auditing of functional components of MSWM

Function	*Technique*		*Shivajinagar*	*Malleswaram*	*Koramangala*	*IISc*	*HMT*	*Airport road*	*Chickpet*	*Average %age*
Storage	Community bin	Percentage of covered bins	30	–	–	33	–	–	84	49.00*
Collection	Community bin	Percentage of area covered in commercial areas	40	0	0	–	–	–	30	17.5**
	Door to door	Percentage of area covered in residential areas	100	100	100	60	100	100	100	94.29
		Percentage of waste segregated	0	0	20	5	0	0	0	3.57
Transfer		Transfer station	A	A	A	A	A	A	A	A
Transport	Truck	Truck with mesh (%)	100	100	100	75	100	100	100	96.43
		Truck with mesh and polythene cover (%)	75	40	75	0	0	0	100	41.43
Process	Percentage of waste recycled	Informal	18	18	18	18	18	18	18	18.00
		Formal								
	Percentage of waste composted				22					3.14
	Percentage of waste for anaerobic digestion									
	Percentage of waste incinerated									
Disposal	Sanitary landfill									
	Dump yard		85	85		85	85		85	60.71
	Quarry				63			85		21.14

A: Absent.

*Only the areas having bins are taken into consideration.

**Only the commercial areas have been taken into consideration i.e., Shivajinagar, Malleswaram, Koramangala and Chikpet.

Compliance audit of MSWM

Checklist for compliance	*Sample wards*						
Function Regulation	*Shivajinagar 79*	*Malleswaram 7*	*Koramangala 67*	*IISc 5*	*HMT 1*	*Airport Road 73*	*Chickpet 28*
Storage							
No littering on the streets?	X	X	X	√	√	X	X
No littering around bins?	X	na	na	X	X	√	X
Are the bins covered?	X	na	na	X	X	√	X
Are the bins cleared every 24 hrs?	√	na	na	√	√	√	√
The storage facility is designed taking into account the quantity of waste generated in a given area and the population density	X	na	na	√	√	X	X
Aesthetically acceptable	X	na	na	√	X	X	X
Bins have easy to operate design	X	na	na	√	X	X	X
Bins for biodegradable waste are painted green, for recyclable waste they are painted white and for other waste they are painted black	X	√	√	X	√	√	√
No manual handling of waste	X	X	X	X	X	X	X
Manual handling with proper precaution and safety	√	√	√	√	√	√	√

Compliance audit of MSWM

Segregation							
Organisation of awareness programmes to ensure community participation in waste segregation	√	√	√	X	X	X	√
Arranging meeting at quarterly intervals	X	X	X	X	X	X	X
Arranging meetings at monthly intervals	X	X	X	X	X	X	X
Arranging meetings once in every six months	√	√	√	X	X	X	√
Collection							
Door-to-door collection/ community bin/ block collection	√	√	√	√	√	√	√
Segregation done at source	X	X	X	X	X	X	X
Collection from slums and squatter area	X	√	√	√	√	√	X
Collection from hotels/ restaurants/ office complexes	V	V	V	V	V	V	V
Separate collection of waste from slaughter houses/ meat and fish markets/ fruit and vegetable markets	√	√	√	√	√	√	√
No mixing of biomedical wastes and industrial wastes with MSW	√	√	√	X	√	√	√
Usage of hand driven container carts for the collection and transfer of waste to trucks or community bins	√	√	√	X	√	√	√
Horticulture, dairies and construction and demolition waste is collected separately	√	√	√	√	√	√	√

Checklist for compliance	*Sample wards*						
Function Regulation	*Shivajinagar 79*	*Malleswaram 7*	*Koramangala 67*	*IISc 5*	*HMT 1*	*Airport Road 73*	*Chickpet 28*
Collection							
No burning of waste (garbage, dry leaves)	√	√	√	√	√	√	√
No stray animals allowed to move around waste storage facilities	X	X	X	X	X	X	X
No stray animals allowed to move around other places in city or town	X	X	X	X	X	X	X
Notification of the waste collection schedule and the likely method to be adopted for public benefit by Municipal authority	X	X	X	X	X	X	X
Has the public been educated about the law stating that it is the responsibility of the waste generator to avoid littering and ensure delivery of wastes in accordance with the collection and segregation system notified by the Municipal authority	X	X	X	X	X	X	X
Transportation							
Waste transportation vehicles are covered	√	√	√	X	√	√	√
Waste during transportation not visible to public	X	X	X	X	X	X	X
Waste not scattered during transportation	X	X	X	X	X	X	X
Waste collected daily and before overflow of bin	√	√	√	√	√	√	√
Multiple handling of waste avoided	√	√	√	√	√	√	√

Process	*Regulations*	*KCDC*	*Terra firma*
Composting	Agreement between the private agency and the municipal authority for supply of solid waste	√	√
	Waste storage area should be covered, else it should have an impermeable base with facility for collection of leachate and surface water run-off into lined drains leading to a leachate treatment and disposal facility	√	√
	Precautions shall be taken to minimise nuisance of odour, flies, rodents, bird menace and fire hazard	√	√
	During breakdown of plant the waste intake is stopped and is diverted into a landfill	√	√
	Segregation prior to process and constant removal of rejects	X	X
	Constant removal of rejects post processing	√	√
	Recyclables routed through appropriate vendors	√	√
	Non-recyclables sent to well designed landfill sites	√	√
	For windrow composting provided with impermeable base	√	na
	Made of concrete or compacted clay, 50 cm thick, having permeability coefficient less than 10^{-7} cm/sec	√	na
	The base shall be provided with 1–2% slope and circled by lined drains for the collection of leachate or surface run-off	√	na
	Ambient air quality monitoring is regularly carried out	√	X
	Compost quality as per standards	√	√
	Treated leachate complies to standards	na	na

Disposal	*Regulation*	*Mandur*	*Mavallipura*
Site selection (proposed sites)			
	The landfill site shall be large enough to last for 20–25 years	√	√
	The landfill site is away from habitation clusters	√	√
	The landfill site is away from forest areas	√	√
	The landfill site is away from waterbodies	√	√
	The landfill site is away from monuments	√	√
	The landfill site is away from National Parks	√	√
	The landfill site is away from Wetlands	√	√
	The landfill site is away from places of important cultural, historical or religious interest	√	√
	The landfill site is at least 20 km away from airport including airbase	√	X
	If not, necessary approval should be obtained	na	X
	Waste processing facility shall be planned as an integral part of the landfill site	√	√
	A buffer zone of no-development is maintained around landfill site and incorporated in the Town Planning Department's land use plans	X	X

Conclusion

- Only 49% of the present bins are covered.
- In collection, 17.5% of the commercial areas have community bins and 94% of the residential areas have adopted the door-to-door method.
- Only 3% of waste segregation has been achieved.
- There are no transfer stations present and out of the trucks present, only 41% have polythene covering.
- Recycling is carried out mainly by the informal sector achieving a high level of efficiency.
- ~3% of waste reduction is achieved through composting and ~61% of the waste is disposed in dump yards and 21% is disposed in open quarry sites.

Cont…

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Conclusion

- Waste disposal needs immediate attention and strict monitoring. The setting up of sanitary landfill sites has to speed-up.
- The number of treatment process plants has to be increased to manage total quantity of waste generated.
- The segregation of waste during storage, collection and transportation has to be set in place for the efficient running of the process plants.