OASIS GRAND STAND PHASE-II (Tower-1,2&6)

WATER REQUIREMENT

During construction phase water will be supplied by private water tankers, whereas during operation phase water supply will be provided through the Municipal water supply/tubewells. Total water requirement is approx. 103 KLD, out of which domestic water requirement is 100 KLD. Fresh water requirement is approx. 70 KLD which is 70% of the domestic water demand. Daily water requirement calculation is given below in Table 1:

Table 1: Calculations for Daily Water Demand

S. No.	Description	Area (in m^2)	Total Occupancy	Rate of water demand (lpcd)	Total Water Requirement (KLD)
A.	**Domestic Water**				
	I) Residential Development				
	• General	150 Units @ 4.5 persons per Unit	675	135	92
	• Visitors	10% of total population	68	15	1
	• Staff	5% of total population	34	45	2
	Sub Total (I)				**95**
	II) Common Facilities				
	• Staff	10sqm/1person for (1000 sqm)	100	45	5
	Total Domestic Water Required (I+II)				**100**
B.	**Horticulture and Landscape development**	2500		1 lt/sqm	3
Grand Total (A+B) = 103 KLD					

Table 2: Waste Water Calculations

Domestic Water Requirement	**100 KLD**
• Fresh(70% of domestic)	70 KLD
• Flushing (30% of domestic)	30 KLD
Waste Water Generated (80% fresh + 100% flushing)	86 KLD
STP Capacity @20% Extra on waste water generated.	103 KLD
SAY	**100 KLD**

The water balance diagram is shown below in figure 1 & 2:

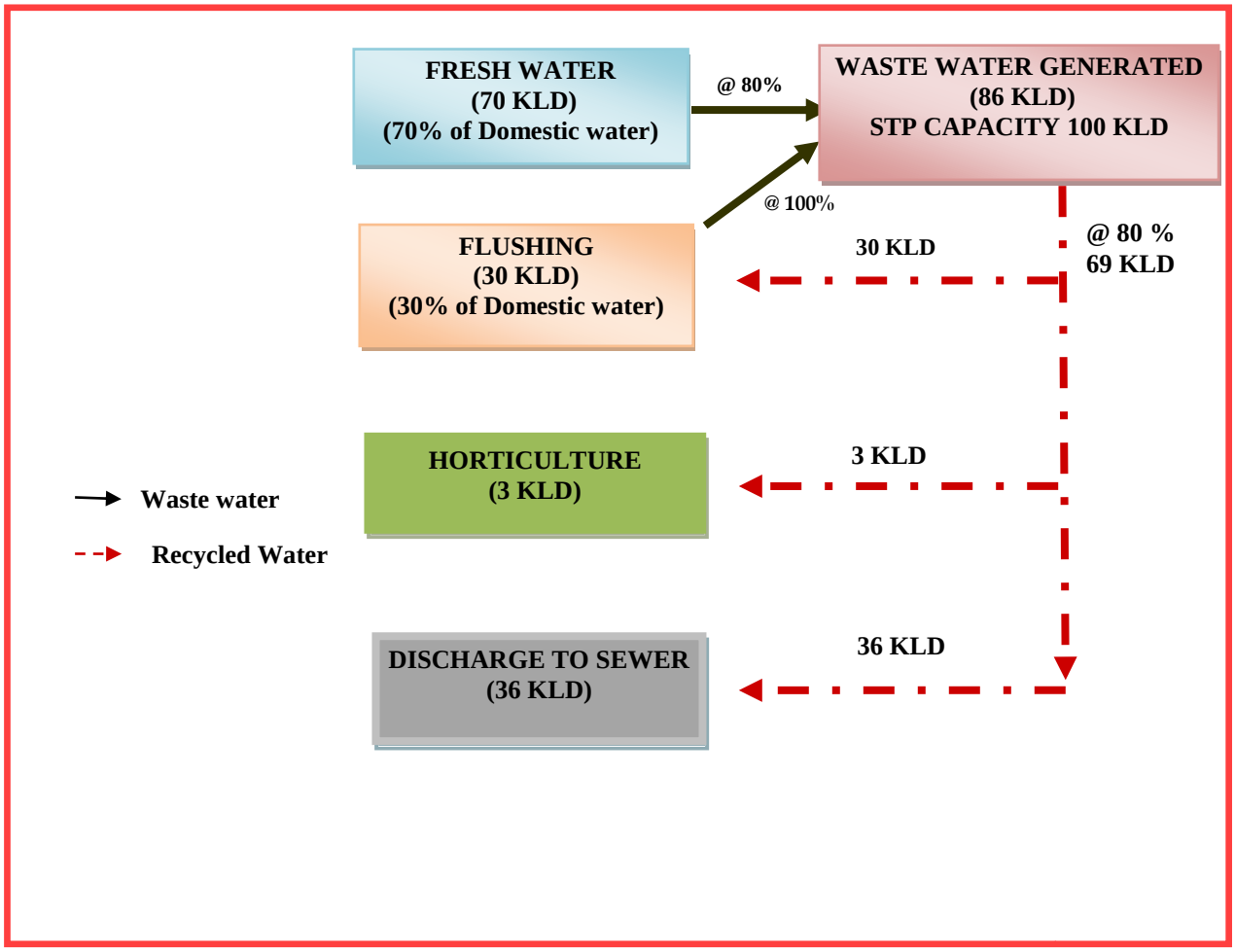

Figure 1: Water Balance Diagram for non-rainy season

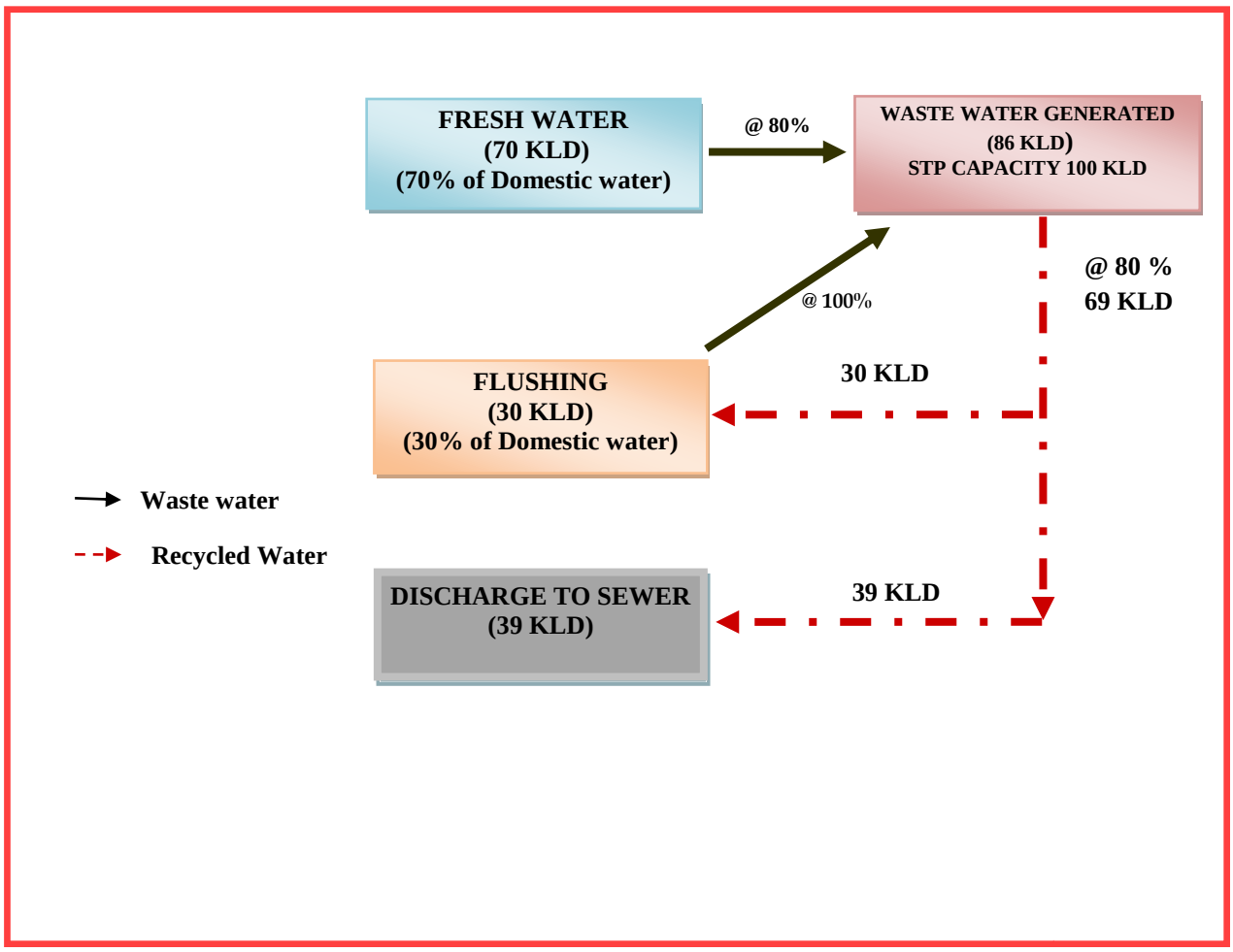

Figure 2: Water Balance Diagram for rainy season

Wastewater Generation & Treatment

It is expected that 86 KLD of wastewater shall be generated from project site during operation phase. Wastewater will be treated in the STP provided within the complex generating 69 KLD of recoverable water from STP which will be recycled within the project but 36 KLD during non- rainy season and 39 KLD during rainy season will become surplus and will be discharged to sewer line.

SEWAGE TREATMENT TECHNOLOGY

FAB TECHNOLOGY

Sewerage System

An external sewage network shall collect the sewage from all units, and flow by gravity to the proposed sewage treatment plant.

Following are the benefits of providing the Sewage Treatment Plant in the present circumstances:

- Reduced net daily water requirements, source for Horticultural purposes by utilization of the treated waste water.
- Reduced dependence on the public utilities for water supply and sewerage systems.
- Sludge generated from the Sewage Treatment Plant shall be rich in organic content and an excellent fertilizer for horticultural purposes.

a. <u>Wastewater Details</u>

(a)	Daily load	:	100 KLD
(b)	Duration of flow to STP	:	24 hours
(c)	Temperature	:	Maximum $32^{o}C$
(d)	pH	:	7 to 9.5
(e)	Colour	:	Mild
(f)	T.S.S. (mg/l)	:	100-400 mg/l
(g)	BOD (mg/l)	:	200-300 mg/l
(h)	COD (mg/l)	:	500-700 mg/l

b. <u>Final discharge characteristics</u>

(a)	pH	:	6.5 to 7.5
(b)	Oil & Grease	:	<10 mg/l
(c)	B.O.D.	:	<20 mg/l
(d)	C.O.D.	:	<100 mg/l
(e)	Total Suspended Solids	:	<10 mg/l

c. Treatment Technology

The technology is based on attached growth aerobic treatment followed by clarification by a tube settler. Lime will be dosed in for suppression of foaming tendencies. The clarified water will be filtered in a pressure sand filter after dosing of coagulant (alum) for removal of unsettled suspended impurities. This water will be passed through an activated carbon filter for removal of organics. The filtered water from ACF is then chlorinated & stored in the flushing tank.

The attached growth fluidized aerobic bed reactor (FAB) process combines the biological processes of attached & suspended growth. It combines submerged fixed film with extended aeration for treatment of the waste water.

The waste water after screening is collected in an equalization tank. The equalization tank is required for preventing surges in flow & facilitating equalization of characteristics over the entire quantity of effluent in a given time. A provision for pre-aeration is made in the equalization tank in order to ensure mixing & to prevent the sewage from going septic.

The equalized sewage is then pumped into the FAB reactor for biological processing. The water enters the bottom of the reactor & flows up through the fixed film media which grossly enhances the hydraulic retention time & provides a large surface area for growth of biological micro – organisms. The FAB reactor is aerated by fine pore sub – surface diffusers which provide the oxygen for organic removal. The synthetic media floats on the water & the air agitation ensures good water to micro-organism contact.

The FAB treatment is an attached growth type biological treatment process where in, the majority of biological activity takes place on the surface of the PVC media. Continuous aeration ensures aerobic activity on the surface of the media. Micro – organisms attach themselves on the media & grow into dense films of a viscous jelly like nature. Waste water passes over this film with dissolved organics passing into the bio-film due to concentration gradients within the film. Suspended particles & colloid may get retained on this sticky surface where they are decomposed into soluble products. Oxygen from the aeration process in the waste water provides oxygen for the aerobic reactions at the bio-film surface. Waste products

from the metabolic processes diffuse outward & get carried away by the waste water or air currents through the voids of the media.

The aerated effluent passes into a tube deck settler for clarification. The theory of gravity tube settler system is that the carrier fluid maintains laminar flow in the settling media at specified maximum viscosity. These two parameters of a carrier fluid, flowing through a hydraulic configuration, will determine the velocity gradients of the flow, the height of boundary layer at the inclined surface and the residence time within the media.

The carrier fluid must be viscous Newtonian, exhibiting a Reynolds number of less than 1000 and preferably, a number under 400. The laminar flow, through the inclined tubes, will produce velocity gradients sufficiently large to form an adequate boundary layer, where the velocity of fluid approaches zero. Boundary layers are necessary in functioning tube settlers, to allow suspended solids to separate from the viscous carrier fluid. Under gravitational forces, they will settle to the hydraulic surface of the tube and subsequently from the clarifier media.

Since the tubes are inclined at 60 degrees, solids settled on the tubes are continually discharged down. This downward rolling action increases particle contact and hence further agglomeration, which increases the sludge settle ability. Studies show that these agglomerated sludge particles can have a settling rate in excess of ten times the settling rate of the individual floc particles in the influent. These heavy agglomerated masses quickly slide down the 60 degree inclined tube and settle at the bottom of the tank.

At the bottom of the Tube deck, where the sludge leaves the Tube surface, the larger agglomerated captures smaller particles in the upcoming stream. This solid contact phenomenon greatly enhances the capture efficiency.

Stages of Treatment: The treatment process consists of the following stages:

- Equalization
- Bio- Degradation
- Clarification & Settling
- Filtration

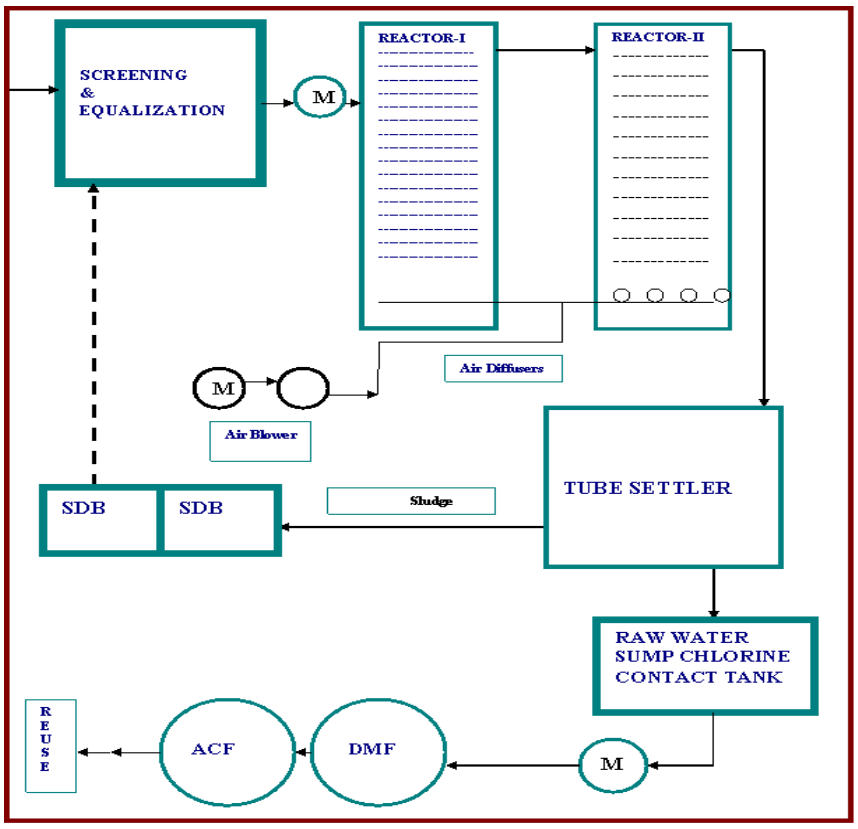

Figure 3: Schematic Diagram of STP

Sewer System

The alignment and slope of the sewer line will follow the road network, drains or natural ground surface and will be connected to the trunk sewers. The discharge point will be a treatment plant, a pumping station, a water course or an intercepting sewer. Pumping stations would be provided at places where the natural slope of the terrain is insufficient to permit gravity flow or the cost of excavation is uneconomical to do the same.

SOLID WASTE GENERATION

Solid waste would be generated both during the construction as well as during the operation phase. The solid waste expected to be generated during the construction phase will comprise of excavated materials, used bags, bricks, concrete, MS rods, tiles, wood etc. The following steps are proposed to be followed for the management of solid waste:

- Construction yards are proposed for storage of construction materials.
- The excavated material such as topsoil and stones will be stacked for reuse during later stages of construction.
- Excavated top soil will be stored in temporary constructed soil bank and will be reused for landscaping of the residential group housing project**.**
- Remaining soil shall be utilized for refilling / road work / rising of site level at locations/ selling to outside agency for construction of roads etc.

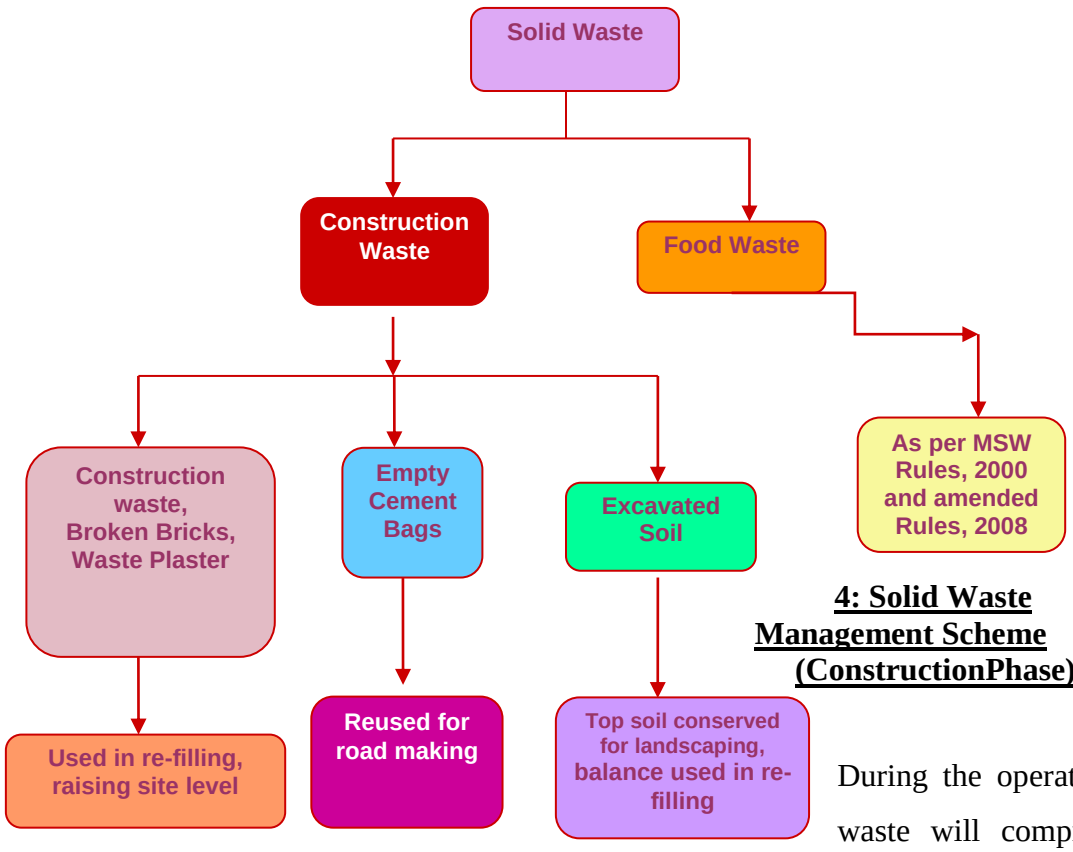

Figure 4: Solid Waste Management Scheme (ConstructionPhase)

During the operation phase, waste will comprise domestic as well as agricultural waste. The solid waste generated from the project shall be

mainly domestic waste and estimated quantity of the waste shall be approx. 390 kg per day (@ 0.5 kg per capita per day for residents, @ 0.15 kg per capita per day for the visitor, 0.25 kg per capita per day for the staff members and landscape wastes @ 15 kg/acre/day). Following arrangements will be made at the site in accordance to Municipal Solid Wastes (Management and Handling) Rules, 2000 and amended Rules, 2008.

Table 3: Calculation of Solid Waste Generation

S. No.	Category	kg per capita per day	Waste generated (kg/day)
1.	Residents	675@ 0.5 kg/day	337
2.	Staff	134@ 0.25 kg/day	34
3.	Visitors	68@ 0.15 kg/day	10
4.	Landscape waste	0.62 acre @ 15 kg/acre/day	9
	TOTAL SOLID WASTE GENERATED		**390 kg/day**

(Source: For Waste Collection, Chapter 3, Table 3.6, Page no. 49, Central Public Health & Environment Engineering Organization, Ministry of Urban Development, (Government of India, May 2000))

❖ **Collection and Segregation of waste**

1. A door to door collection system will be provided for collection of domestic waste in colored bins from household units.
2. The local vendors will be hired to provide separate colored bins for dry recyclables and Bio-Degradable waste.
3. Litter bin will also be provided in open areas like parks etc.

❖ **Treatment of waste**

- Bio-Degradable wastes

1. Bio-degradable waste will be subjected to organic waste convertor and the compost will be used as manure.
2. STP sludge is proposed to be used for horticultural purposes as manure.
3. Horticultural Waste is proposed to be composted and will be used for gardening purposes.

- Recyclable wastes

i. *Grass Recycling* – The cropped grass will be spread on the green area. It will act as manure after decomposition.

ii. Recyclable wastes like paper, plastic, metals etc. will be sold off to recyclables.

❖ **Disposal**

Recyclable and non-recyclable wastes will be disposed through Govt. approved agency. Hence, the Municipal Solid Waste Management will be conducted as per the guidelines of Municipal Solid Wastes (Management and Handling) Rules, 2000 and amended Rules, 2008. A Solid waste management Scheme is depicted in the following figure for the residential project.

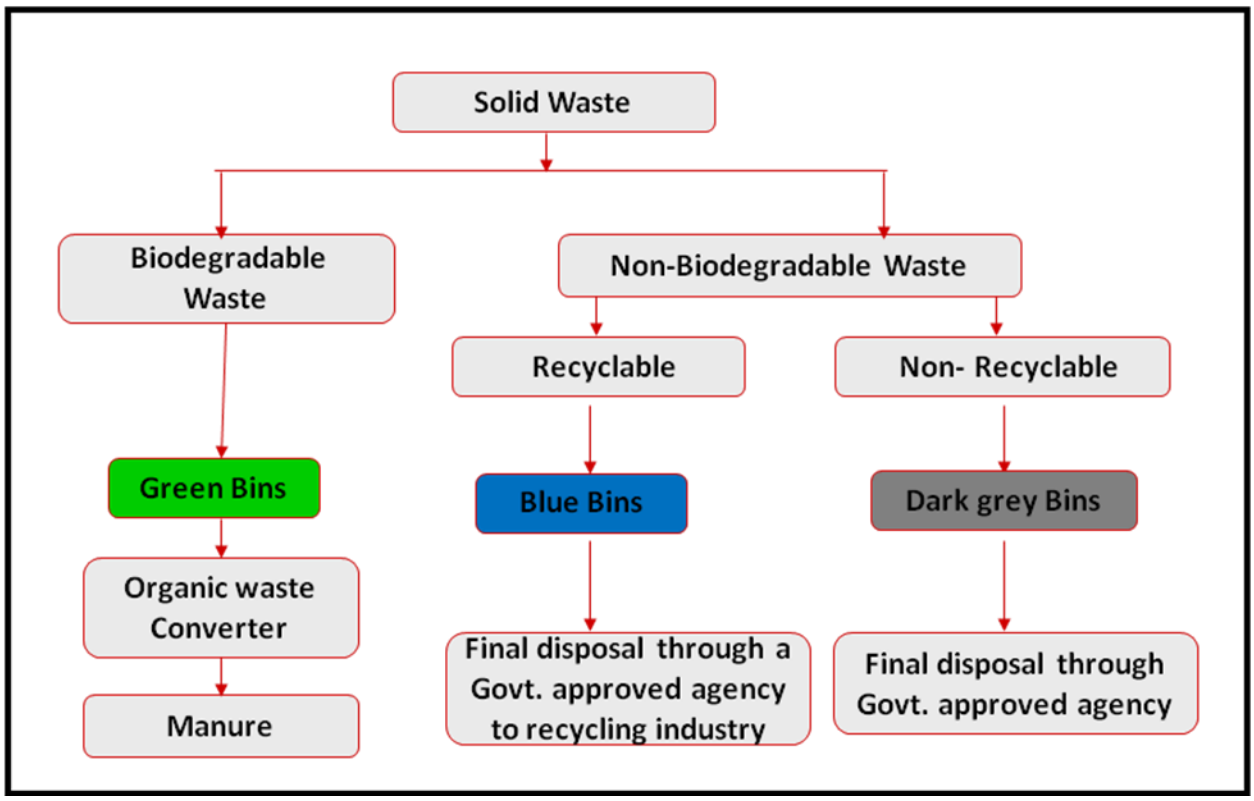

Figure 5: Solid Waste Management Scheme (Operation Phase)