

## **A Study on “Grey-water Management with special reference to Improved Waste Water Soak Pit Interventions in Meghalaya”**

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### **Abstract**

Article 47 and 48A highlights the duty of the State to improve the standard of living of the people and to protect and improve the environment. Sanitation has been a part of the national agenda since the First 5-year plan (1951-56). Under the aegis of Swachh Bharat Mission (Gramin), SBM(G) a number of interventions for solid and liquid waste management have been adopted and the assets (infrastructure) reported in Integrated Management Information Systems (IMIS). However, despite claims, the same is not reflected in usefulness and utility in all the Villages. Thus, while the intent of policy making for development programmes such as SBM (G) is to improve sanitation thereby improving the well being and quality of life of the people, it therefore begs an in-depth study on their implementation taking SBM (G) in Meghalaya as one case. The study can add towards improving the quality of functioning and implementation of State programmes so that the intent can be met and the targeted beneficiaries be reached out.

**Keywords:** Sanitation, SBM(G), Intervention, Development, Villages, Policy-making, Beneficiaries

### **Introduction**

Safe sanitation means promotion of safe disposal of human waste avoiding open defecation as well as effective management of solid and liquid waste. Poor sanitation is one of the primary causes of many deadly diseases, deaths among children under age 5(five), contamination of ground water sources, loss of family income on account of increased health costs, and compromised human dignity. Waste, if not properly managed, generates foul smell, breed flies and insects, contaminates water, generates carbon dioxide while burning and wastes valuable land area for dumping. Management of solid and liquid waste as such becomes a crucial component in each society.<sup>1</sup>

Sanitation is the basic need of human beings. Safe sanitation is not a borrowed modern concept from the West rather there are historical evidences in India’s ancient civilization regarding scientific methods used in toilet construction and waste management. But hundreds of years of servility took away the important value of Swachhata from India’s social system. This had severely affected the health and dignity of people in rural areas, especially of women and children. For last many decades, India took steps to improve access to safe sanitation and cleanliness. But even after 32 years of independence, the sanitation coverage was merely 2% in 1982. In 1986, a rural sanitation programme named Central Rural Sanitation Programme

(CRSP) was started. However, it primarily focuses mainly on toilet construction and related funds allocation, and there was no stress on behavior change. As a result, the supply based approach did not achieve desired results. Since then, sanitation programmes were restructured time and again under different initiatives, namely Total Sanitation Campaign in 1999, Nirmal Bharat Abhiyan in 2012 and currently the Swachh Bharat Mission (Gramin) with effect from 2nd October 2014.<sup>2</sup>

The basic aim under the above rural Sanitation programmes is 'to improve the overall quality of Life of the rural people through accessibility to safe sanitation'. To fulfill the desired objective, demand-driven and community led approaches are adopted under which the village community plays a proactive role in identifying and accessing critical issues and concerns regarding the sanitation status of the Village.

### **Environmental Sanitation**

Development also comes with the issue of rapid waste generation; the quantity of both solid and liquid waste is increasing day by day and when such wastes are disposed off in an un-controlled manner it can lead to adverse impact on public

health and environment. Hence, these wastes need to be managed efficiently so as to safeguard the sanitation aspect in households and communities and to sustain a healthy environment. To define, Solid and Liquid waste management is the collection, transportation, processing, recycling, treatment and disposal of waste materials.

In order to improve the quality of life in the rural areas, the importance of environmental sanitation needs to be stressed and improved. Both solid and liquid waste management (SLWM) comes under environmental sanitation. Solid and Liquid Waste Management is a key component of any sanitation initiative which in India is emphasized and focused in the flagship programme of SBM(G).

### **Swachh Bharat Mission (Gramin) in Meghalaya**

The objective of 'safe sanitation for all' under the Swachh Bharat Mission (Gramin) is enforced with the mission-mode strategy of creation of Open Defecation Free (ODF) Villages. And through concerted efforts from all Stakeholders, Meghalaya has managed to attain ODF status by becoming the 11th ODF State in the Country w.e.f. 31st January, 2018 much ahead of the Nation's target which is 2nd October, 2019.

**Table 1.0 Abstract of ODF Achievement in Meghalaya in Different Components in 2014**

<b>Sl No</b>	<b>Indicators</b>	<b>Target as per BLS 2012</b>	<b>Coverage</b>	<b>Achievement (in %)</b>
	Nos of ODF Villages	6028	6028	100
	Construction of IHHLs	4,42,833	4,42,833	100
	Construction of CSCs	403	250	62.03
	Construction of School Toilets	8037	8037	100
	Construction of Anganwadi Toilets	646	646	100

## Beyond ODF

With the attainment of ODF Status, Meghalaya had set a new target under SBMG 2.0 towards converting all ODF villages into ODF Plus Villages.

‘An ODF Plus Village is a Village that sustains its ODF Status and has arrangements for the managing Solid and Liquid waste’.

## Solid & Liquid Waste Management

Under the Solid and Liquid Waste management initiatives, while focusing on the construction of assets there is a healthy promotion and encouragement of positive and correct attitude among the general masses towards management of waste. A number of creative sustainable waste management models have been adopted by Villages for which awards and titles have been conferred.

The objective of rural solid waste management is to collect waste at source, recovery of recyclable materials for recycling, conversion of organic waste to compost and secure disposal of remaining waste.

For management of household biodegradable waste, a dual chamber heap composting tank may be used for production of organic compost. The method involves scientific

process of aerobic decomposition. Segregated non-biodegradable solid waste on the other hand can be packed and stored for collection by waste collectors for recycling, shredding and otherwise.

Disposal of waste water is a major issue both in rural and urban areas. Stagnant waste water smell bad and also acts as breeding place for mosquitoes resulting in the spread of diseases like dengue, malaria, filarial, etc. Developing methods for re-using, re-cycling or proper disposal of waste water as such becomes highly important.

## Grey Water Management

A study on Grey water claimed that about 70% of daily water used in our domestic homes is just being wasted. This domestic waste water is let off into open drains untreated and finally reaches water bodies contaminating them with high nutrient content.

Grey water is waste water from bathroom, washing clothes and kitchen. Depending on its use, the water may require less treatment and generally contains less pathogen. It is always benevolent to manage domestic grey water generated from each household in the area or land surrounding the house. There are a number of technological options suitable for the treatment of domestic grey water.



Dual Chamber Home Composting Unit



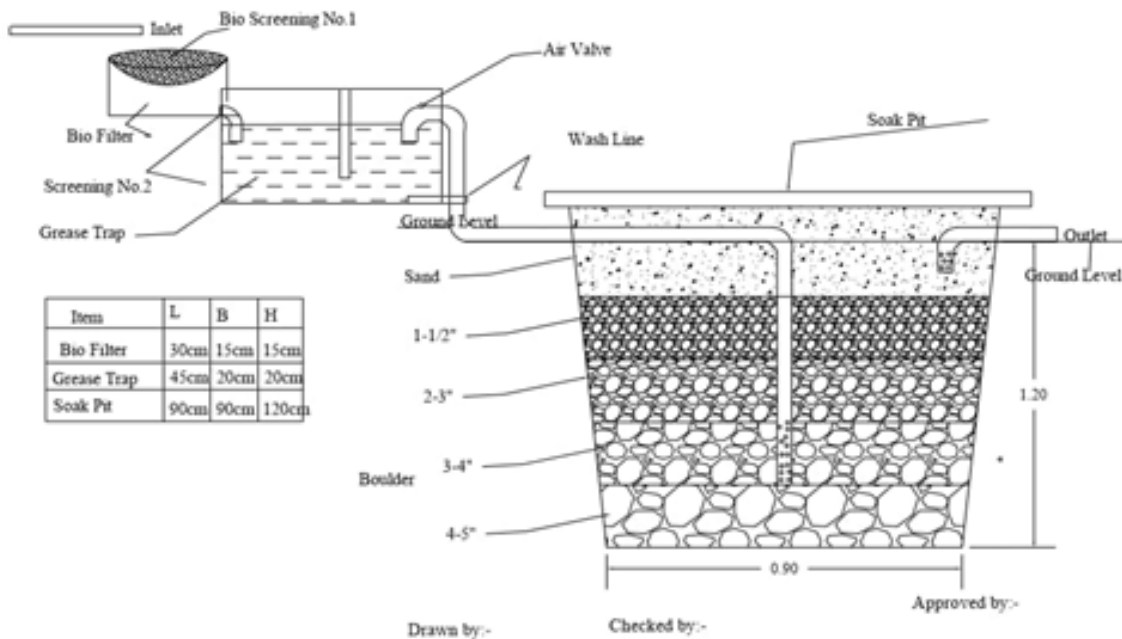
Pynursla C & RD Block, East Khasi Hills

- a) Kitchen Garden with pipe root zone system
- b) Kitchen garden without pipe root zone system
- c) Leech pit
- d) Soak pit

**Improved Waste Water Soak pit**

For safe disposal of grey water, the ‘improved waste water soak pit’ employs a scientific process

utilizing the physical properties of floatation of oil and soil infiltration of water. It is a combination arrangement having a Bio-Filter, Oil Trap and the conventional Soak pit as its components. One such intervention was the use of a Domestic Soak pit for safe disposal of kitchen waste water. These components are arranged in such a way to optimize the performance of the Soak pit.



Drawn by:- Junior Engineer, (PHE) R.W.S. Sub-Division Mawkkyrwat  
 Checked by:- Sub-Divisional Officer, (PHE) & District Co-ordinator DSBM Mawkkyrwat  
 Approved by:- Executive Engineer, (PHE) Cum-Member Secretary DSBM Mawkkyrwat  
 Deputy Commissioner Cum-Chairman DSBM Mawkkyrwat



Kitchen Waste Water Soak Pit with Bio-Filter & Oil Trap Dymmiew & Massar Village, Pynursla C&RD Block, EKH

**a) Bio-Filter**

Headers	Particulars
Utility	: <i>A simplified arrangement for removing grit particles from Grey water.</i>
Application	: <i>Used as an additional screen for removing left over solid food particles present in grey water especially kitchen waste water.</i>
Features	: <i>The grit free can be further treated and the retained solids can be used back as manure by application to soils.</i>
Advantage	: <i>It is low cost, low maintenance, user-friendly and eco-friendly</i>
Materials Reqd	: <i>Square or Rectangular plastic net having small pores so as to be able to trap the solid impurities; Bio-mass wastes like bettle-nut husk, peelings or grass cuttings, etc.</i>

**Description:**

The waste water bio-filter is a screen used in addition to the normal sink washer usually present in the utensils washing platform or basin. It is usually placed outside the house near the waste water outlet. It is a simple perforated plastic basket that helps to trap solid particles that may escape from the washing platform allowing only the grit free waste water to flow into the Oil Trap.

To further improve the functioning of the Bio-filter, another filter media is incorporated usually of bio-mass materials which can be grass cuttings, leaves, bettle-nut husk or any other material of coarse nature. The filter media helps in better trapping the solid impurities besides reducing the fat and grease from sticking into the Filter. For maintenance purposes, the bio-filter can be easily cleaned on a regular basis by simply removing it and emptying the bio-mass filter at the roots of trees, vegetables, shrubs or at any point in the garden, following which fresh bio-mass is again fed into the Bio-Filter.

**b) Oil Trap**

Headers	Particulars
Application	: <i>Used by households for safe disposal of kitchen waste water</i>
Process	: <i>A simple process based on the floatation property of oils when mixed with water by which it does not get mixed with water and remains on top of the water level thereby enabling easy removal of it from kitchen wastewater.</i>
Utility	: <i>Oil Trap can be effectively applied in any kitchen waste water disposal system for removing the fat, oil and grease (FOG) content in the wastewater before its discharge in drains or prior to any further treatment of it for recycling and reuse.</i>

**Description:**

An Oil Trap is a single or dual chamber container usually fitted in the line of flow of the wastewater immediately after the discharge outlet from the house. It has an inlet for the influent wastewater at one end of the container and the outlet for the effluent at the other end. A dual chamber grease trap has a partition wall at the middle of the container that has an opening at the bottom of the wall which serves

as a connecting provision between the chambers. Besides, tee - connectors is fitted at both the inlet and outlet of the grease trap.

### How it works:

The Oil Trap is the preliminary and vital component of any wastewater treatment or disposal system. It is designed to remove 100% fats, oil and grease content from the wastewater before discharging it in existing sewer or prior to any further treatment. When the wastewater mixed with oils, fats and grease from the kitchen enters the grease trap, the wastewater settles in the tank for some time during which the solid particles if any, settles down at the bottom of the container and the fats, oils and grease rise up through the water medium and floats as scum forming the top layer of the wastewater in the container. The grease trap is of the suitable size to allow the wastewater to settle in the tank for about 3 to 5 minutes after which it comes out of the container through the tee connector fitted at the outlet. The tee connector by virtue of its design retains the scum layer of fats, oils and grease in the container while allowing only the wastewater to flow out of it. In a dual chamber grease trap, the partition wall screens all the fats, oils and grease and retains them in the first chamber thereby reducing the accumulation of them in the second chamber. Whatever fats, oils and grease is floating in the second chamber are further screened by the tee connector at the outlet thereby increasing the efficiency of the Oil trap.

### Design & Specification:

Construction of an Oil trap is very flexible provided it meets the requirements of accumulation of fats, oils and grease. Its size depends on the number of persons in the households or on the amount of water used by the household daily. In general, the following dimensions may be adopted for a family of 5 persons discharging approximately 100 litres of wastewater daily:

Dimensions of a Oil Trap	Inner Dimensions		Size of connecting pipes	
	Length	2 feet	Inlet	40 mm
	Width	1 foot	outlet	40mm
	Height	1.5 feet	Connecting Tees	40mm

### Costing:

An Oil trap is a simple mechanism that can be constructed at a very minimum expense. The cost estimates for the above dimensions is given below:

Sl.Nos	Items	Particulars (Approx Rate as of 2017-18 in Meghalaya)	Amount
1	Red Bricks	70 nos @Rs. 10/-	Rs. 700/-
2	Coarse Sand	2 bags @ Rs. 50/-	Rs. 100/-
3	Fine Sand	1 bag @ Rs. 50/-	Rs. 100/-
4	Stone Chips	1 bag @ Rs. 100/-	Rs. 100/-

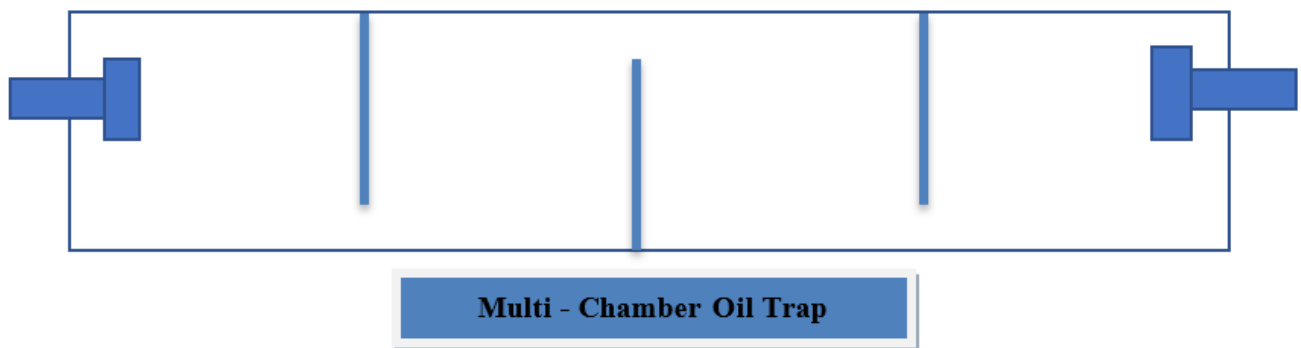
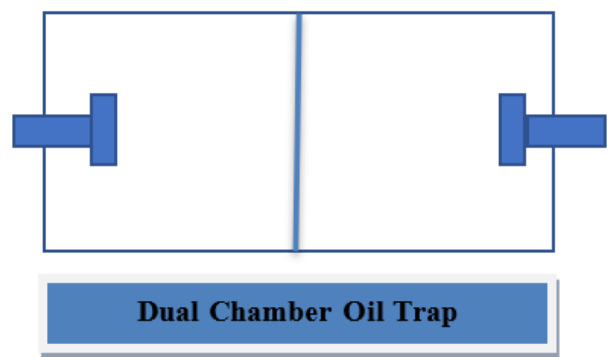
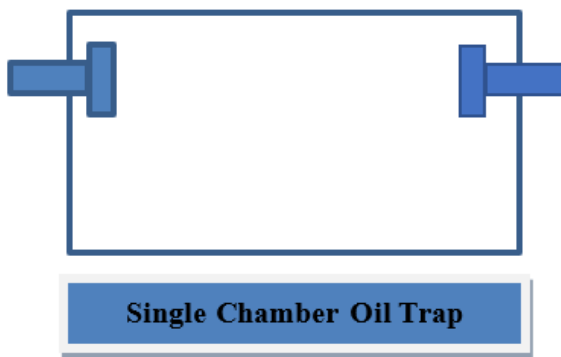
5	Cement	1 bag @Rs. 375/-	Rs. 400/-
6	PVC Tee	2 nos @Rs. 80/-	Rs. 160/-
7	PVC Pipe	1 no @ Rs. 240/-	Rs. 240/-
8	Labour	lumpsum	Rs. 1000/-
<b>Total</b>			<b>Rs. 2800/-</b>

**Need of Oil Trap:**

For any domestic cooking, the use of fats, oils and grease is unavoidable. These will be washed out along with wash water during cleaning of utensils which sometimes contains leftover eaten foods. They ultimately are carried along with the wastewater to the drains that finally reaches the water bodies affecting the water bodies by depleting the oxygen content of the water thereby rendering the value of water to the minimum and affects the aquatic life.

**Multiple options of Oil Traps:**

The following are the schematic drawings of multiple options for an Oil trap that can be constructed by households based on their suitability considering the cost, space availability and nature of the wastewater.



### c) Soak Pit

A Soak pit is a facility constructed in the drainage line of households for purpose of safe disposal of kitchen wastewater by utilizing the soil infiltration property of water.

Discharged kitchen waste water from households is made to pass through the Bio-filter and Oil Trap, following which it is allowed to flow in to the Soak pit which is a dug-out pit in the ground filled with layers of soling stones and gravel.

Waste water which has been discharged into the soak pit will percolate into the soil passing through the different layers of sand, stones and gravel which in turn act as filtering media for the waste water and rendering it clean by natural filtering. This mildly clean water will finally reach the aquifers, recharging them and ultimately may feed the otherwise dried-up springs and wells.

The Soak pit is also incorporated with an outlet which serves as an overflow valve in case of slow percolation of the soil. The overflow water would have been treated to the desired level to allow it to be discharged into the existing Sewer/ Drainage system.

#### How to construct the Soakpit :

1. Dig out a pit near the kitchen of 3ftx 3ftwidth x depth.
2. Fill the bottom of the pit upto a layer of 10 inches with stones of 4/5 inches size.
3. Insert a PVC pipe of 2 inches diameter upto the top of the first layer of stones filling.
4. On top of the above layer, fill another 10 inches layer with stones of 3/4 inches size.
5. Then repeat another 10 inches with stones of 2-3 inches size.
6. Lay about 10 inches of gravels on top of the last layer of stone filling.
7. Top the gravel layer with sand.
8. Finally cover the pit with gunny bags/sacks/ soil.
9. Apply stone leveling on the top of the filled pit if necessary.
10. Connect the drainage pipe from the house to the PVC pipe which is already inserted in the soak pit and allow the wastewater to flow freely in to the pit.

#### Summary

Therefore, the ‘improved waste water soak pit’ is an integrated system that incorporates the multiple functioning of the above three components viz Bio-filter, Oil Trap and Soak pit to dispose Grey water.

A Planted Filter may also be used to dispose-off safely the waste water using certain aquatic plants that absorbs the nutrients from the waste water thereby rendering it safe enough for discharge in open drains. (However, this option is still being done on a trail-basis in a few households for which desired results are awaiting)

The improved waste water soak pit is comparatively better in performance than the ordinary Soak pit in terms of the following:

- a) It is economically friendly involving only low cost for construction
- b) It is easy to built as it is technologically simple
- c) It can be easily maintained by households
- d) It provides for removal of grit and oil from waste water
- e) It avoids contamination of Grey water



- f) It avoids sealing of percolation of water in to the soil
- g) It avoids water stagnation over-ground thereby eliminating foul odour and breeding of flies thereby helps curbing spread of diseases.
- h) It improves aesthetics of the household making it drain-free.
- i) It greatly enhances the performances of the soak pit and also increases its life.
- j) It helps in ground water recharge.

The technology is simple, eco-friendly and cost-friendly; it can be easily constructed and maintained by households. However, an in-depth research can be done to improve its utility in diverse terrains.<sup>3</sup>

#### **Field Study (Conducted on March 2022)**

##### **A. Pomlaheir Village, Mawryngkneng C&RD Block, East Khasi Hills District, Meghalaya**

Located in Mawryngkneng C&RD Block at 35 Kms from the Capital City of Shillong lies Pomlaheir village. It comprises of 230 Households, 1(one) LP/UP School, 1(one) Secondary School and 1(one) Anganwadi Centre. The main livelihood of the people in the villages is farming and marketing.

It is a model village for sustainable waste management with special reference on community involvement. Under the abled and dedicated leadership of the Village headman and with the incentives provided under SBM(G), each household constructed the improved waste water soak pit.

##### **B. Laitmysaw Village, Myllem C&RD Block, East Khasi Hills District, Meghalaya**

Situated close to the District headquarters at about 12 Kms from Shillong, it is predominantly a farming community. While the SLWM sanction

had been allocated only to a few households, the Village community realizing the efficiency and effectiveness of incorporating improved waste water soak pit, passed a GP resolution making it mandatory for each household to have waste water soak pit connection. Besides grey water management, the village also has effective solid waste management practices in each household and at community level.

The practices are coordinated in such a way that it complements the existing activities undertaken by the Village so that sustainability is taken care of. It has exhibited models of sustainability in exemplary ways which makes it an ideal role model for sustainable waste management which others can emulate. The Village became one of the focal point of visits from District, State and National level Officials and Tourists which saw visits by esteemed persons like the Chief Minister of the State, Shri Conrad Sangma, Addl. Secretary, Ministry of Jal Shakti, Shri Arun Baroka, Minister of State MoS, Ministry of Jal Shakti, Shri Prahlad Singh Patel and others.

#### **Indicators based upon the Study:**

The study was based upon general observation of the sanitation status in the Households, Schools, Public places & Institutions in the Villages. Discussions and informal interviews were also conducted with key sanitation leaders in the above villages namely the Headmen and the Village Water and Sanitation Committee Members.

The study sheds light on the community engagement towards improved waste management; and the benefits the villages reap by willingly accepting and participating with Swachh Bharat Mission Gramin in SLWM implementation, for which the following key indicators may be noted:

- i. There is minimal stagnant of waste water.

- ii. Spreading of flies is curtailed as possibilities of breeding of flies are prevented with the elimination of drains.
- iii. Fresh air blows through the village as the usual foul smell due to drains is no longer present.
- iv. The look of the household courtyard as well as the Village aesthetics are enhanced
- v. Enhanced soil moisture and subsequent recharging of ground water due to soil infiltration of waste water through massive use of soak pits which resulted in reviving of a number of springs and streams.



### Why an in-depth in the area is necessary?

With the intent of improving the standard of living of the people through development programmes and mission like SBM(G) in terms of sanitation attitudes and assets, the working and functioning of the improved waste water Soak pit based upon the study conducted in the aforementioned villages can be adopted. However, a more detailed study and research can be done so as to improve its applicability across diverse geographical terrains because the same technological intervention that is applicable in

certain geographical terrains is not applicable in other areas.

For example, Wahrew Village, Pynursla C&RD Block in East Khasi Hills as against Sarikhusi Village, Umling Block, Ri Bhoi District.

### **Conclusion**

The improved waste water soak pit contributes as one method for sustainable grey water management. However, the mere creation of assets in households will not automatically translate in to the desired changes in our approach and our relationship with the environment. It can be attained only when such innovative activities were employed at multiple levels to foster an enabling environment for an effective and informed community engagement to achieve a clean and healthy environment.

Besides, the aforementioned interventions, the main thrust is on promotion, facilitation and inculcation of right attitude and practices towards health and hygiene through positive behavior change.<sup>4</sup>

After-all, Development requires the removal of major sources of un freedom: poverty as well

as tyranny, poor economic opportunities as well as systematic social deprivation, neglect of public facilities as well as intolerance. If development is what development advances, then there is a major argument for concentrating on that overarching objective, rather than on some particular means, or some special chosen list of instruments. Viewing development in terms of expanding substantive freedoms directs attention to the ends that make development important, rather than merely to some of the means that, inter alia, play a prominent part in the process.

*‘Development and freedom can only come if there is a healthy balance between the environment and human activities.’<sup>5</sup>*

All the above points to the fact that in order to have a healthy sustainable human-environment relation we must have favorable and flexible balance between policies targeting innovative interventions which is in need at the local level.

*As Margaret Mead stated “We won’t have a society if we destroy the environment”*

### **Endnotes:**

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<sup>2</sup>Ministry of Jal Shakti, Department of Drinking Water and Sanitation, 2020 May, Swachh Bharat Mission Grameen: Phase II operational guidelines. p.14-15

<sup>3</sup>Public Health Engineering Department, Swachh Bharat Mission Gramin Meghalaya Shillong, Meghalaya, A decade of change: An overview of rural sanitation in Meghalaya 2008-2018, p.8

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<sup>5</sup>Ministry of Jal Shakti, Department of Drinking Water and Sanitation, 2021 June, Manual: Biodegradable Waste Management, p.1-3

<sup>6</sup>Ministry of Jal Shakti, Department of Drinking Water and Sanitation, 2021 June, Manual: Grey water management, p.8-10

<sup>7</sup>Overview of Rural Sanitation in Meghalaya under Swachh Bharat Mission(Gramin), Public Health Engineering Department

<sup>8</sup>Report on Implementation of Solid and Liquid wastes management in Meghalaya under SBM(G)

<sup>9</sup>Success Stories from Meghalaya on People's Efforts to bring about Cleanliness in their Villages under SBM(G) Implementation, Public Health Engineering Department, Meghalaya

<sup>10</sup>Ministry of Jal Shakti, Department of Drinking Water and Sanitation, 2021 June, Manual: IEC for ODF Plus

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