Options for managing the grey water to ensure safe water sources

Swati Bhatia

Deputy Programme Manager

Water Programme

Centre for Science and Environment

What do we try to understand today?

- What is greywater?
- Grey Water and Source Sustainability?
- What is missing ?
- What should be done?

Wastewater at HH

Urine = 1-2 liters/person/day

Faeces = 150-300 grams/person/day

60-70% of total per capita water consumption

Blackwater/Toilet wastewater

Greywater (Kitchen, Bathroom, Laundry)

Flush water = 10-25 liters/person/day

What is Greywater?

Wastewater from

is called greywater

How much greywater is produced?

Fresh water
100 Liters per day

Greywater
60-70 Liters per day

It is estimated that rural India generates about
15,000 to 18,000 Million Liters of greywater per day

Characterization of wastewater

Sr. no	Parameter	Values*				
		Grey water (GW)	Black water (BW)	Septic tank effluent (only BW)	Septic tank effluent and greywater	Sewage water **
1	BOD (mg/l)	100-300	600-1000	300-600	150-400	250-400
2	COD (mg/l)	200-500	1000-200	600-1000	300-600	500-800
3	TSS (mg/l)	100-300	800-1200	300-500	150-350	600-1000
4	Faecal coliforms (MPN/100ml)	10^2-10^3	10^6-10^7	10^5-10^6	10^4-10^5	10^5-10^7
5	Total coliforms (MPN/100ml)	10^2-10^3	10^7-10^7	10^6-10^7	10^5-10^6	10^5-10^7

* Values mentioned above are from wide range of literatures. Therefore it is recommended to test the samples before selection and design of treatment plant

** Sewage is the wastewater flowing in the sewers. The major sources are residential, commercial establishments

Where does the greywater go?

In rural areas, structured arrangement for the collection and treatment of wastewater is rarely found.

Consequences

- Unpleasant and dirty surroundings
- Mosquito / vector breeding and subsequent health implications
- Contamination and pollution of water bodies
- Loss of precious natural resource

Indiscriminate disposal in the open

Surface drainage system

Polluted water sources

Consequences

- Contamination of drinking water supplies and waterbody degradation
- What remains unseen- groundwater pollution

Liquid Waste in Rural Areas

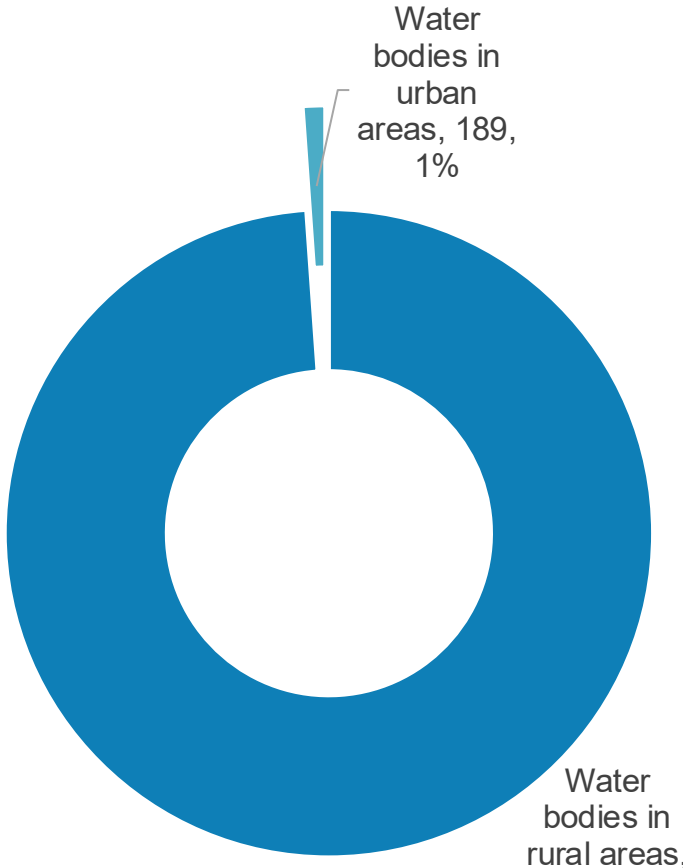
It also contains

- Animal/cattle Waste
- Leakages or improper containment systems- black water mixed with grey water.

- Increasing use of agricultural pesticides.
- Increasing use of soaps and detergents.
- Increasing usage of Pharmaceutical products and cosmetics

- Increase in usage of plastics

Findings of the water census



20 percent into disuse due to pollution or neglect

Also-99 percent of the problem and the solution lies here

If polluted- brings consequences

Affects rural health, increased costs, bad surroundings, restored waterbodies return back to as usual.

What challenges do you face in managing the grey water?

Key challenges

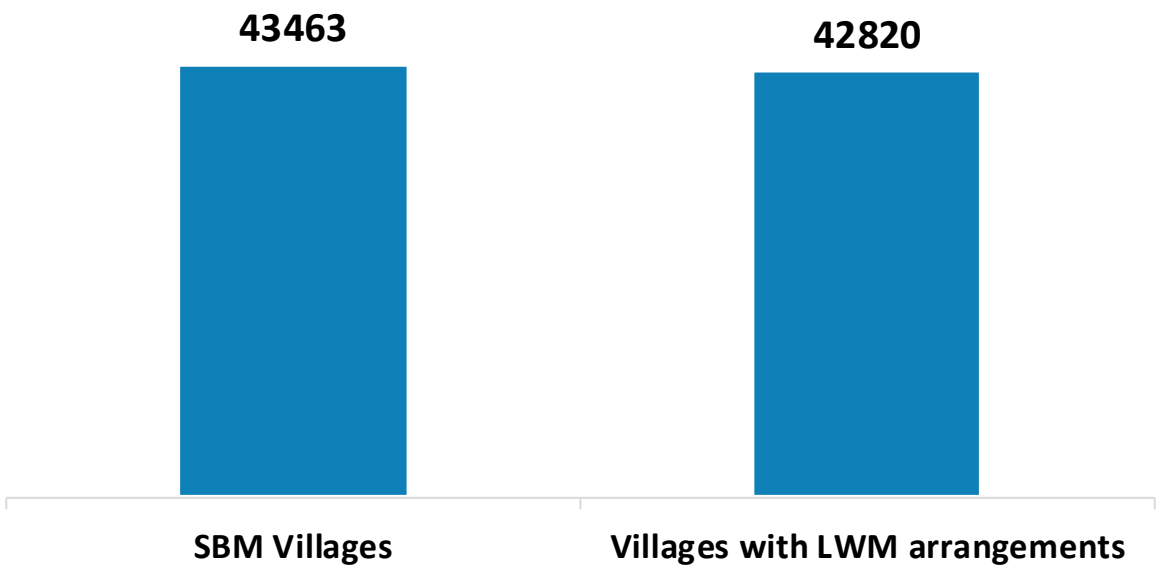
Lack of funds to construct HH level management systems

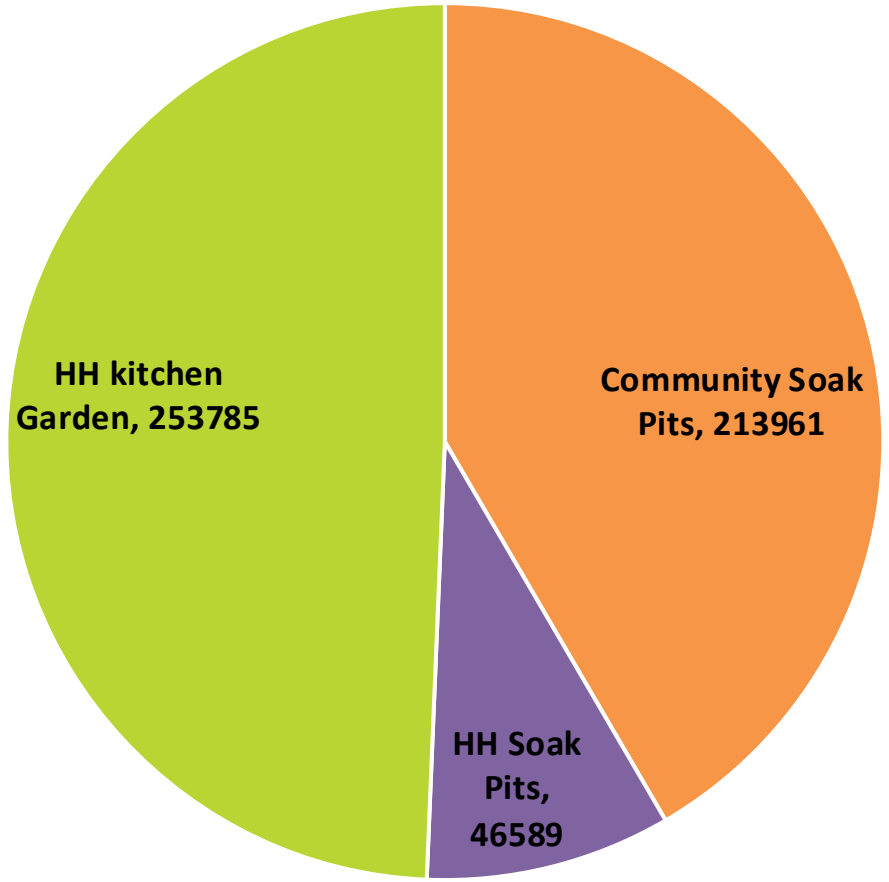
Lack of technical know-how of open drains

Inadequate solid waste management
In adequate sanitation system

Lack of adequate O&M of village level treatment systems

SBM-G dashboard-Rajasthan



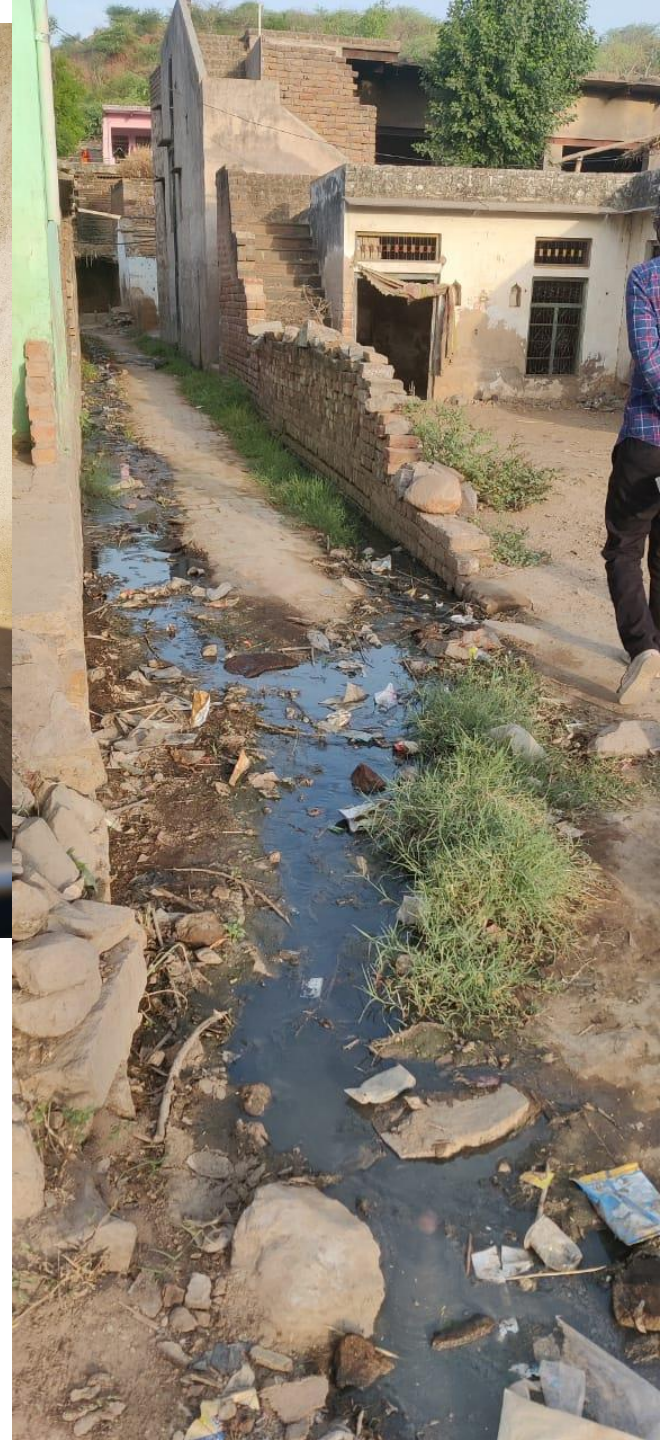


Village-Block	Structures
Basant- Sumerpur	1 Community Soak Pit, 1 HH soak pit, 2 drainage locations
Khetarli-Bali	3 Community Soak Pit, 2 HH soak pit, 5 drainage locations
Nawagura-Balrai-Rani	4 Community Soak Pit, 2 drainage locations

- CSE observations from Pali and Alwar Survey- Improper drains and Soak pits wrongly tagged.
- Soak pits available-improper design

Is it enough? **Is it needed?**

Findings from Pali and Alwar



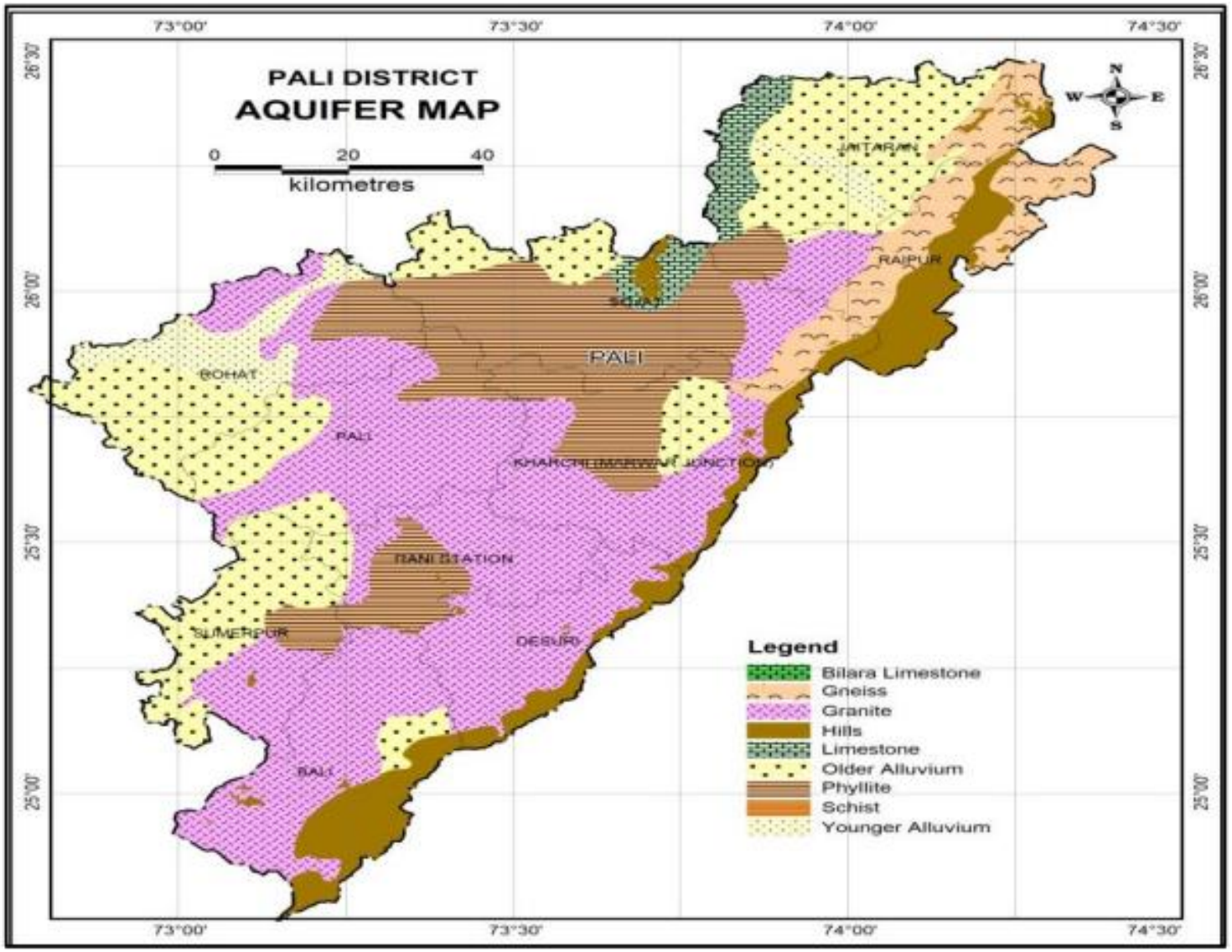
Present path being followed

- Choices- not considering climate change, groundwater and soil
- Random adoption of technology/soak pits
- Improper design of drains
- No treatment – open dumping
- Lack of awareness on community practices
- Lack of awareness generation on greywater management
- Focus on solid waste

Factors which govern the greywater production

- Number of People → More population larger the quantums produced
- Quality & Quantity → More Water-Easily available and good quality -more usage
- Cost of Water → Free Water-more usage → These would also govern the management and choices for management of greywater
- Lifestyle/storage/ consumption → Near urban areas or in interiors- different consumption patterns
- Climate/Weather → More rain-less consumption Summers –more consumption basis availability

Understanding the soils and choice of solution



Stable soil → Soak Pits ← High Permeability

Choice of solution based on

- **Water filtration capacity-** Sand has highest, followed by loam
- Groundwater
- Cost of solution adopted
- Community acceptance and need

Choice of Solution

Choices based on needs and community acceptance- not always costly or needed if quantum's are low

Grey water management interventions

Greywater Management

Household

Community level

Cluster of houses – community leach pits

Conveyance – closed drains/small bore systems

Village level – WSP/CW/DEWATS/SBT/phytorid/others

"Nahani trap (Floor trap)" *must be installed at the household level for proper functioning of greywater management interventions*

Treatment technologies

Point of generation- Household level	• Kitchen gardens • Soak pits • Leach pits • Magic pits
Intermediate- along the flow	• Community/Street/Ward level soak pits • Settler + Constructed wetland • Any other simple method-Primary + Secondary treatment

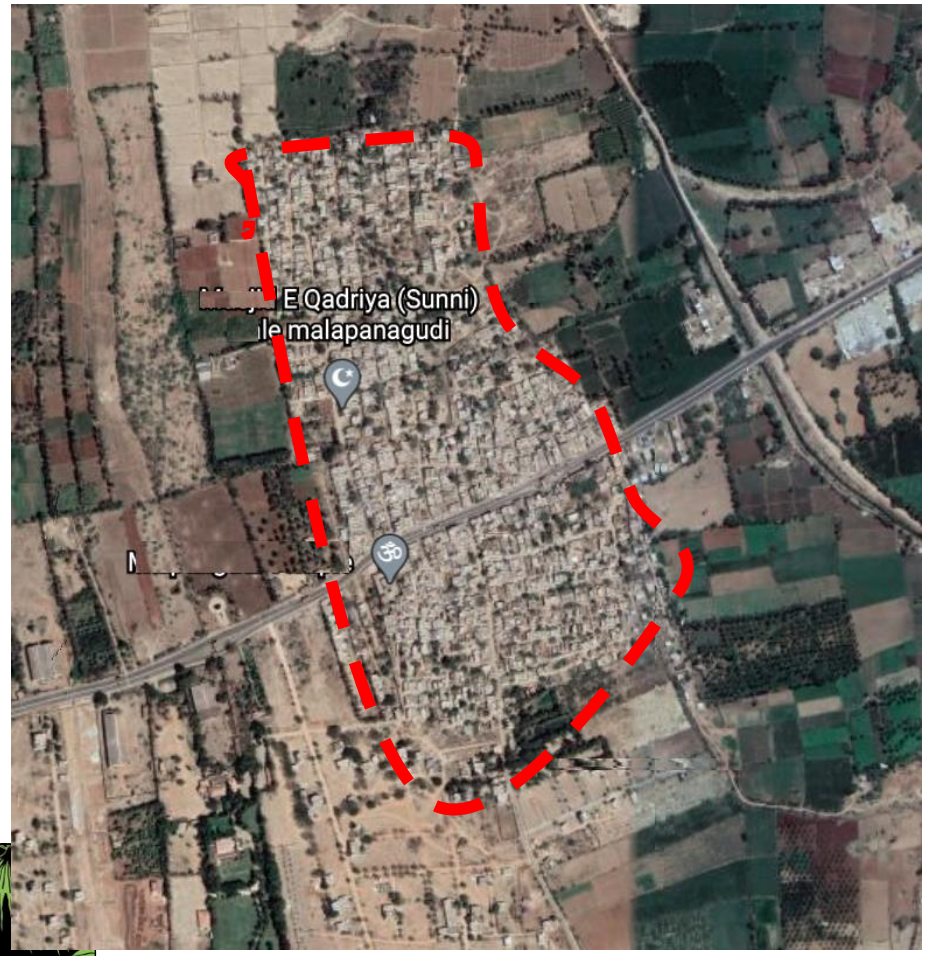
End point- Centralized	• At the outfall location
	• Mouth of the water body, if any
	  • Settler + Constructed wetland
	  • Waste stabilization ponds
	  • DEWATS/Phytorid or any other option

Key points to consider while planning greywater treatment systems

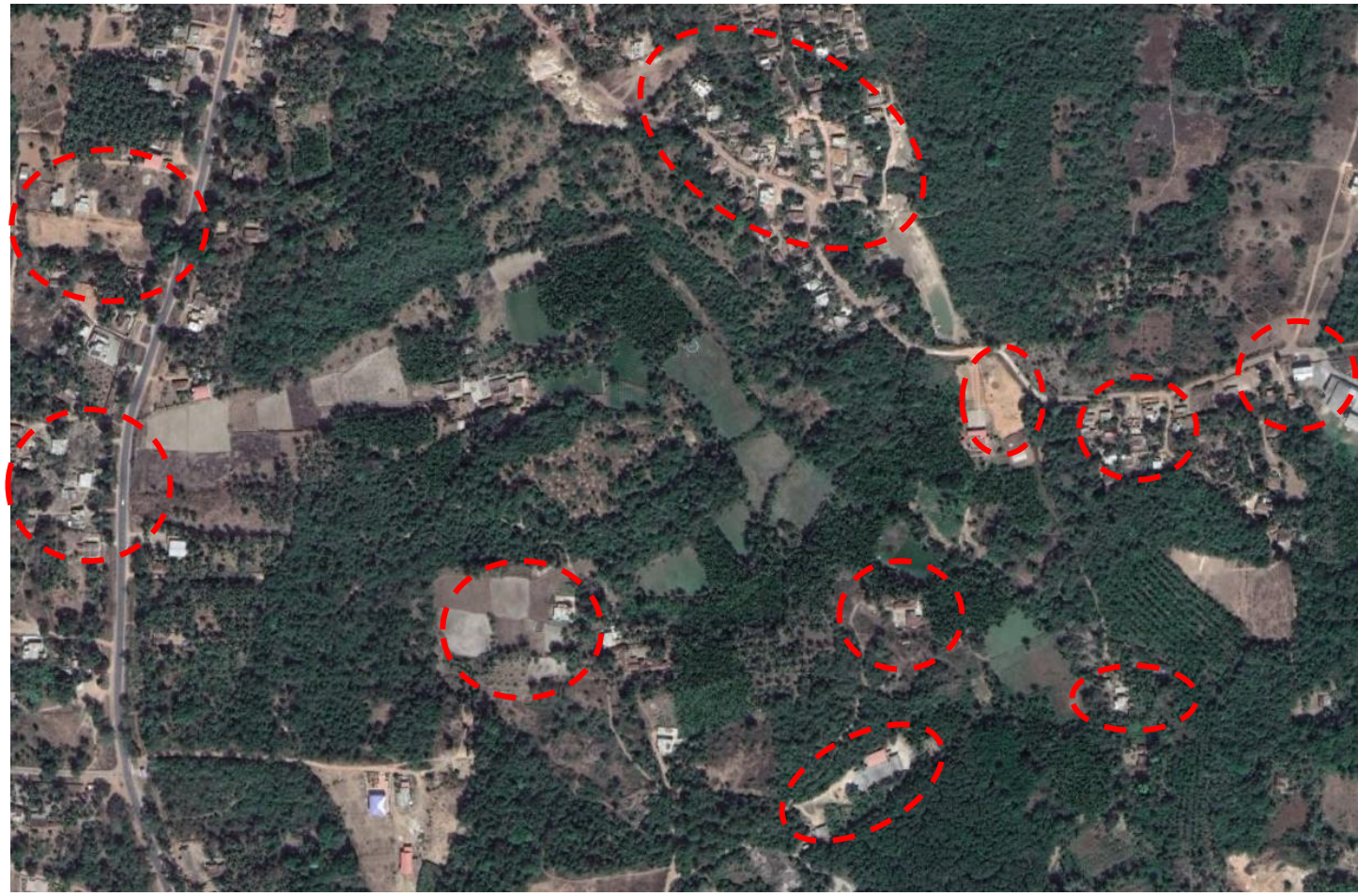
Scale	Typology/ Context	Planning aspects	Management
• Population of the planning area • Per capita water supply • Quantity of greywater generated- general lifestyle/usage	• Hilly/low-lying or plain terrain • Groundwater table • Soil characteristics	• Density/ Sparsity of development • Level of treatment required • Re-use options – Agri/farming or other uses • Environmental/ Regulatory impact if any of the chosen method of management	• Operation & Maintenance requirements • Management arrangements • Financial capacity of the GP

Density of villages

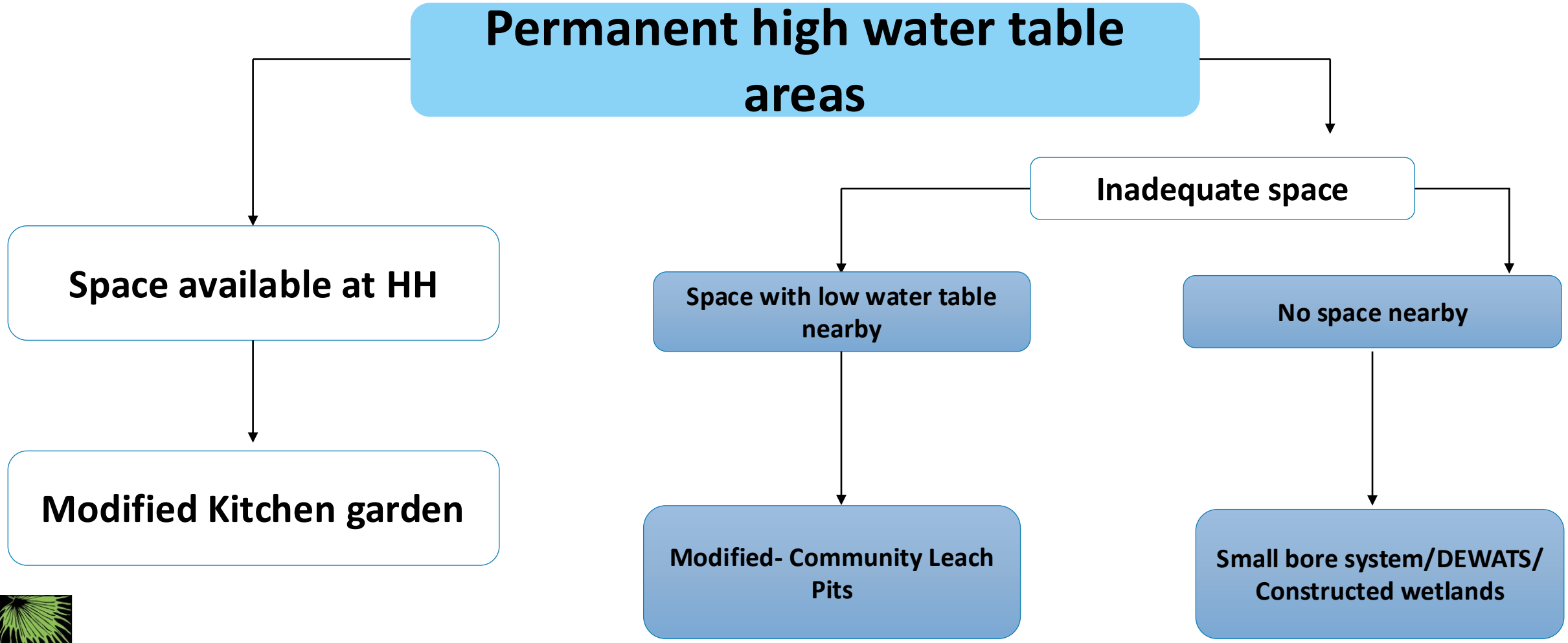
Dense areas



Cluttered areas

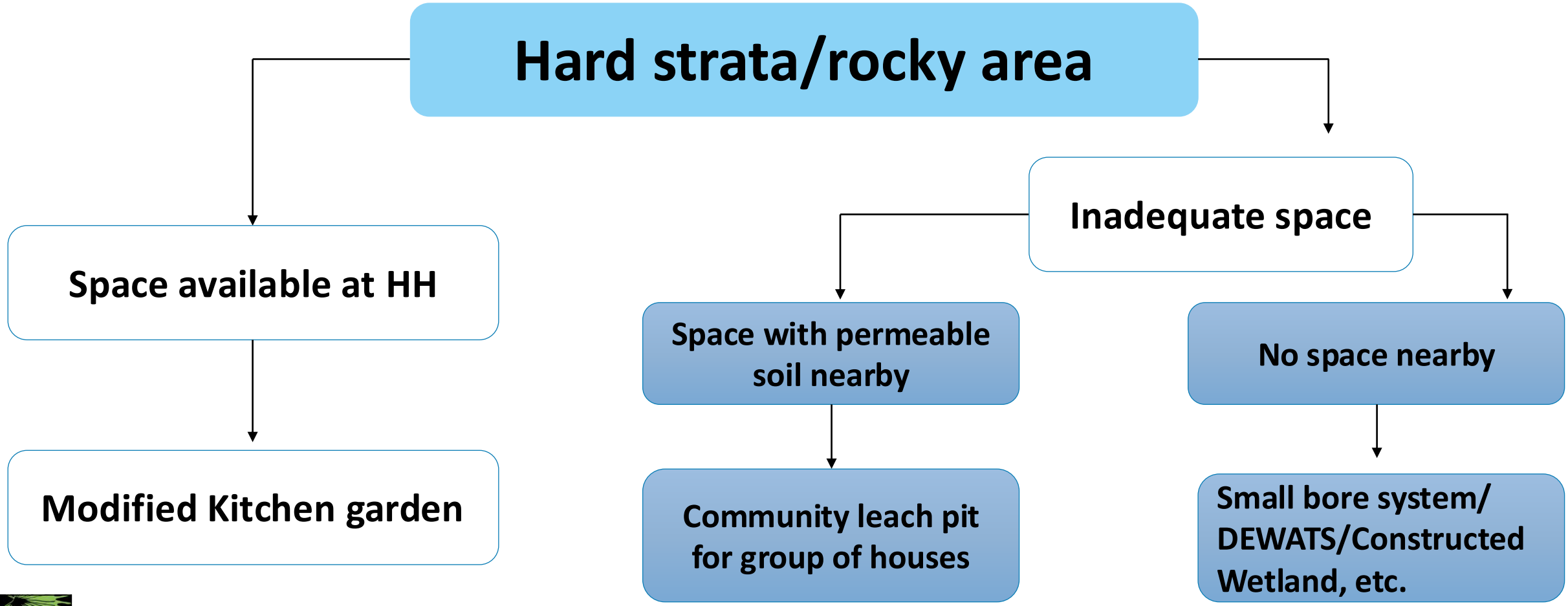


Areas with seasonal or high water table/flood prone/waterlogged areas



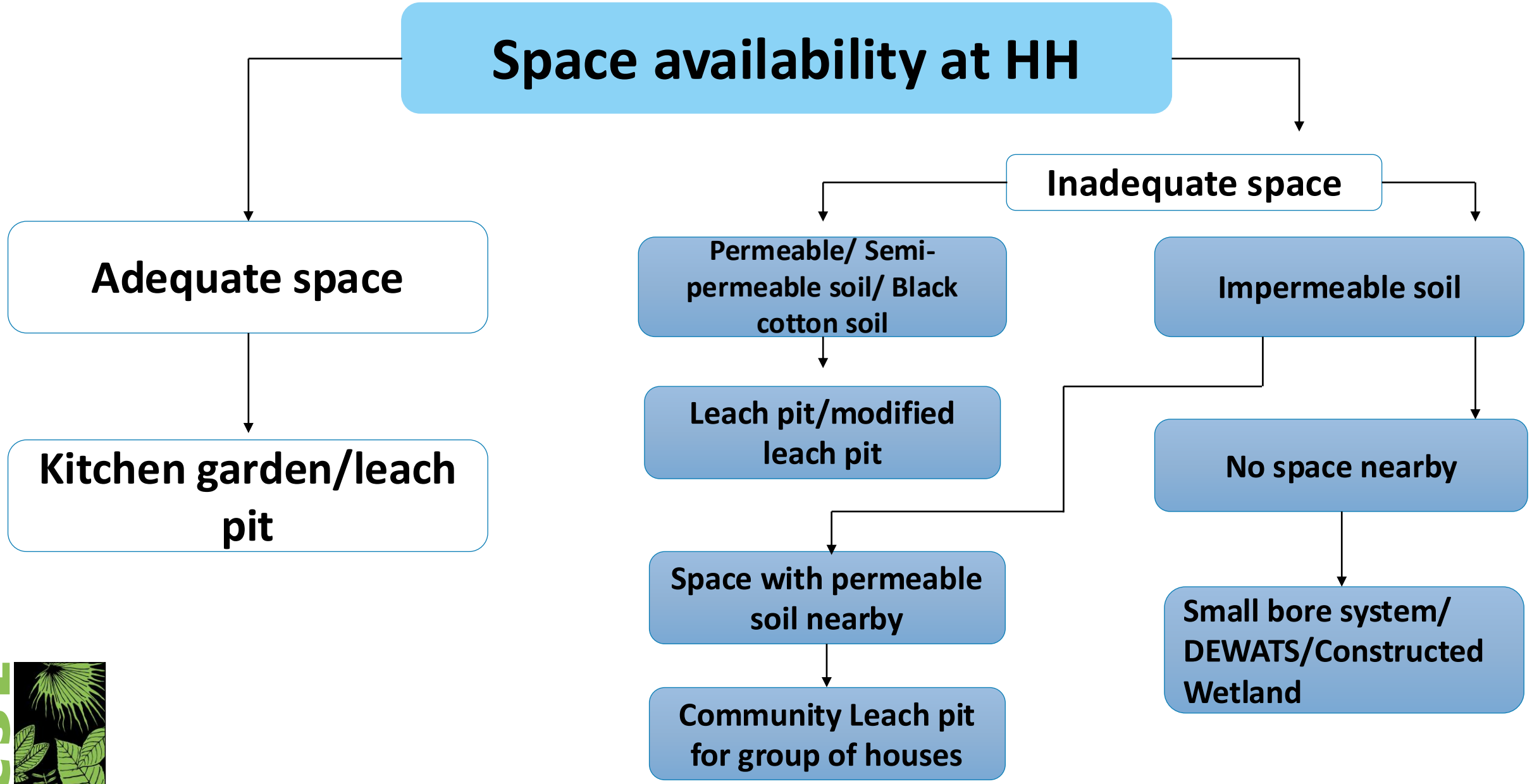
For areas at low temperatures (below zero degrees): HH level treatment options must be adopted. Soak pits/leach pits to be placed at a depth of 1-1.5 m below ground level

Areas with Hard Strata (Rocky Strata)



For implementing household-level technologies and community leach pits, a soil percolation test must be carries out.

For other areas



Choice of Solution

As JJM comes- consumption increases.

Adopt solutions considering soil, groundwater, cost, need, community acceptance

Not everything fits everywhere

Thank You