

KISUMU AFRIWATSAN WORKSHOP

SANITATION SYSTEMS ADAPTED TO FLOODED AREAS: WASTEWATER TREATMENT USING WETLANDS AND THE EARTHAUGER TOILET IN RUFISQUE AND MEDINA GOUNASS (DAKAR), SENEGAL

BY

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BACKGROUND

- 36% OF THE POPULATION IN DAKAR AREA IS CONNECTED TO THE SEWER SYSTEM,
- 46% RELIES ON NON SEWERED SYSTEMS.
- BECAUSE OF HIGHT COST OF MECANICAL EMPTYING, FEACAL SLUDGE IS OFTEN DISCHARGED MANUALLY UNDERGROUND BY DIGGING :



- ENVIRONMENTAL DEGRADATION ,
- A GROUNDWATER QUALITY DEGRADATION,
- GROUNDWATER RISE UP & FLOODING AREAS
- WATER RELATED DISEASES INCREASES,.....

- AS FAR AS FEACAL SLUDGE IS CONSIDERED AS WASTE BUT NOT AS RESOURCES, THE SITUATION WILL LAST.

BACKGROUND (CONT')

- THIS IS THE CASE, PIKINE, GUEDIAWAYE, THIAROYE (DAKAR) , CASTOR, DIOKOUL.(RUFISQUE)
 - 17 000 M³ /DAY INJECTED TO THE THIAROYE GROUNDWATER DUE TO WASTEWATER DISCHARGING.
- **CONSTRUCTION OF TANKS ABOVE THE GROUND.**



But this is not a sustainable solution!

QUESTION: WHICH SANITATION FACILITIES TO ADDRESS BOTH MIDDLE INCOME COMMUNITIES/FAIRLY GOOD QUANTITIES OF WATER AND LOW INCOME COMMUNITIES:LOW WATER ACCESS

I. THE EARTH AUGER TOILET AS A POTENTIAL SOLUTION FOR LOW WATER CONSUMERS

- CHALLENGES:

- ❖ BUILD A TANK IN SHALLOW GROUNDWATER AREA?

- ❖ MANAGE END PRODUCTS WITHOUT;

- ❖ **DEGRADING THE GROUNDWATER QUALITY?**

- ❖ **FILLING UP THE GROUNDWATER WITH WASTEWATER ?**

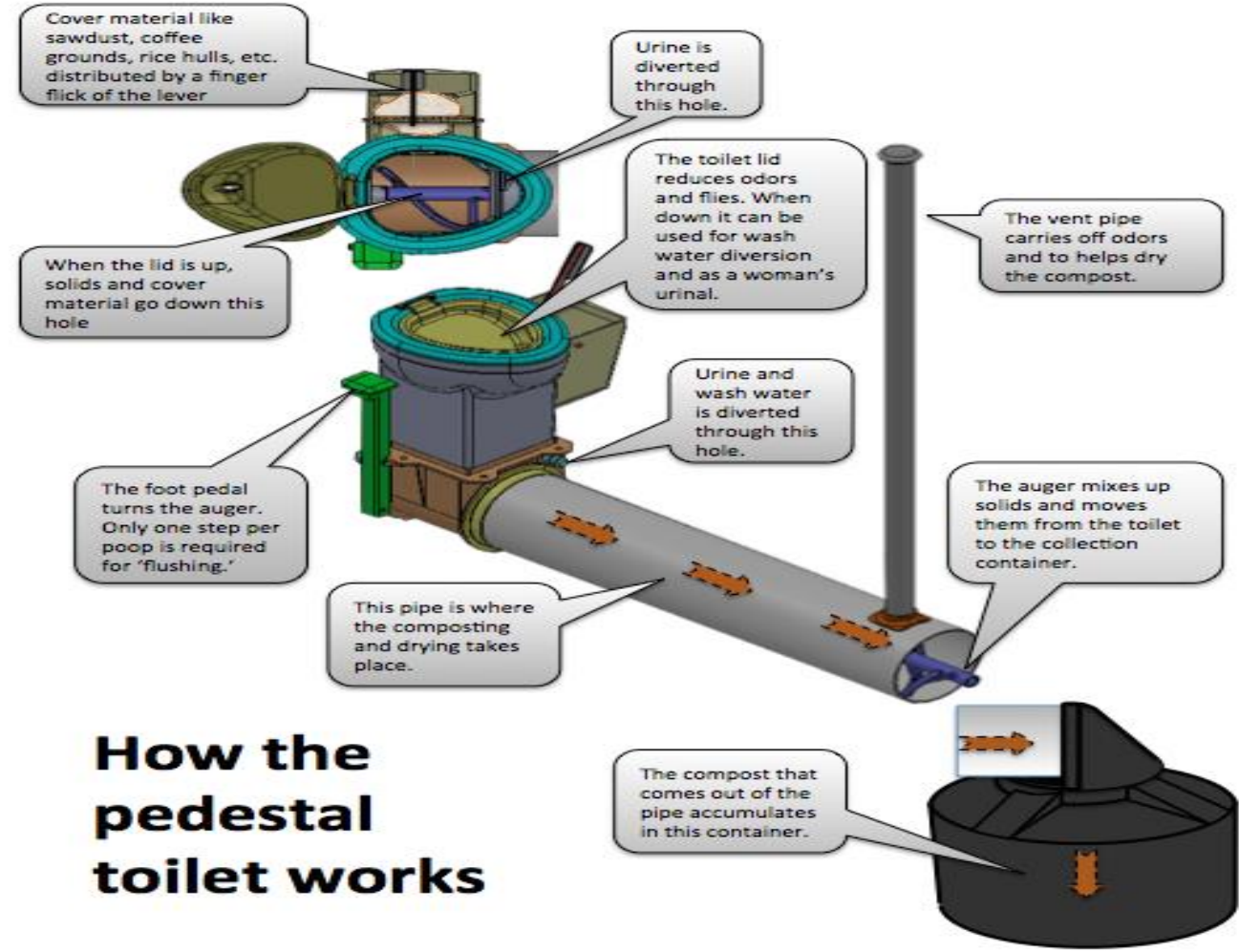
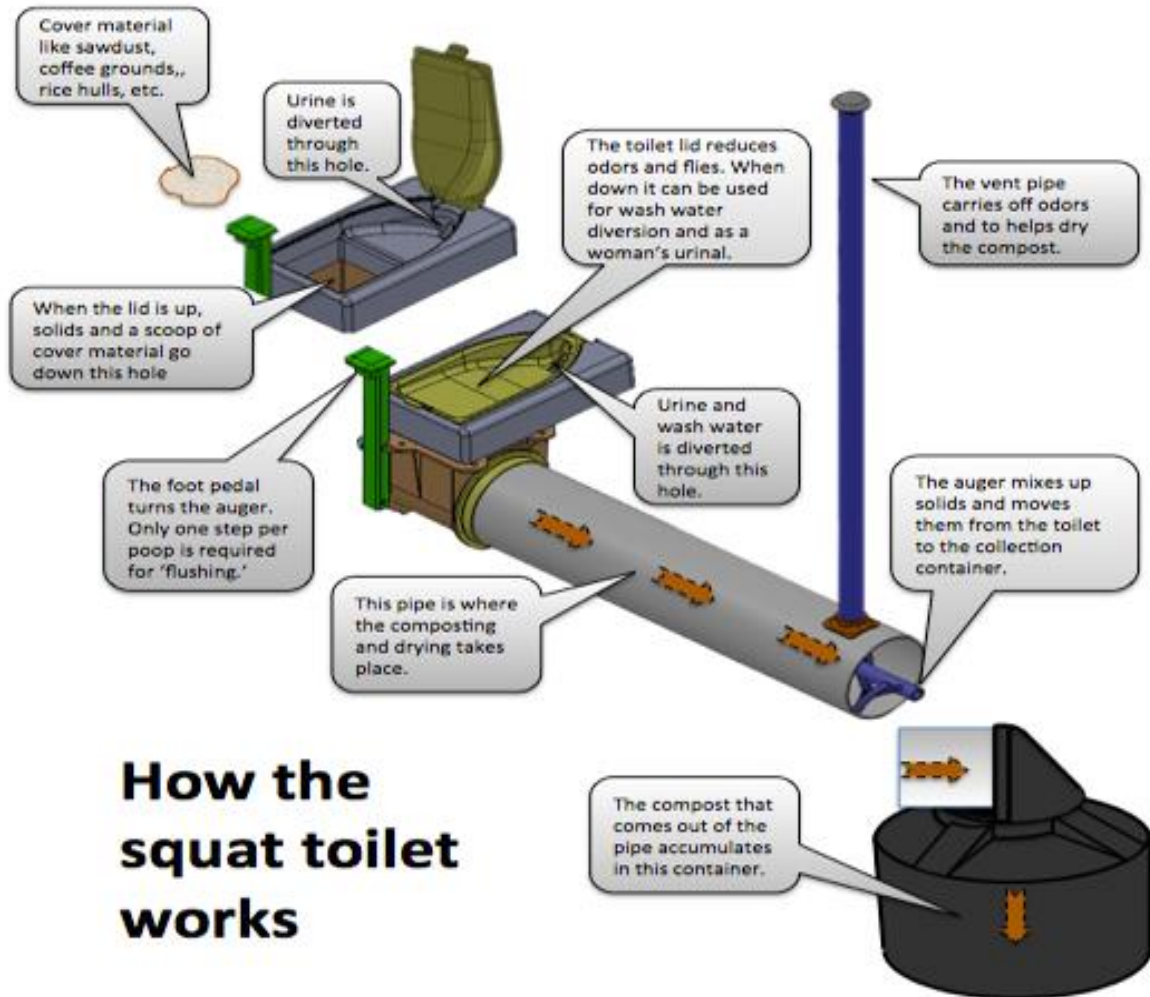
- ❖ DEAL WITH THESE CHALLENGES WITH RELATIVE LOW MEANS (TECHNICALLY AND FINANCIALLY)?

- CAN THE EARTH AUGER BE A SOLUTION FOR LOW WATER CONSUMERS?

2 MODELS TESTED IN 4 HOUSEHOLDS (2 SQUATS , 2 PEDESTALS) IN THE AREA OF PIKINE.



DESCRIPTION OF THE SQUAT & PEDESTAL



MANAGEMENT PARAMETERS

Analysis of solids

❖ Production of solids

Parameters	X	Y
Number of people in the house	8	7
Production of solids /day /P (g wet)	174	205
Number of days to fill a 200 l barrel	451	90
Number of months needed to fill a 200 l barrel	15	3

Feces production: 150 et 200 g /p/ d.

- Sawdust use : 24 to 54 g/p/d; = 13kg /month (family 8 people) = 50 kg bag /3 months.

MANAGEMENT PARAMETERS

Analysis of liquids

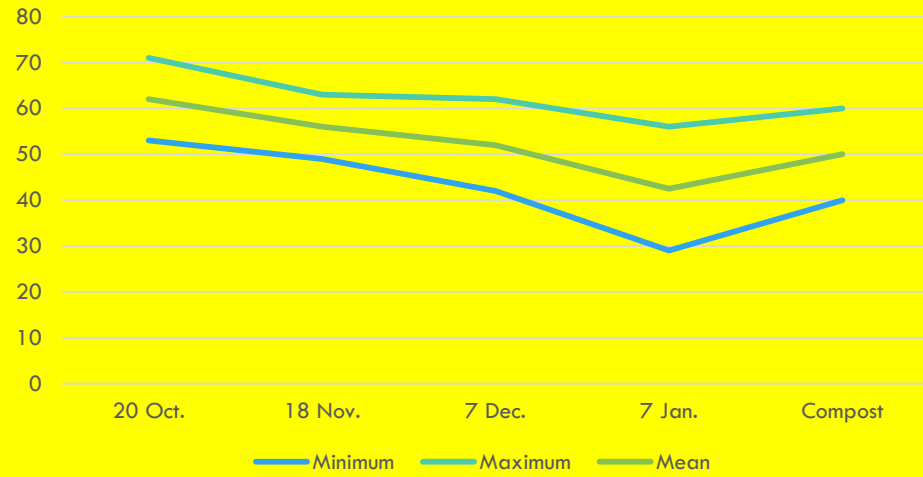
❖ Liquid's Production

Parameters	X	Y
Number of persons	8	7
Production of liquids /day (l)	21,16	37,77
Production of liquids /P/day (l)	2,64	5,39
Production of liquids /month (l)	635	1133
Number of days to fill a 200 l	10	5

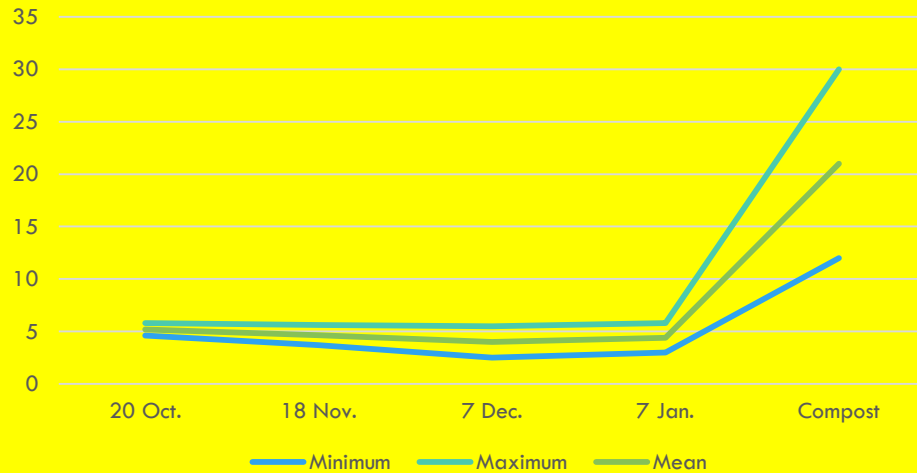
EFFECTIVENESS

Analysis of solids

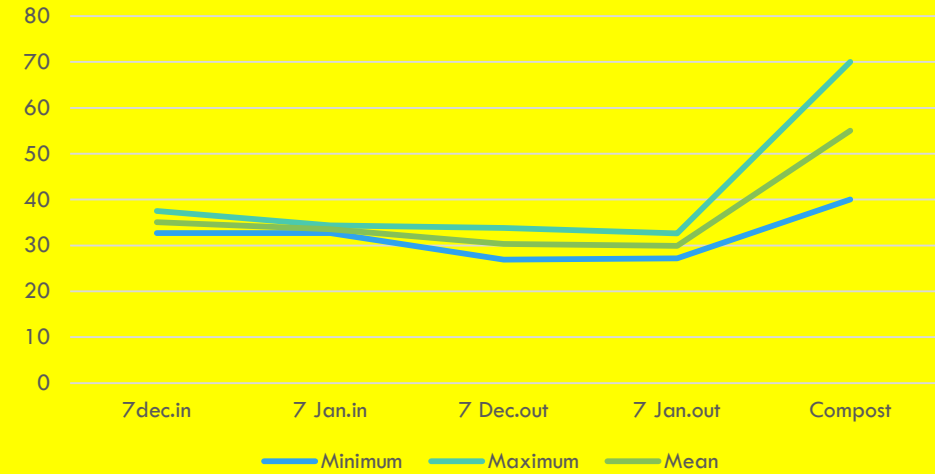
Variation of moisture in the barrel (%)



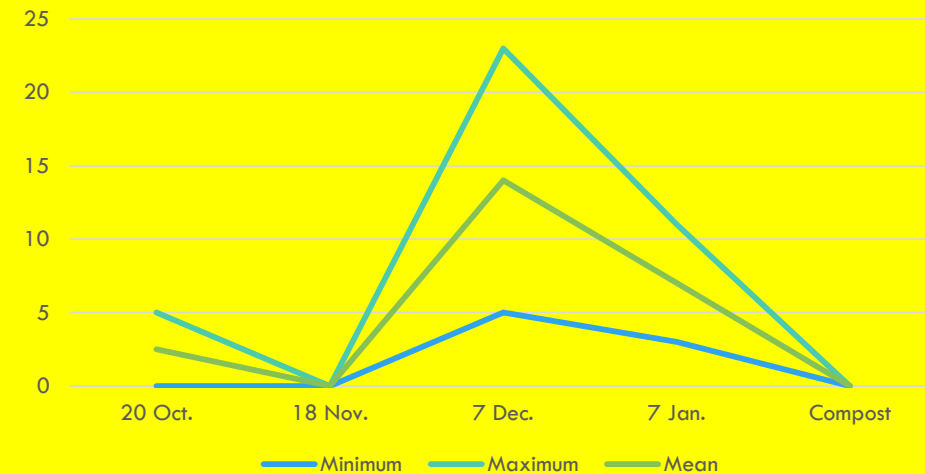
Variation of C/N in the barrel



Variation of temperature in the barrel



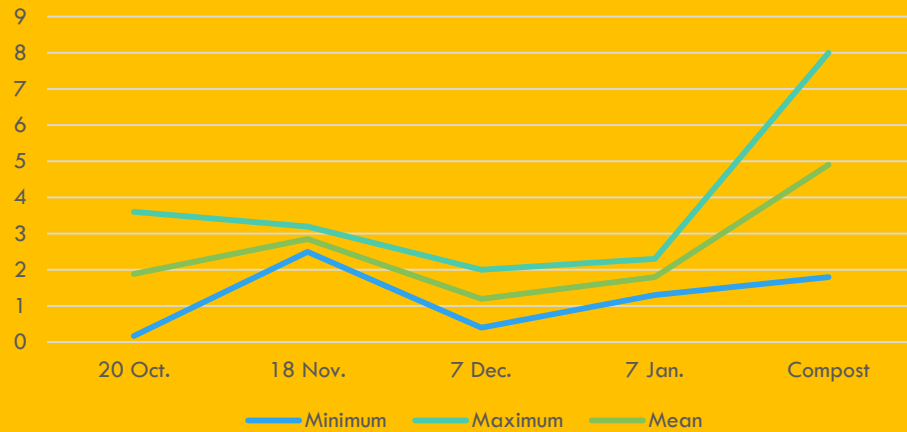
Variation of Ascaris eggs in the barrel



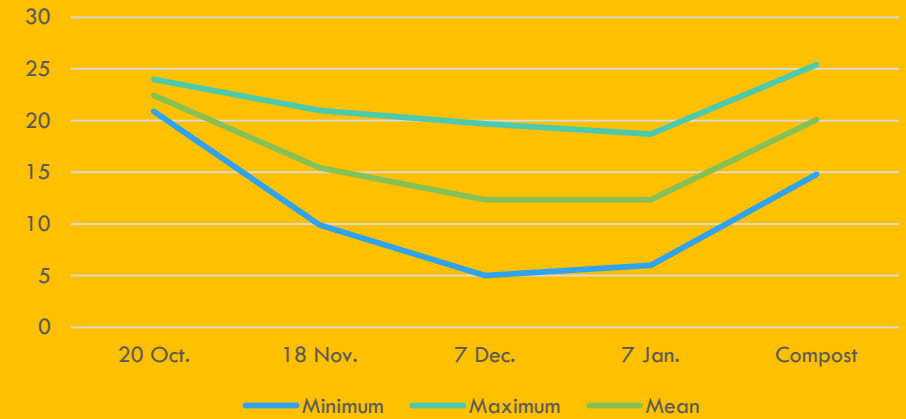
EFFECTIVENESS

ANALYSIS OF LIQUIDS

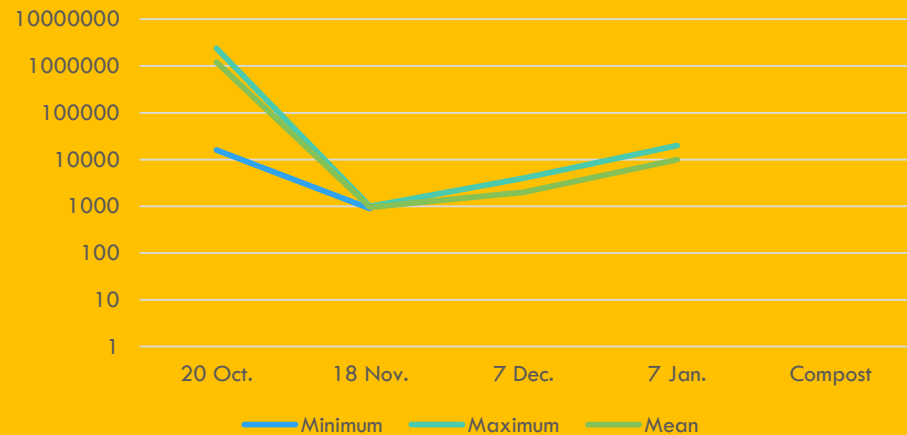
Variation of total nitrogen in the barrel of liquids



E C variation in the barrel of liquids



Variation of FC in the barrel of liquids



Absence of helminth eggs

II. THE WETLAND SYSTEM A POTENTIAL SOLUTION FOR HIGH WATER CONSUMERS

• **CHALLENGES:**

- ❖ **GROUNDWATER IS HIGH BUT CAN ALLOW BUILD A TIGHT TANK NOT DEEPER THAN 1M,**
- ❖ **HOUSEHOLDS HAVE ENOUGH MEANS TO CONTRIBUTE TO A SMALL SIZE SEWER SYSTEM,**
- ❖ **HOUSEHOLDS USE ENOUGH WATER TO ALLOW CIRCULATION OF WATER INTO THE PIPES AND SELF CLEANING OF SMALL SIZE PIPES (110MM DIAM),**
- ❖ **COMMUNITY CAN ALLOCATE LAND FOR CONSTRUCTION OF THE TREATMENT PLANT**

• **CAN THE WETLAND USING FLOATING OR FIXED PLANTS (WATER LETTUCE, WATER HYACINTH, REED BEDS) BE A SOLUTION?**

• **HOW IT WORKS:**

• **PRINCIPLE: TRANSFORM ORGANIC POLLUTION FROM HUMAN WASTE INTO VEGETAL BIOMASS TO BE HARVESTED AND EXPORTED, PRODUCE SAFE WATER TO REUSE OR DISCHARGE INTO THE ENVIRONMENT.**

➤ **WASTEWATER DISCHARGED IN A POND WITH PLANTS FOR A DEDICATED TIME (RETENTION TIME) TO ALLOW :**

- **BIODEGRADATION OF ORGANIC MATTERS/COMMUNITIES OF MICROORGANISMES**
- **PRODUCTION OF NUTRIENTS /UPTAKE BY PLANTS**

➤ **ENERGY: SUN**

MANAGEMENT PARAMETERS

At the household level

mouth with a filter

*two grease and oil
extracting boxes*

settlement-digester tank



MANAGEMENT PARAMETERS

At the treatment plant level



Setting up & management of a settling pond

Harvesting plants & valorization of plants and treated water



VALORIZATION OF END PRODUCTS

FOR THE EARTH AUGER

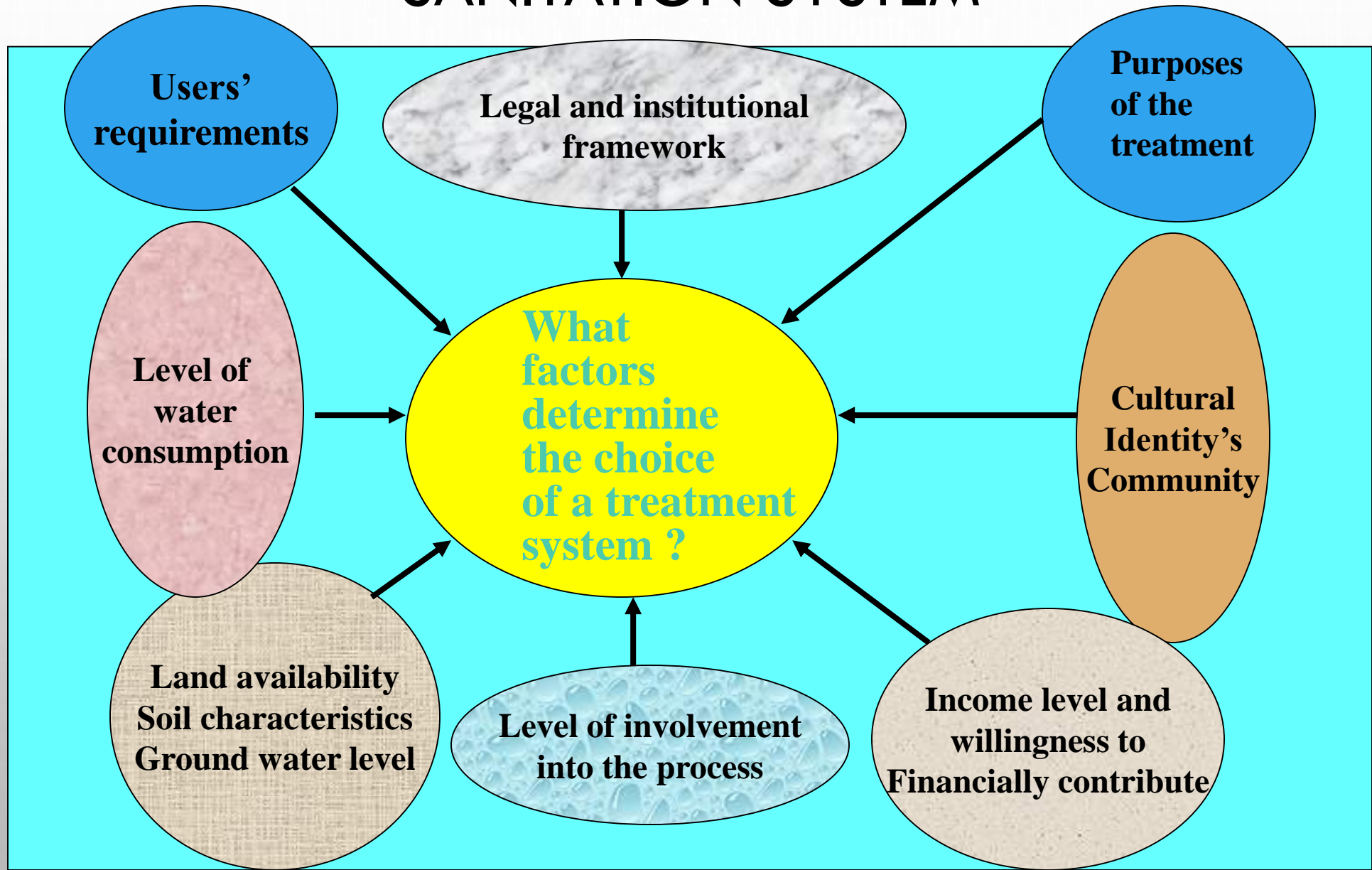


- As solid combustible $CV=17,5 \text{ MJ/Kg DM}$
- As soil conditioner $C/N = 4,4$

FOR THE WETLANDS

- Harvested plants used in construction/feed animals?
- Treated water for irrigation

LESSON LEARNED: STRATEGIES FOR SETTING A SUSTAINABLE SANITATION SYSTEM



Thank you for your attention

