



“Culture’s barriers on introducing dry toilet technology in Indonesia”

Neni Sintawardani and Jovita Tri Astuti

Research Center for Physics, Indonesian Institute of Sciences



Global Facts of Water Availability

Jacques Diouf, General Director of FAO, in World Water Day, 22 March 2007 said:

1. Water consumption is doubled globally in this one century, and in the contrary its availability drastically decrease
2. Predicted: in 2025, 1.8 billion people have to live in an absolute scarceness/shortage water



Human needs vs Lifestyle

Increase in population, urbanization, and social change (poverty and lifestyle).

- The increase in population number will automatically change 'demand' for basic needs.
- Urbanization causes pressure on land exploitation and triggers urban poverty and overexploitation of limited natural resources.
- In the meantime, poverty issue itself restricts the people from access to appropriate living resources (drink water, housing and food) so that distressing the natural resources.
- Another social issue is the change in lifestyle due to improved education and economy. As comparison, water consumption in cities reaches 132 liter/individual/day whereas in rural areas the amount is 25 liter/individual/day. Such difference is 5 times larger, which means that 1% increase in urbanization rate equals 5% increase in water consumption.

Therefore, there should be more effective approach for any policy to this lifestyle issue



Situation in Indonesia

- **World Summit on Sustainable Development (WSSD)** → people in the world must be aware of 5 important matters: water, sanitation, energy, food & agriculture, biodiversity and public health
- Indicators of **prosperity**: water, energy and sanitation.
- Sanitation's aspects: clean water, wastewater, toilet, sewerage systems, culture and attitude
 - How is in Indonesia?



Water demand and availability during dry season in some big islands in Indonesia.

Year 2003					
Island	DEMAND (Dry Season)		AVAILABILITY (Dry ss)		Balance
	(billion m3)	(%)*	(billion m3)	(%)*	
Sumatera	11.6	17.5	96.2	19.9	Surplus
Java & Bali	38.4	57.8	25.3	5.2	Deficit
Kalimantan	2.9	4.3	167.0	34.6	Surplus
Nusa Tenggara	4.3	6.5	4.2	0.9	Deficit
Sulawesi	9.0	13.6	14.4	3.0	Surplus
Maluku	0.1	0.2	12.4	2.6	Surplus
Papua	0.1	0.1	163.6	33.9	Surplus

* Percentage of the national sum.





River and sewerage system

Up Stream



Small City



Big City



Down Stream







Water and Sanitation →

Facts of Clean Water Infrastructure in Indonesia:

From around 306 PDAM (waterworks) in Indonesia, they serve:

1. Only 33 million (39%) urban people and 9 million (8%) rural people
→ 47%

2. With sub-standard quality,

3. Low consumption (14m³/ month /house hold) → <90 l/person/day

4. Average pipeline leakage of 40%.

✓ Every day 400,000 m³ domestic waste is dumped directly into rivers and land without pretreatment → 61 % is on water

✓ It is estimated that 70-75% of water pollutants comes from domestic. Rivers polluted by organic waste and fecal that decrease water quality significantly. In year 2002, data from Ministry of Health showed 5,789 case of diarrhea with 94 death.

✓ Centralized sewerage system exists only in 7 cities, providing service to 973,000 population (1,31% of urban population or 0,5% of the total population in Indonesia)

Miserable



LIPI

Population and Sanitation

- ❑ Indonesian population is 213,6 million (2002) → 53% live in Java.
- ❑ Mostly dwell in the villages, and only 35 percent live in towns and cities
- ❑ Pollution: 70-75% of water pollutant comes from domestic.
- ❑ >90% of population have no Centralized sewerage system
- ❑ Final human waste disposal system in the cities: 63,07% septic tank, 16,70% to rivers/lakes, 14,44% to the ground, 5,79% to pond/beach/ others (EPS 2002].
- ❑ Septic tanks generally come in infiltration pit or directly into river/drain age ditch. Consequently river and groundwater of the urban are generally contaminated by *E.coli* bacteria.



Toilet-Activities vs Habitual

- Flush toilets: open ditch, sit, hook
- Dry toilets: open ditch (digging the earth), direct to canal
→ esp. in dry region.
- Clean water: a big need; problem in access. In average needs minimum **8 liters per person just to clean up the “body” after squatting. Toilet paper: unusual!!**



Toilet in ordinary household in Indonesia:

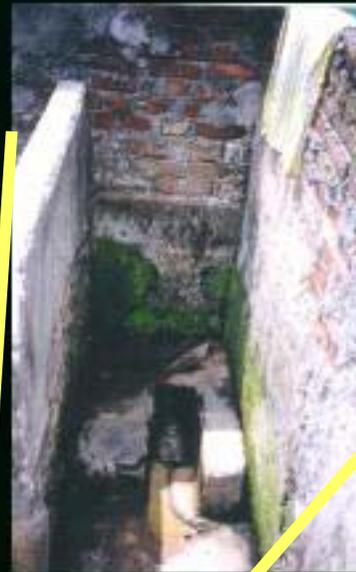


Water is always needed!





Public Toilet



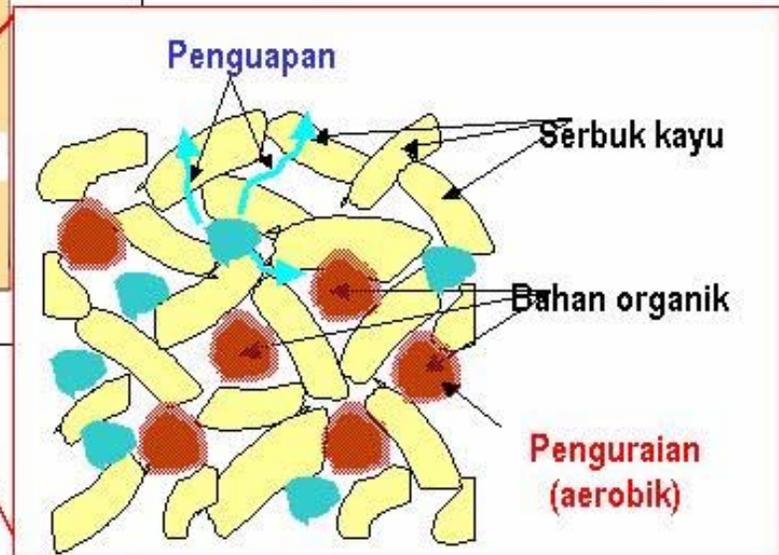
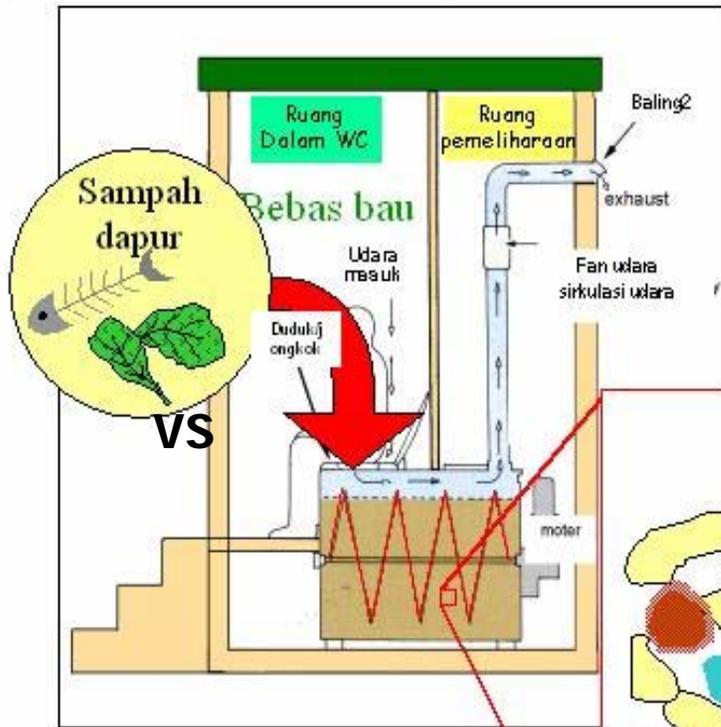
Water is
always
needed!



Introducing Bio-Toilet as Dry Toilet

- **The need of water for squatting activities (flushing, washing) is high!.**
- **It is also important to evaluate the habits and economic capacity of the people regarding their adaptability to alternative sanitation system.**
- **Bio-toilet offers to solve sanitation problems in high populated areas by recycling organic wastes directly back to nature, which is environmentally sound (reduce water usage), inexpensive (no need of sewerage pipe), can be conducted on-site. → possibility to develop small scale enterprise??!**

BIO-TOILET



On-Site Treatment

Dry Toilet vs Cleanness???

Lithographic picture of the sawdust



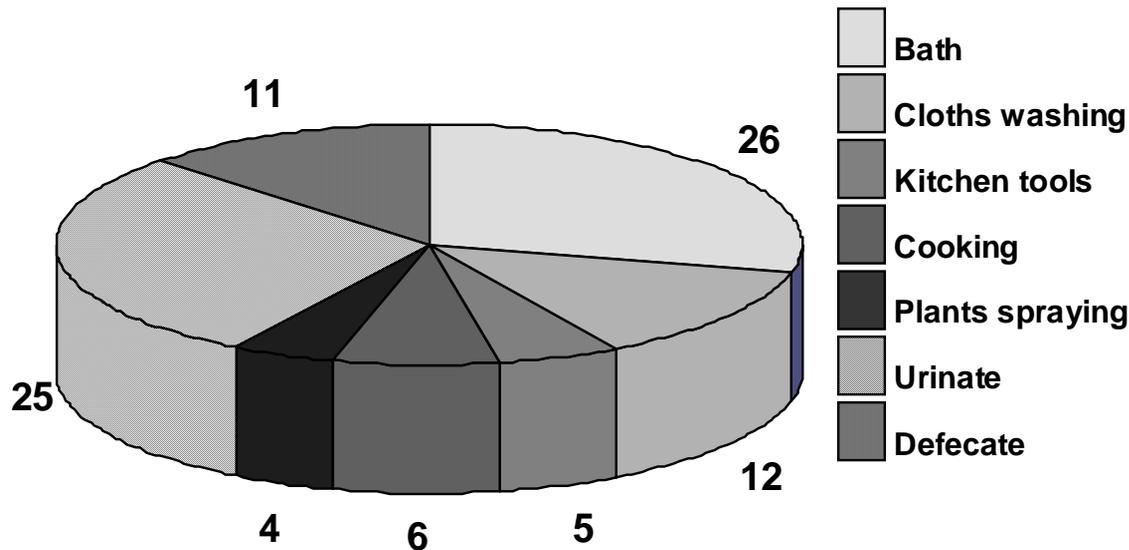
Bentuk serbuk kayu dengan pori-pori alaminya



Daily Water Usage: respondents are dwellers in Bandung's Slum Area

Interview of 62 households (274 persons)

Average daily water usage (litre/person/day)



Total average = 89 litre/person/day

Toilet activities: 40 % of total water consumption

The culture and behavior of the community of "to be clean" is reflected to the high amount of consumed water → *but not expressed the sanitation or hygienic problems*

About 53% of the interviewee said that they used public toilet located direct by the side of Sekewaluh Canal

It is not included water usage for cleaning the body before praying, that normally done by the Moslems five times per day, → wastewater from these activities is relatively clean

Average daily water usage in Kiarcondong area
(sampling from Sukapura and Kebonjayanti villages)
Neni Sintawardani/BKPI/LIPI07



Study on People Perception for Using Dry Toilet

Introduction of Bio-Toilet in a
Religion School



Why in a relig. School?

Most of Indonesian are Moslem. Percentage of population based on the religion :

- v Moslem : (88.22%)**
- v Catholic : (3.05%)**
- v Protestant : (5.87%)**
- v Hindu : (1.81%)**
- v Buddhist : (0.84%)**
- v Others : rest**

- The acceptance for dry toilet (without water) is depend on the Islamic rule of law or in application bio-toilet should be in line with “Syariah”, Syariah = that means the rule of Islam (way of life)**

- ✓ The education level of students relatively homogeneous (undergraduate), therefore it is expected to be good respondents and an accurate data could be resulted**
- ✓ The leader of Pesantren Daarut Tauhiid is Mr. Abdullah Gymnastiar (well-known as Aa Gym). He is a well-known young moderate “Ulama” (Moslem scholar) in Indonesia**
- ✓ Pesantren Daarut Tauhiid is not only concern with the religious aspect, but it is also the social, economic, technology, environment, entrepreneurship aspect, etc.**



Daarut Tauhid Religion School (DT)

- Based on those activities and their impacts to the community, LIPI makes joint cooperation for introducing the Bio-Toilet (type S-50) with DT to promote the use of dry toilet and conserve water. A unit of modern bio-toilet has been installed to serve one of its men dormitories and used by LIPI for performance evaluation.
- In this dormitory, periodically every 4-6 months 40-70 students coming from all part of Indonesia will join the course/school. Not like in common religion school in Indonesia, in DT the students learn more about business and entrepreneurship based on Islamic way of life.
- Their syllabus emphasize to increase student's creativity on income generating activities using information and environmental friendly technology.
- After this learning program, the students are expected to be an entrepreneur to generate income and influence the community to be self-reliance/sufficient in life.



Material and Type of the Existing Toilet in Daarut Tauhiid



BT building (bamboos)



Reactor room



Reactor filled with coco dust



Inside of Building



Closet



Water flow meter

Closet : squat type, porcelain
Wall material: brick (permanent)
Floor : cement
Door : wood

Construction of BT Building at Pesantren Daarut Tauhiid



Method

- Based on the agreement between LIPI and Daarut Tauhiid Management Board, socialization of Biotoilet concept was conducted first to “Santri Putra” or *Santri Ikhwan*; it means male students of Pesantren Daarut Tauhiid (Moslem religion School). These students come from varying regions in Sumatra, Java, Kalimantan, Sulawesi, Nusa Tenggara, etc. There are 2-3 groups per year; and the students are about 40-60 persons per group. The program was carried out for 4-5 months for study not only about the Islam Religion, but also technology, environment, and entrepreneurship. After finished, all students back to their own region, and expected as an agent for the society changing.



Material of Socialization activity :

Class program (90-120 minutes)

1. Present Situation of Water and Sanitation in Indonesia
2. Showing sanitation system in slum area
3. Water Scarcity VS Water Usage for Defecate (Habit)
4. The Future Situation (Good Water and Sanitation)
5. Biotoilet as an alternative technology of toilet
6. Video of biotoilet
7. Discussion
8. Questionnaire before using biotoilet (The impression of the Biotoilet concept)

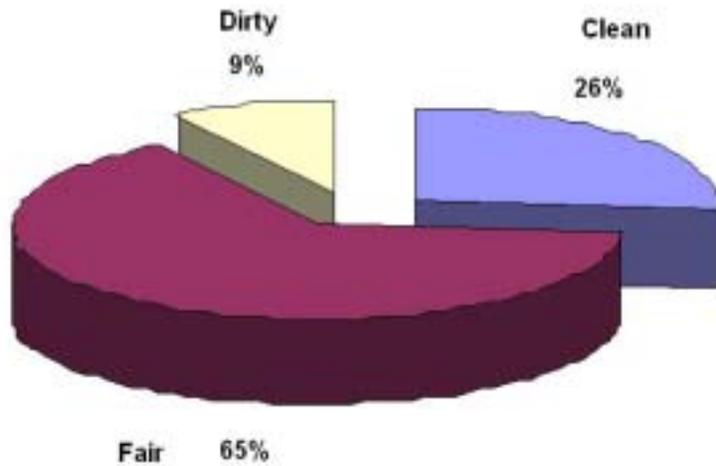
Visit Biotoilet (30-60 minutes): technical mechanism, how to use, what is forbidden to do, data collection system

- Questionnaire after using Biotoilet (The impression of the Biotoilet)

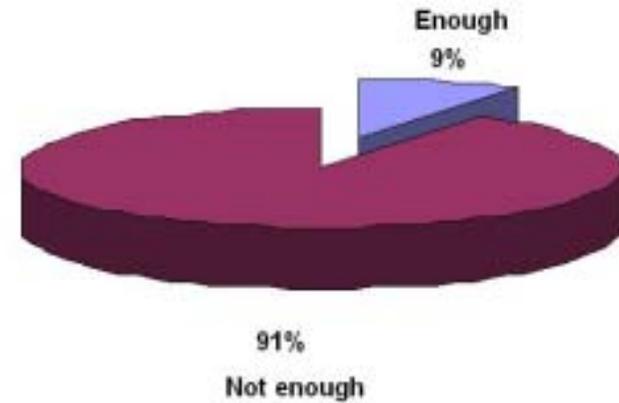


Impression of the existing toilet facilities

Condition of existing WC

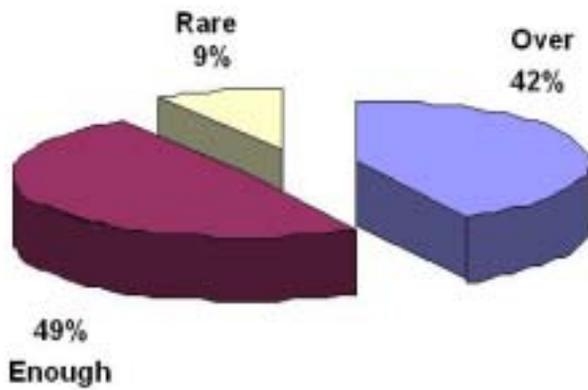


Number of existing WC

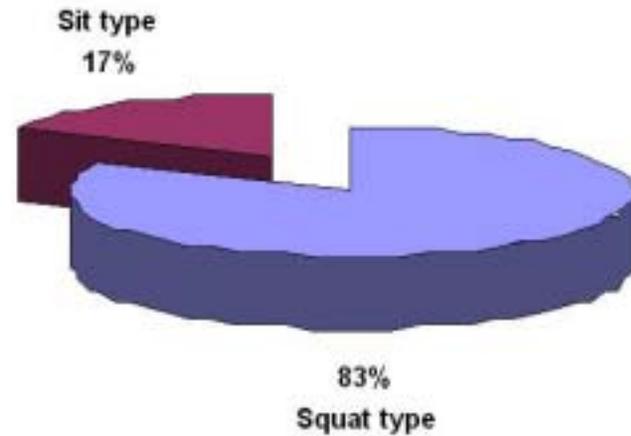




Clean Water Facility



Wanted WC-Type

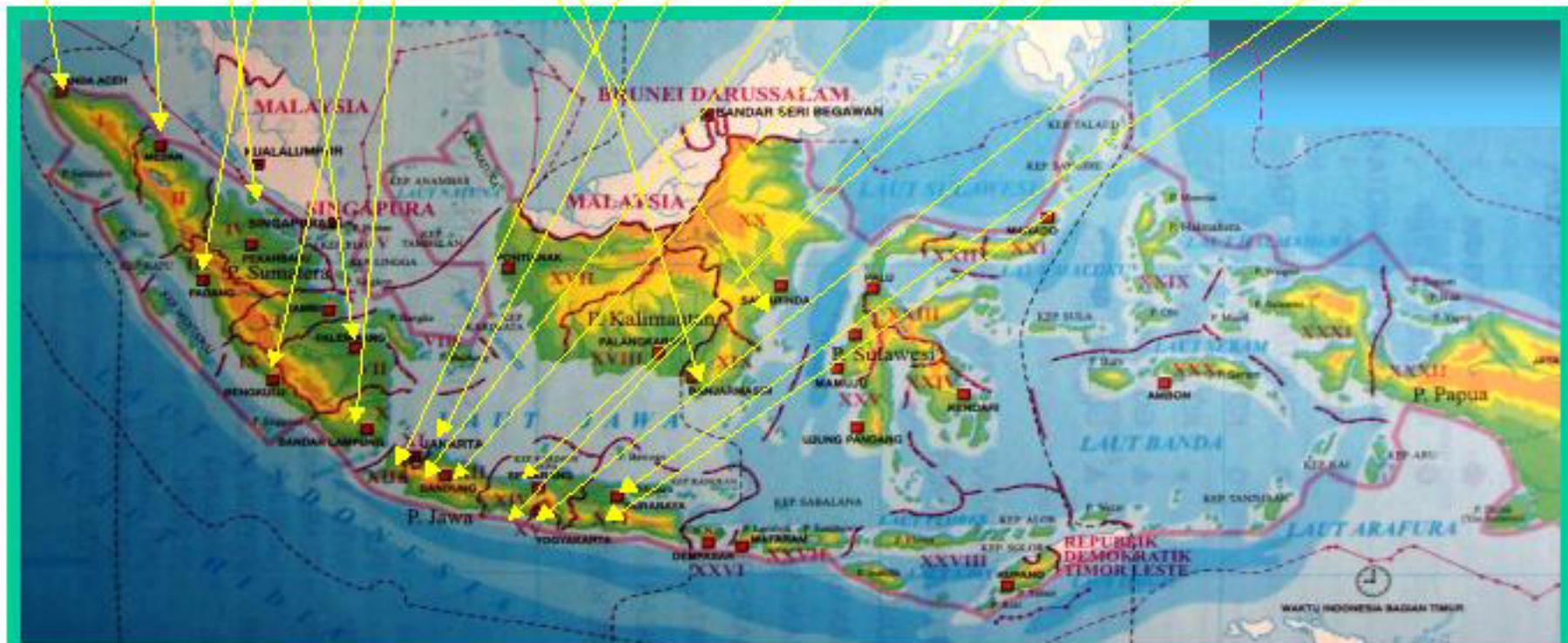
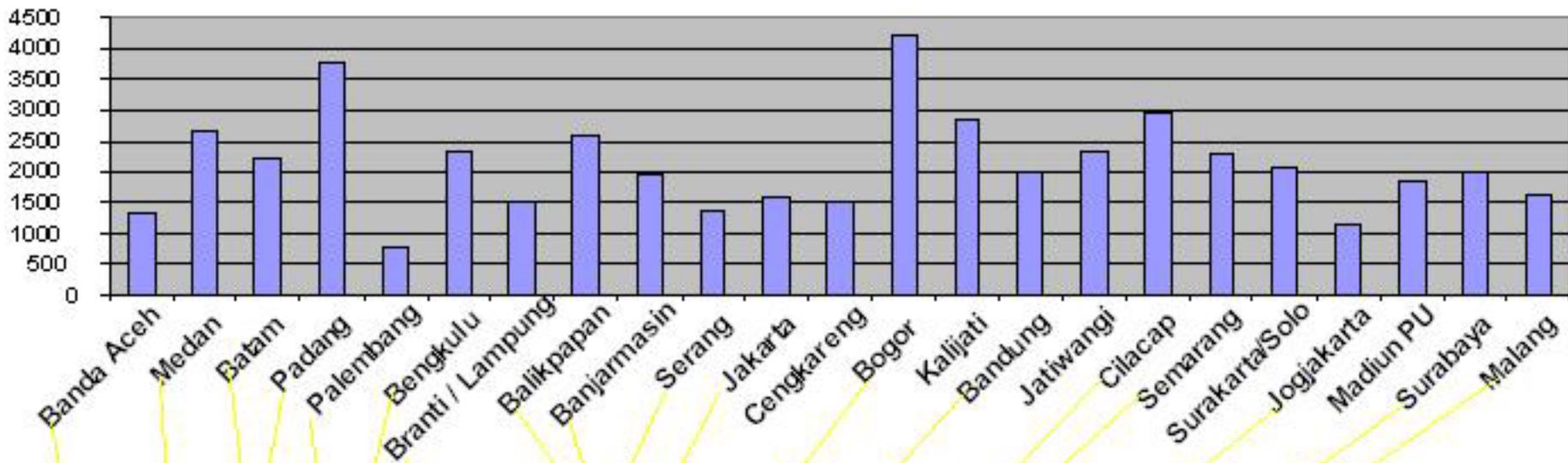




Impression after using BT

- Only 59% of respondents could use BT during their stay in school. existed BT was only one room. They have to share of using WC or bathrooms.
- It showed that only 40% of the students who used BT using it oft, 60% were only seldom using BT. It could be seen that even only one room, the students wanted much to use it.
- As normal, 56% of the students defecated 1 time daily, 38 % defecated 2 times daily.
- To promote BT in society or school, students can still use water to clean up their body by using water spray. Sprayed water can be used only in the outer area of BT-bowl.
- By using spray, people get use to wash with small amount of water to clean up the body. It needed time to reduce water amount. About 75% of the students still needed 3 to 4 times sprayed water each time. 10% of students could use water only 1=2 times spraying. 15% of students sprayed water more than 4 times.

Average Presipitation per Year (mm)





- Limiting the water to clean up the body?? 67% of students agreed with that action. They said 3-4 times of spraying water was quite adequate.
- The use of toilet paper was unacceptable for the students. 94% of the students did not want to use toilet paper, because they feel still unclean (67%). 7% said that toilet paper can be used only in emergency, when there's no water. About 27% were doubtful or uncommon to use toilet paper.
- Even was ordered to dispose toilet paper directly to BT, 63% of the students never throw paper to the bowl.



Technical impression of the students on using BT (after using BT):

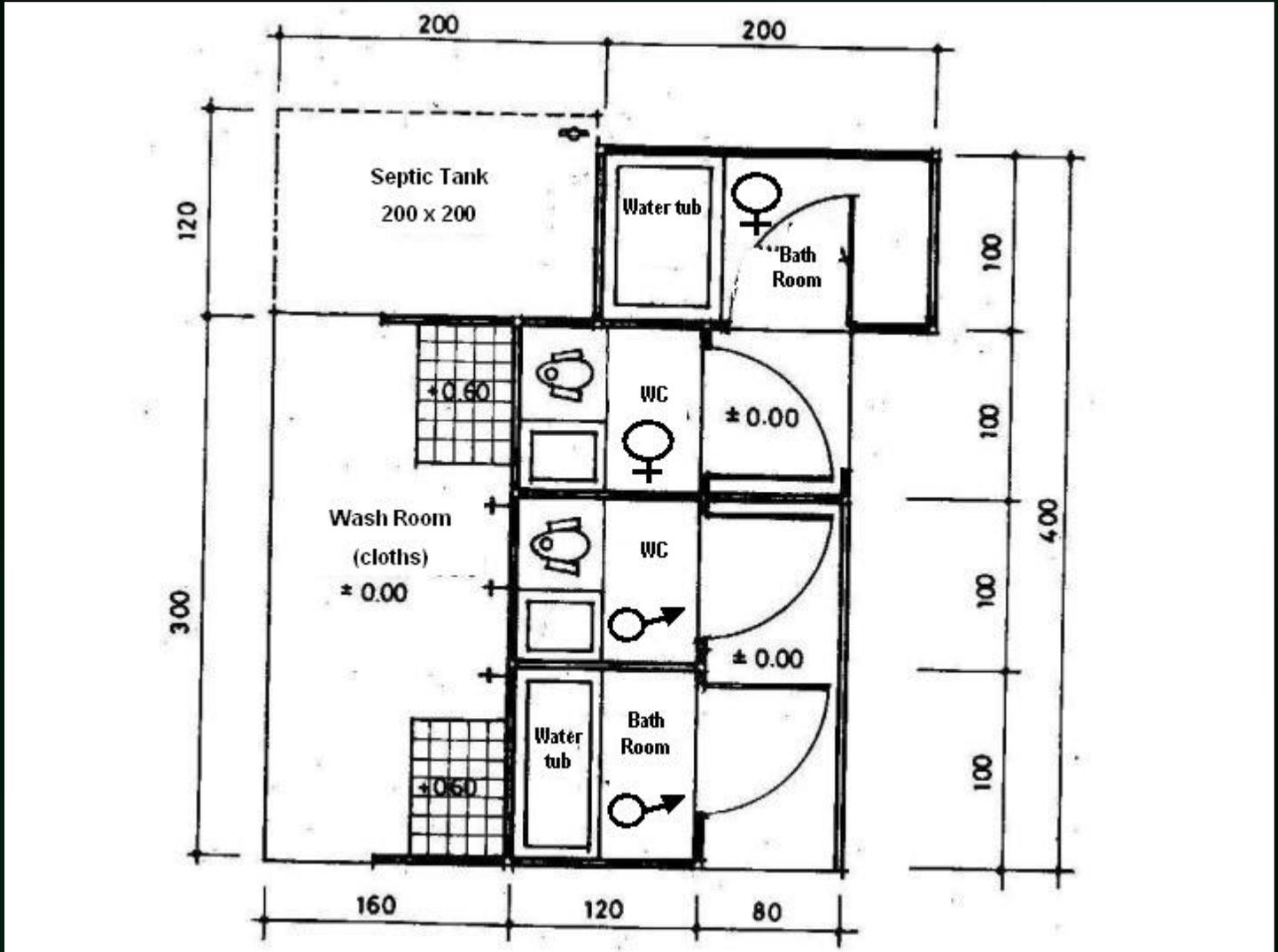
- ✓ From all respondents in three school-periods, only 21% filled up the impression's questionnaires after using BT at the end of their stay, even in fact 59% of the students (totally 164 students) used BT during their school. This active group was in age of 20-25 years old (79%). About 63% were high school absolvent, and 37% were under graduated from universities.
- ✓ Only 9% said the BT was dirty, 91% said "It was clean to enough"
- ✓ Only 10% of the students said about the bad smell came up from BT. 90% said from odorless to a light strange smell. The unpleasant smell was sulfuric smell to sour (63%). The "feces" smell that is utmost unpleasant smell was not significantly exist.
- ✓ Lightning in the BT's room was good, only 14% said not enough light in the booth.

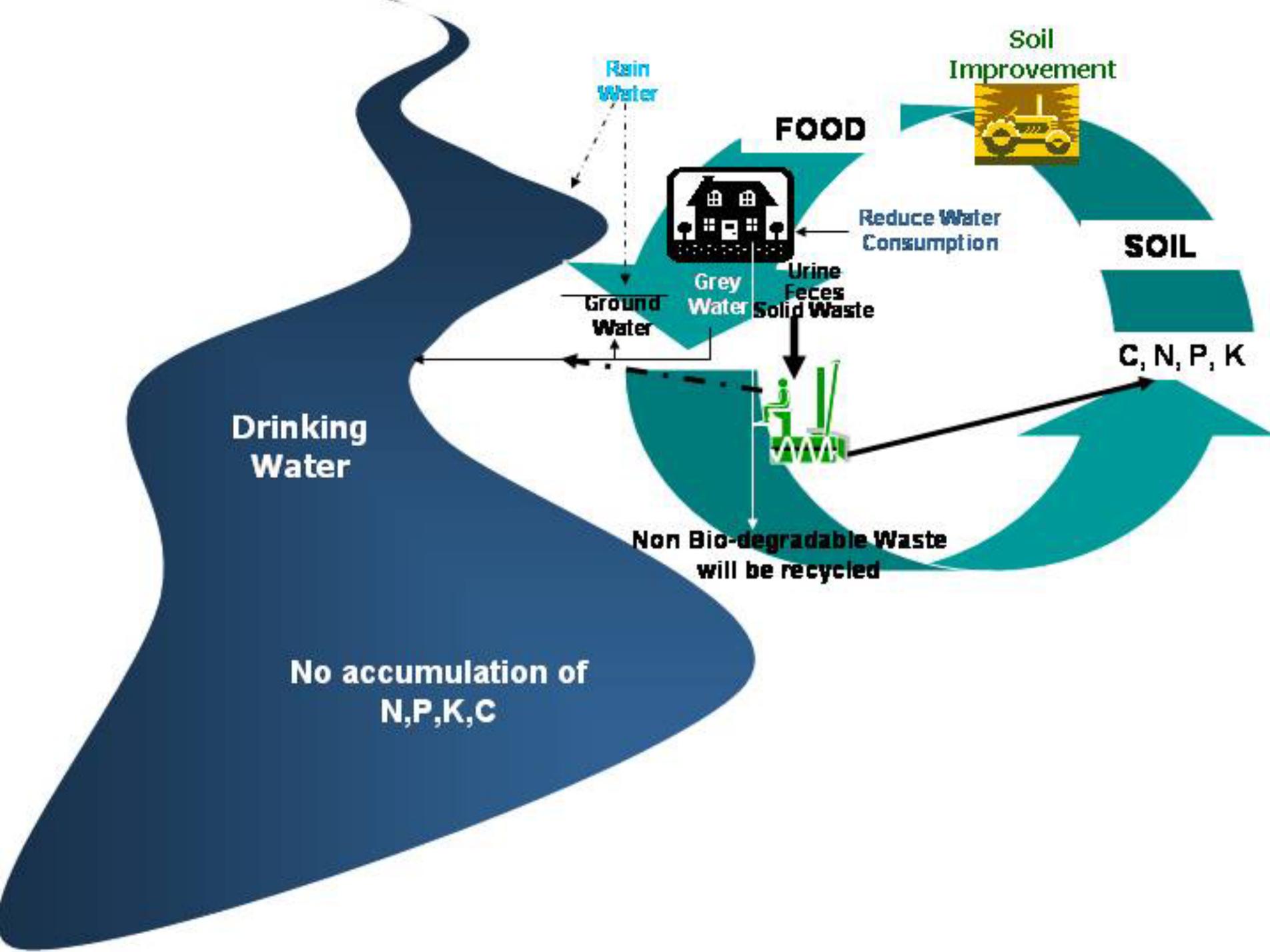


- ✓ A good ventilation system made the BT room comfortable for the users. This kind of full ventilated room is wanted/desirable by the users.
- ✓ 80% of students said that the construction of BT was good to enough/medium. But 32% of students said that the room was small. Only 19% said the space in the BT room was quite fit, and 48% said that it was not too bad. For the space, actually all the respondents wanted a BT room bigger than 3x3 m². It seems that they compared directly with the existing bathroom in school.
- ✓ By asking respondents for the comfort of BT in compare with normal existed toilet, 31% said BT better than the existed toilet, and only 16% said in contrary. About 50% of respondent said both model was accepted.
- ✓ After using the BT, 95% respondents agreed to use BT.



National Standard for Area of Public Toilet and Bath Facilities







ACKNOWLEDGMENT:

- To Prof. Dr. N. Funamizu and Prof. Dr. T. Ishikawa for this wonderful collaboration and supports in this study.
- To JST for supporting the joint research in Sustainable Sanitation between Japan and Indonesia.



Don't let it happened.....

