Chemical Free Eco-friendly

Ecological Purification System (EPS)

0. Introduction: Phytoplankton, Reservoir study, Meet Slow Sand Filter, Importance of Ecological point. JICA training 植物プランクトン、貯水池研究、緩速ろ過、生態学の視点、JICA研修へ



17

101-

1. Water cycle, Safe water, Acceptable risk. 水循環、安全な水、許容できるリスク







18-26

5. From JICA training in Miyako-jima, Okinawa to Samoa 宮古島JICA研修からサモアへ







2. Key of purification in nature is food chain. Refocus to Slow Sand Filter.

浄化は食物連鎖が鍵、緩速ろ過の再認識









27-51

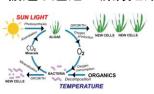
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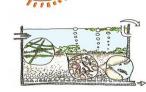


117-138

22

3. Algae and animals in Slow Sand Filter. 緩速ろ過池の藻類と動物





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7. Aerobic condition is essential for EPS. 生物浄化法は酸素が必須

6. Safe water for rural people by EPS in Fiji

フィジーの展開:生物浄化法で地方給水へ





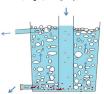


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149-163

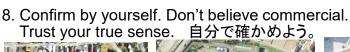
Up-flow Roughing Filter to reduce SS 濁り対策で上向き粗ろ過、モデルで解説





74-100

27





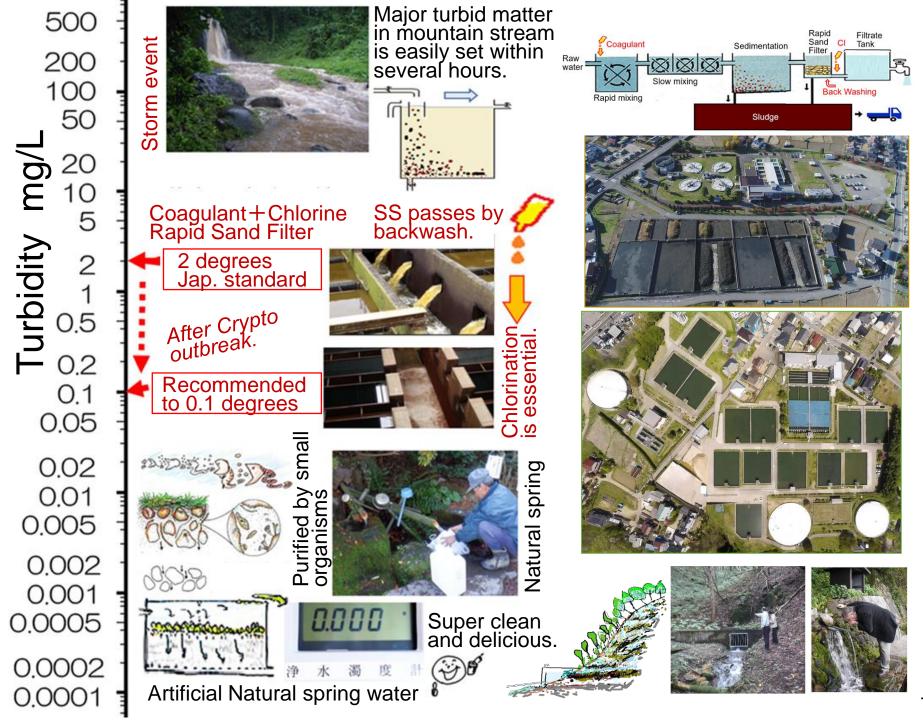




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The name of Slow Sand Filter caused a misunderstand of real mechanism.

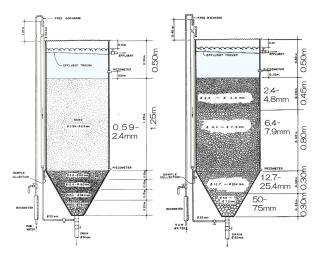




Down flow and Up-flow Roughing Filter test (Master student report): Luiz Di Bernardo 1980. Univ. São Paulo, Brazil

INFLUENT UPFLOW DOWN FLOW PERFORATED PLASTIC PIPE

Down-Flow and Up-Flow



Sand URF and Gravel URF



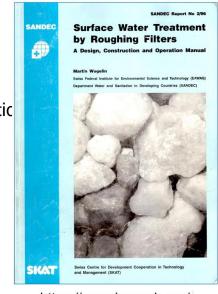
Down-Flow and Up-Flow

Drain



Swiss Federal Institute of Aquatic Science and Technology

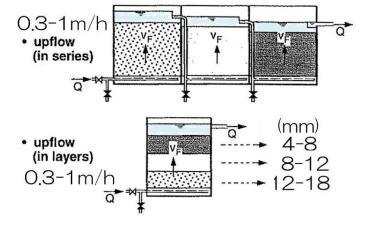




https://www.ircwash.org/ sites/default/files/Wegeli n-1996-Surface.pdf



Nakamoto was a JICA advisor of the control of a reservoir ecosystem to São Paulo Univ. and Federal Univ. of São Carlos in 1974 and 1976.



They believe the main action is based by mechanical reduction.

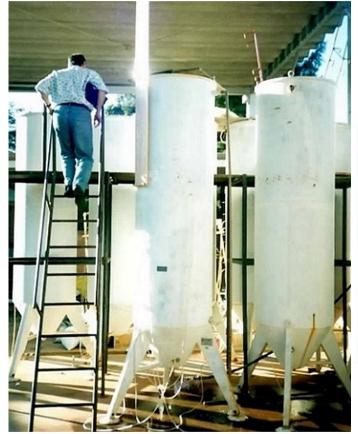


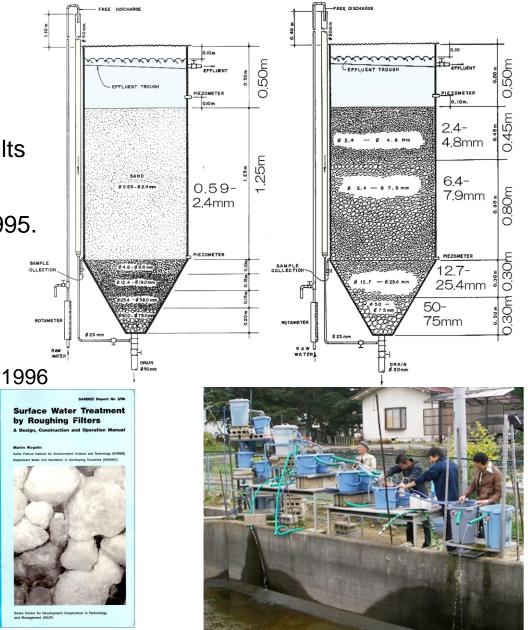
Luiz Di Bernardo examined chemical free roughing filter from 1980 in Brazil.

He reported the results in 1988, in London.

I visited São Carlos, Brazil in Aug. 1995.

He still examined URF.





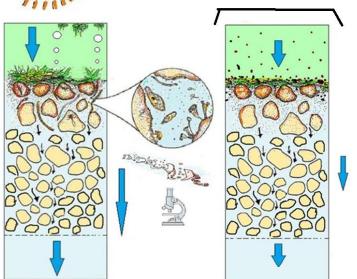
I examined URF with students from 1996, I noticed a large contribution of biological action in URF.

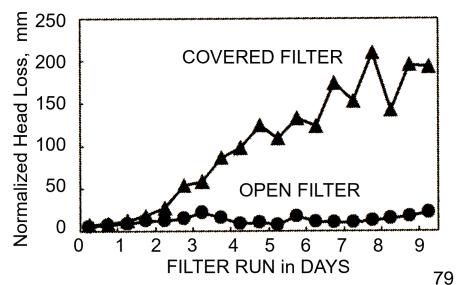
Multiple Roughing Filters to eliminate SS from an irrigation canal water.

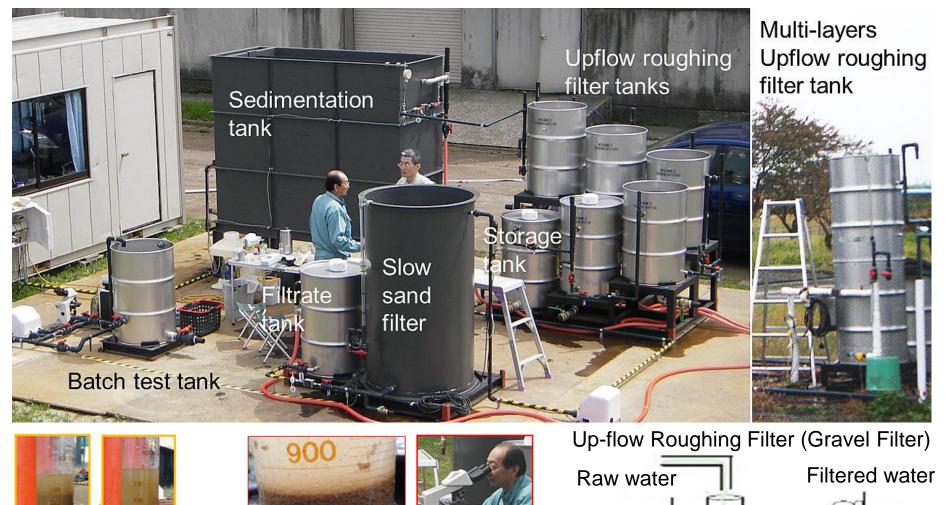


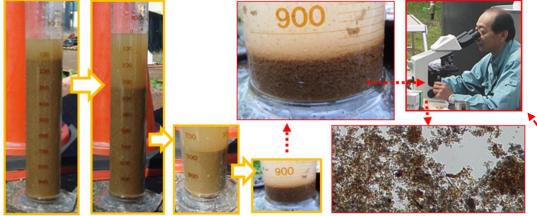


Filter resistance (NHL) of Open filter was almost constant. But the resistance of Covered filter increased almost every day.



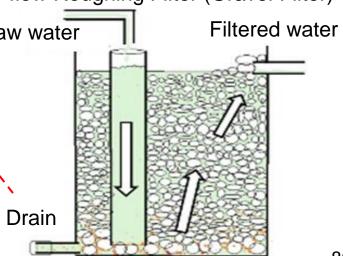






Drained sludge from URF settled Quickly.

Coagulated particles like a activated sludge.



In Japan, river water is usually clear and small amount of water.









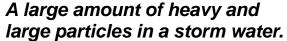
Clear and suspended free water from spring is found in a flood plain.



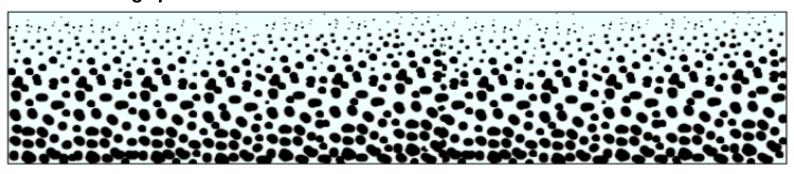


Light and small particle which is not easily settled.

Flood water is dirty. There is huge amount of soil matter from land surface.



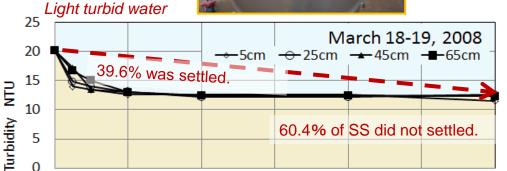


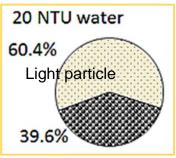




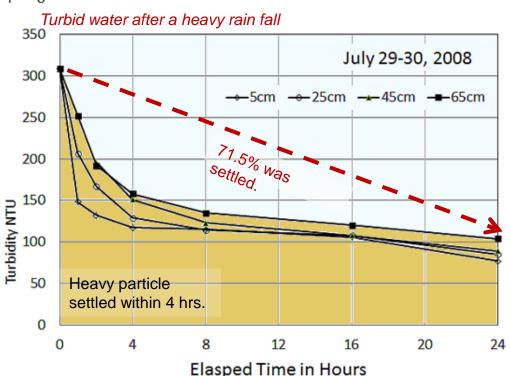


There were extremely small particles like as colloidal particles in case of small turbidity, like as less than 20 NTU. The rapid settling of turbid matters was observed within 4 hrs. However, a large portion of turbidity did not decrease.

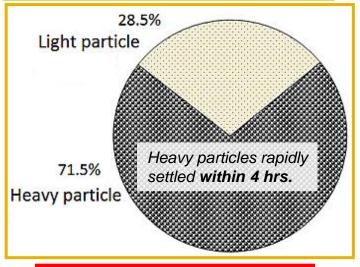




Light turbid water: small turbidity, a large portion of light particle.



In case of turbid water, a large portion was heavy particles.



4 hrs. settling is enough.





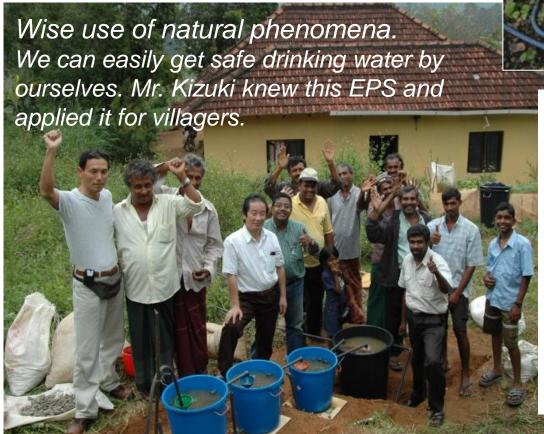
There are sedimentation tank, several gravel filter, and slow sand filter. Polluted water turns to safe and reliable water quality.

Polluted water of River Kanda, Tokyo is pumped up.

No detection of coli-form bacteria, lead, herbicides of Atrazine and simazine. Nitrate N concentration: 2.0 mg/l, Nitrite N: 0 mg/l, pH8.5, total hardness: 250 mg/l and residual chlorine 0 mg/l.

OISCA Tokyo: polluted water (Kanda river)→gravel filter → gravel filter → small sand filter→ safe water

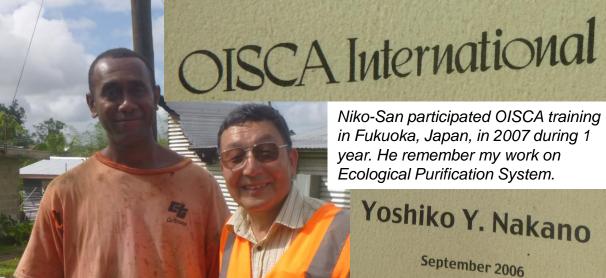
Sri Lank: three Up flow roughing filters → sand filter → safe drinking water (300 liters / day). This water is the demand of safe drinking and cooking water for 5-6 families.





Three points worth to remember

- 1. Knowing is NOT enough, we must APPLY it to something useful.
- 2. Willingness is NOT enough, we must PUT it into the PLAN and ACTION.
- Putting the PLAN into action is NOT enough, we must ACCOMPLISH the goals.

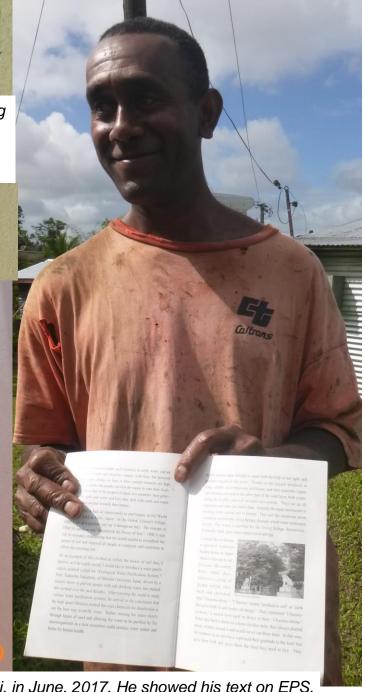


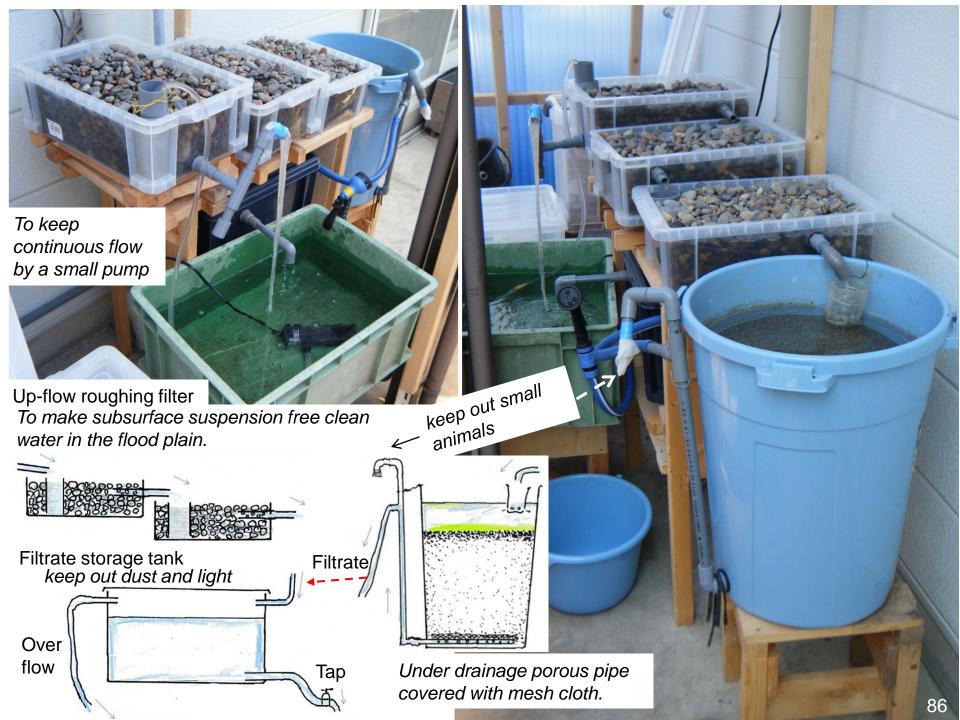
Niko-San participated OISCA training in Fukuoka, Japan, in 2007 during 1 year. He remember my work on Ecological Purification System.

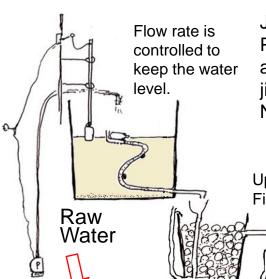
Yoshiko Y. Nakano

September 2006

As an example of this method to utilize the power of soil that, I believe, will be highly useful, I would like to introduce a water purification method called the "Ecological Water Purification System." Prof. Tadanobu Nakamoto, of Shinshu University, Japan, driven by a sincere desire to provide people with safe drinking water, has studied this method over the past decades. After traveling the world to study various water purification systems, he arrived at the conclusion that the high speed filtration method that uses chemicals for disinfection is not the best way to purify water. Rather, running the water slowly through layers of sand and allowing the water to be purified by the microorganisms in a rich ecosystem could produce water tastier and better for human health.



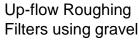




JICA training of Ecological Purification System using a simple model in Miyakojima, Okinawa, Japan, Nov. 7th. 2007.

Filters using gravel.

Sand Filter

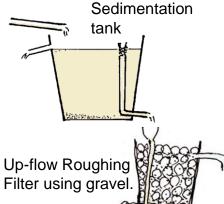




Up-flow Roughing Filter (Reduce fine particles)

(Trap Colloid matter)







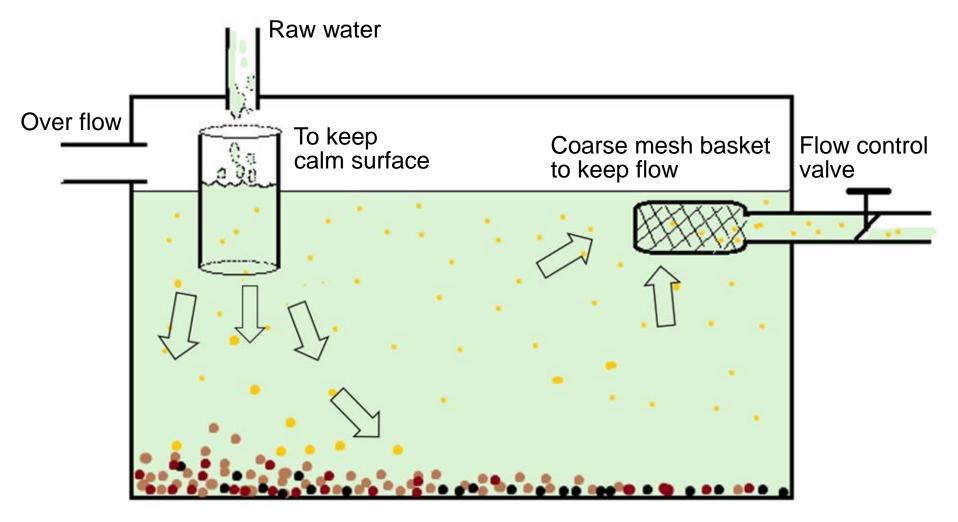


Nepal



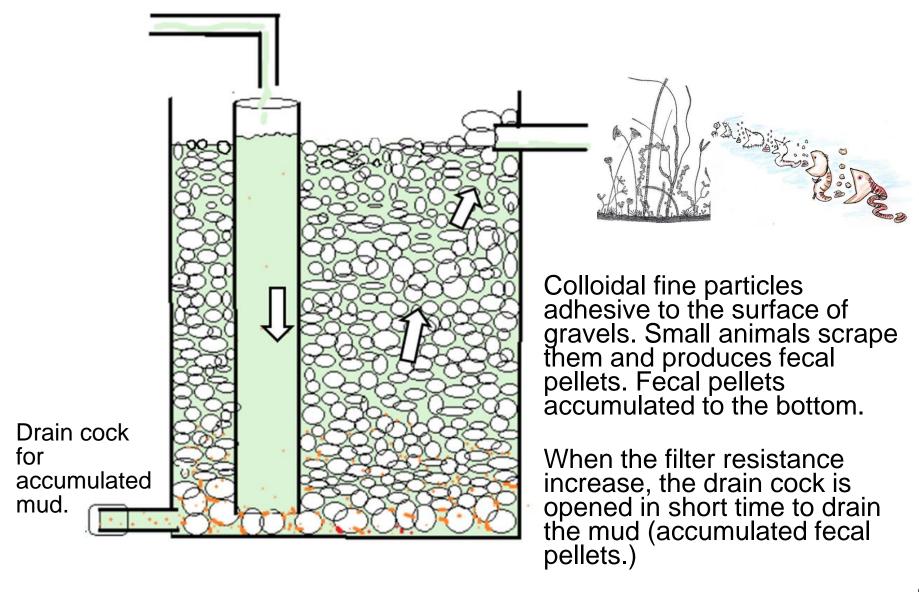


Receiving Tank (Settling Tank)



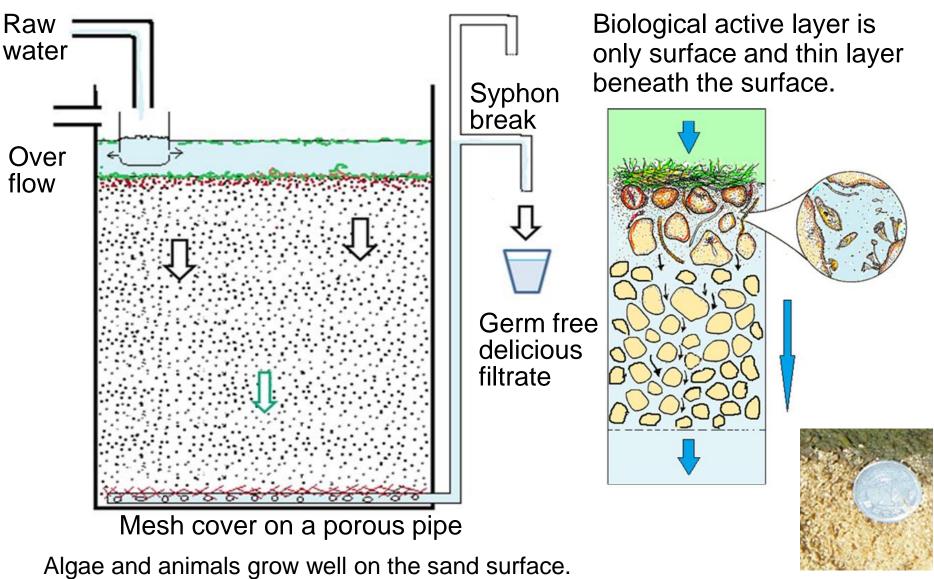
Heavy particulate matters are easily settled. However, colloidal light particles like silt material are not settled in this settling tank.

Up-Flow Roughing Filter (URF): Gravel Filter Additional URF if necessary.



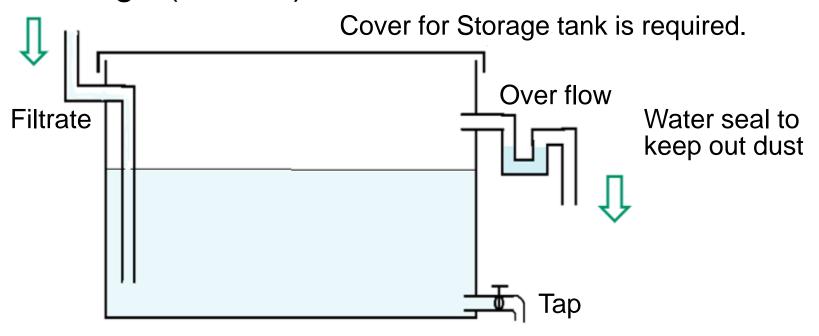
EPS (Sand) Filter (Natural Down Flow)

Ecological Purification System

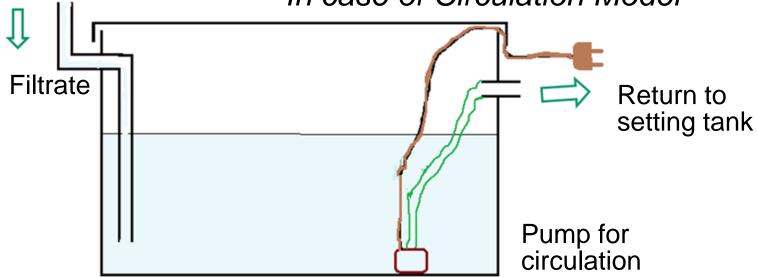


Deep sand layer is a guarantee layer for emergency.

Storage (Filtrate) Tank



In case of Circulation Model

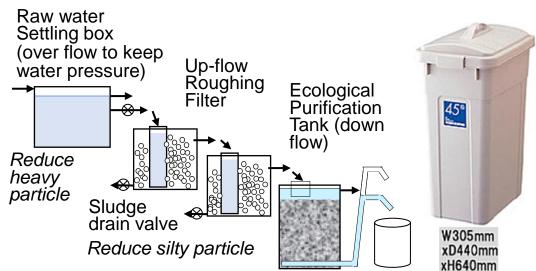




Filter rate can be measured using a cup and is regulated by a cock.

Shallow water depth over sand is important to keep aerobic condition.

Passing time of water is shorter in shallower depth.
And higher flow rate is also better to keep aerobic condition.



Filter area = 30.5 cm x 44 cm = 1,342 cm2 In case of Present Thames filter rate (40cm/h = 9.6m/d) Filtrate/min = 1,342 cm2 x 40 cm/h/ 60 (min) =895 cm3(ml)/min Filtrate/h = 1,342 cm2 x 40 cm/h = 53,680 cm3/h =53.7 liter/h Filtrate/d = 53.7 liter x 24 hrs = 1.29 m3/d

	unit	Simpson 1829	English Filter	Present Thames Filter	Experiment in Samoa
Flow rate	m/d	2	4.8	9.6	20
	cm/h	8.3	20	40	83
Flow rate in sand layer (50% porosity)	cm/h	16.7	40	80	167
Passing time of 1 m sand layer	hr	6	2.5	1.25	0.6
Passing time of upper active 1 cm	min	3.6	1.5	0.75	0.36

I studied on ecological function of Miyako-jima wks. I made a video on EPS function of Miyako wks in March 2004 and published a book in August 2005.





JICA training started in 2006.









JICA made Video in 2008

Slow sand filtration: creating clean, safe water(Full ver) in 2020





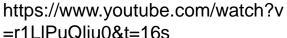


https://www.youtube. com/watch?v=V6 uD ZE_I8E&t=1218s





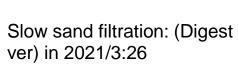
Quest for Safe and Delicious Tap Water, Miyako-jima, Island in March 2004. /15:22 With English subtitle version in Oct. 2007.





Ecological Purification System: JICA training for SIWA, April 18, 2013

> https://www.youtube.com/ watch?v=NCI9oeNM0al









https://www.youtube.com/watch?v= QAH1SoAgfL0&t=37s

JICA Training on Ecological Purification System (EPS) in Okinawa, Japan in 2022

DIY EPS bucket model making 2022 - YouTube / 38:01 https://www.youtube.com/watch?v=jz94KFkLL3E



NGO Okinawa Blue Water





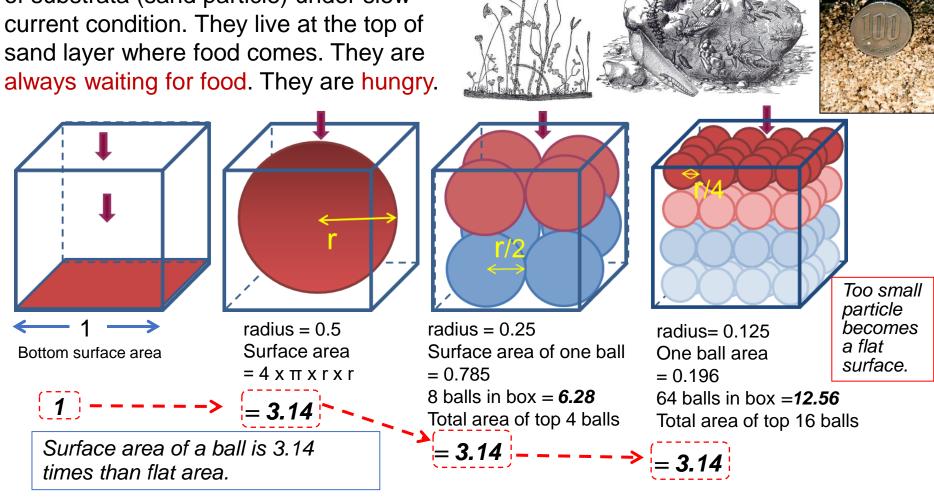








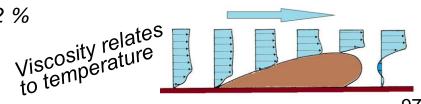
Most of small organisms live on the surface of substrata (sand particle) under slow



Total surface area of top layer of balls is always same of 3.14 times than flat area. Smaller ball makes larger area.

And, total volume of balls is always same of 52 % (porosity: 48%) in a box.

Filter resistance increases toward smaller size of particle.

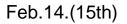


Points: shallow depth, enough radiation on the bottom, rapid growth, large size of sand.

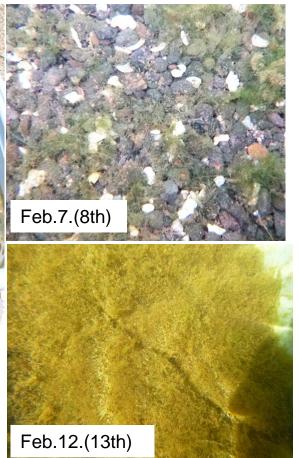
Sand separated with mosquito mesh (1-2 mm)

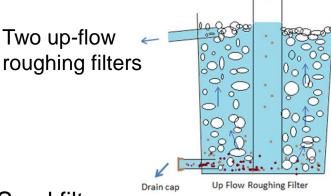




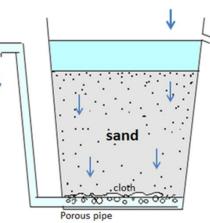


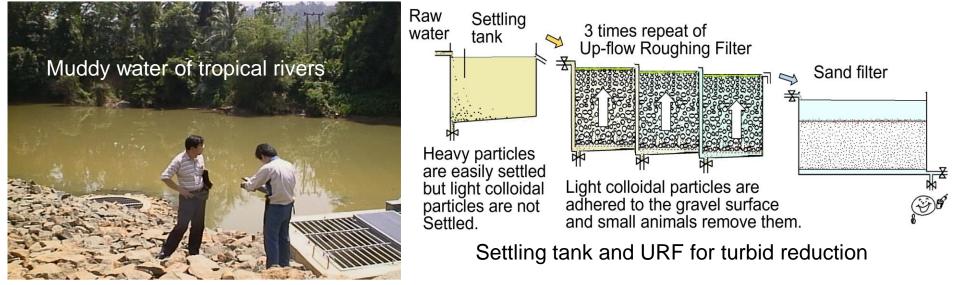
Shallow depth: Algae grow well





Sand filters (5m/d, 10m/d, 20m/d) All good filtrates.



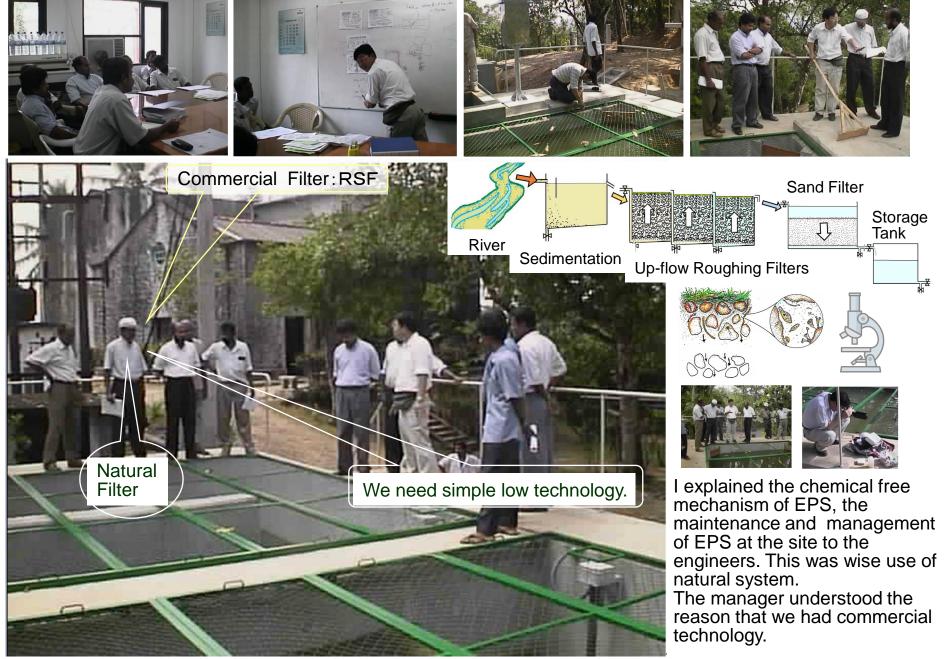


Water supply plant to the national Ratnapura hospital, Sri Lanka by EPS



Explain the ecological purification mechanism of chemical free system.

Manager said "Conventional is a commercial filter. This is a natural filter".



I visited again this site after construction in 10 years later. The hospital director said there was no problem.



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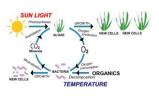




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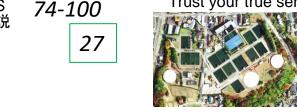
139-148

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8. Confirm by yourself. Don't believe commercial. Trust your true sense. 自分で確かめよう。



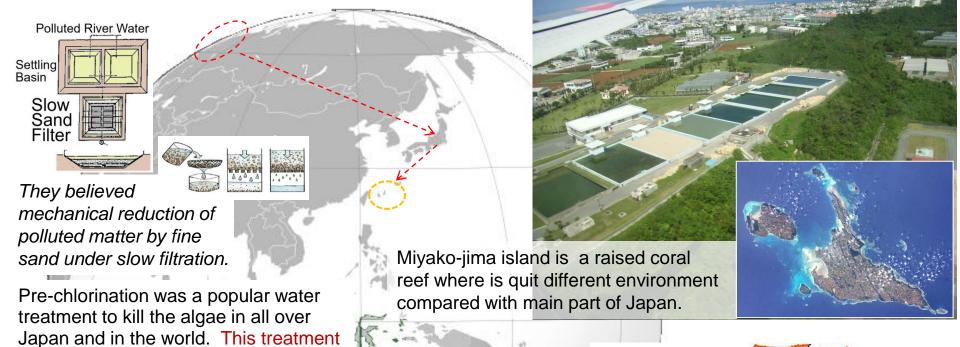


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Mr. Mitsutoshi Tomari, managing director of Sodeyama WTP, Miyako-jima, visited to Nakamoto, Shinshu Univ. in July 8, 1997.

Freshwater Lens

Rainfall

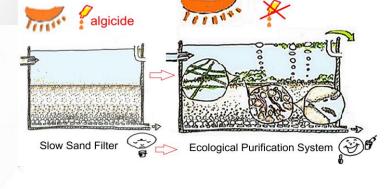
Ocean

was for Rapid sand filtration.

He stopped to injection of algaecide into receiving well.

As soon as the injection stop, the taste of tap water became delicious.

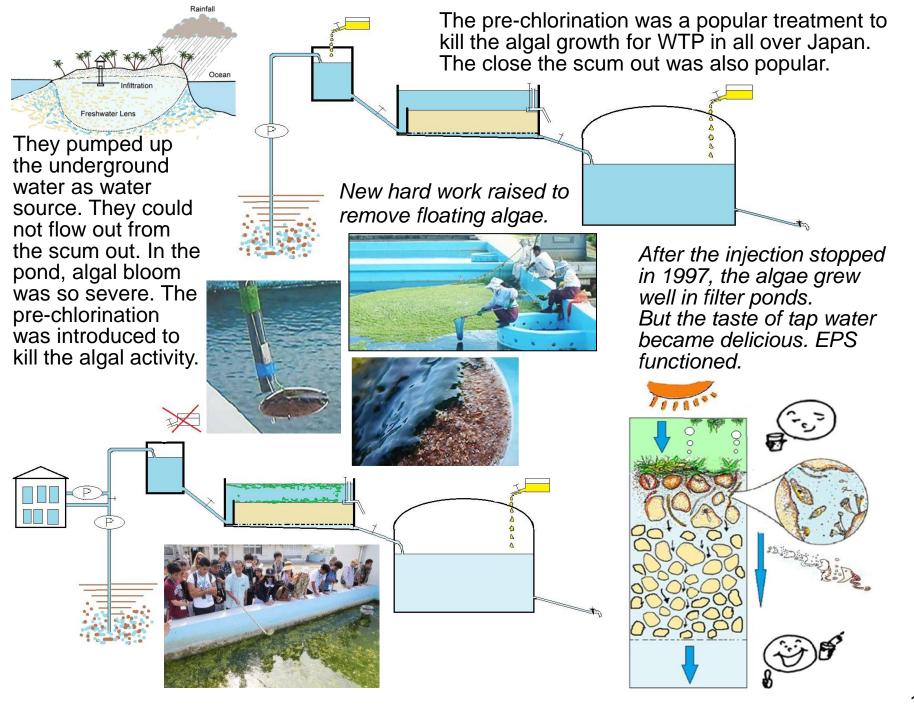
Biological communities started to work in SSF. Ecological Purification System functionated in this Slow Sand Filter.





How to make delicious water

Nakamoto published Ecological Purification System text in 2005



I started JICA training on EPS in Okinawa from 2006.



At the end of the sixweek JICA training in Okinawa (September 1, 2010), Ms. Marista from the Solomon Islands, gave a speech of thanks on behalf of the trainees.









It is also worth appreciating the Ecological Purification System as taught by you, Dr. Nakamoto; a simple, natural and yet an effective water purification technology, we can all agree to as the most relevant technology for the Islands.

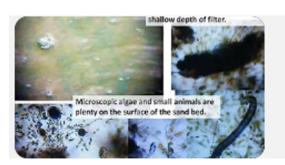
It is cheap to construct, operate and maintain which makes it even more attractive. We are grateful to your pioneering research on this technology and for generously impart this to us, so that the people of the pacific may in the very near future will have access to the high quality and delicious taste that this technology provides.

International Course on Slow Sand Filter in Okinawa, in 2010 by JICA – YouTube / 6:08

https://www.youtube.com/watch?v=c3mVlbmFPqA&t=138s

















You can deepen your understanding through outdoor experience rather than classroom lectures.





Slow sand filter problem in Samoa was solved by ecological point in 2010 – YouTube / 13:45



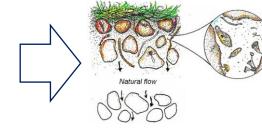
https://www.youtube.c om/watch?v=KkkwdlHui4





This problem was happened by the misunderstand of the real mechanism. Slow sand filter system is not simple mechanical filter. This is a real Ecological Purification System.





Settling tanks

Samoan people used non-treated water (Non-purified water), before construction of Alaoa Purification plant (1984).

Joseph River company (Germany) constructed 5 slow sand filters only during 1984-87.

Slow

sand

filters

Dorsch consult (Germany)
constructed settling tanks and Upflow roughing filters in order to reduce
the extraordinary load of surface run

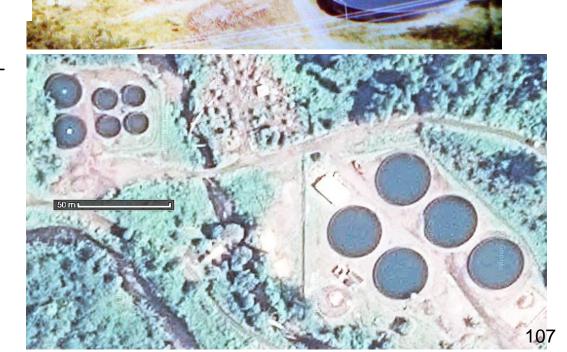
Roughing

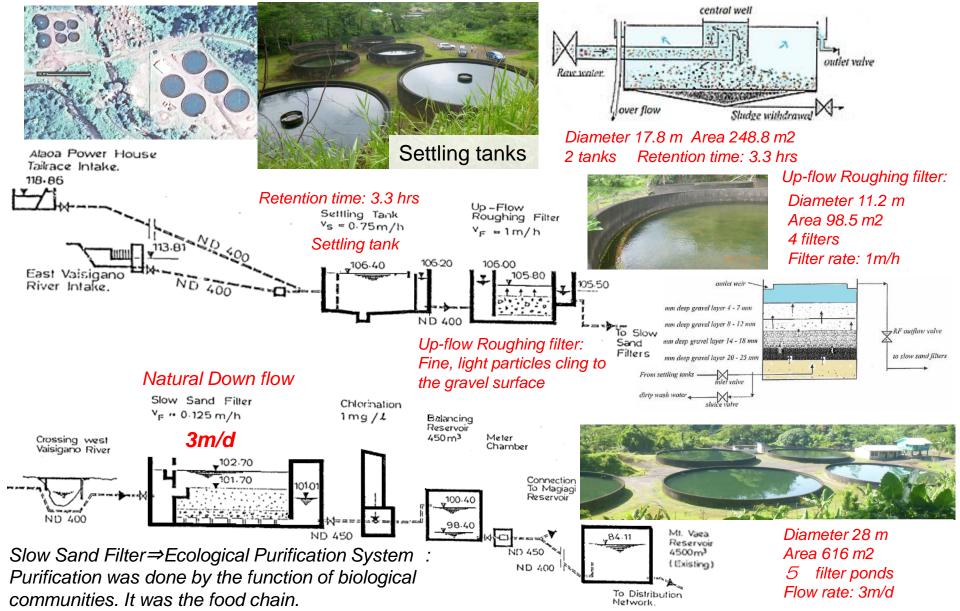
http://www.cwsc.or.jp/cwscpanel/wp-content/uploads/2022/10/AlaoaDurch-Manual.pdf

off by storm event in 2000.







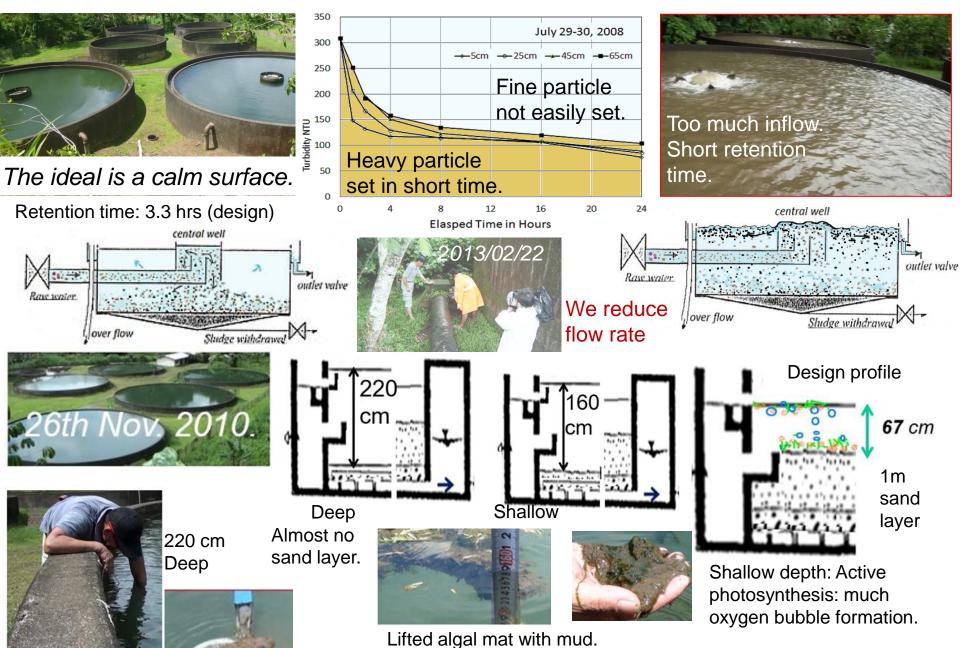


English standard rate: 5m/d (0.2m/h). 616 $m2 \times 3m/d = 1,848 \, m3/d \times 5$ filters =9,240 m3/d Present Thames rater: 10m/d (0.4m/h) 5 $m/d \approx 3,080 \, m3/d \times 5$ filters = 15,400 m3/d 00 $m/d \approx 6,160 \, m3/d \times 5$ filters = 30,800 m3/d 00 $m/d \approx 6,160 \, m3/d \times 5$ filters = 30,800 m3/d

= Any rate is good results.

One day demand: 0.1 to 0.3 m3/day person

108



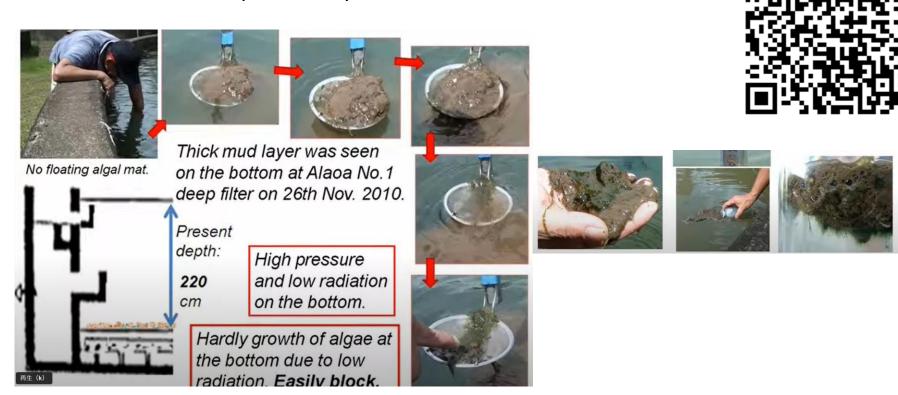
Large mud on the bottom

We recommend: Put sand. Make shallow depth.

Water depth is the key for ecological purification system of slow sand filter pond.

Role of algal mat in slow sand filter, shallow depth is key: experience in Samoa - YouTube/ 5:05

https://www.youtube.com/watch?v=ot-KAm6TuaY



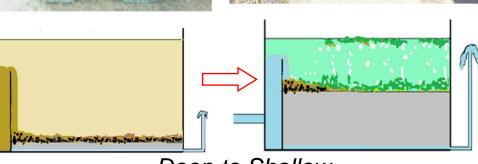


Only the good was nut on

I knew there was only sand layer on bottom porous brick in slow sand filter pond in UK.



Only the sand was put on the gravel layer using a cloth to separate them.



Deep to Shallow





Stuffs of Samoa Water Authority presented their activity at the 5th Conference at Nagoya, Japan in 2014.

They made shallow water depth of 0.5 - 1m.



CONCLUSION





- Increased sediment removal
- Self cleansing process reducing scraping frequency
- Reduction in SSF scraping Reallocation of manpower





名古屋市上下水道100周年

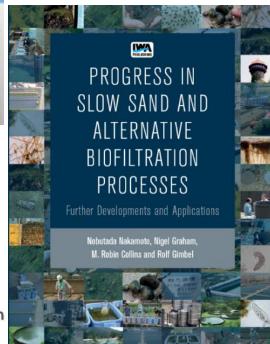
The 100th Anniversary of Waterworks & Sewerage of Nagoya



https://www.youtube.com /watch?v=Wv1FxTkDfsM&t =2s

5SSABC - YouTube / 14:15





5SSABC

第5回 緩速・生物ろ過国際会議 19th (Thu) June - 21st (Sat) June 2014 The 5th International Slow Sand and Alternative Biological Filtration Conference





Professor Nigel J.D. Graham Imperial College London, UK Chairman, Program Committee



Professor M. Robin Collins, Ph.D., P.E. University of New Hampshire Vice-chairman, Program Committee



Professor (Emeritus) Nobutada Nakamoto Shinshu University, Japan Vice-chairman, Program Committee

Biological activity is related with radiation and temperature.

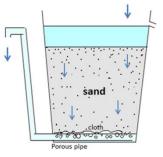
High flow rate experiment for the performance of slow sand filter was done in Samoa (tropical region) from Dec. 2012 to Feb. 2013.



Two up-flow roughing filters

Different flow rate of sand filters (5m/d, 10m/d, 20m/d) All good quality of filtrates.

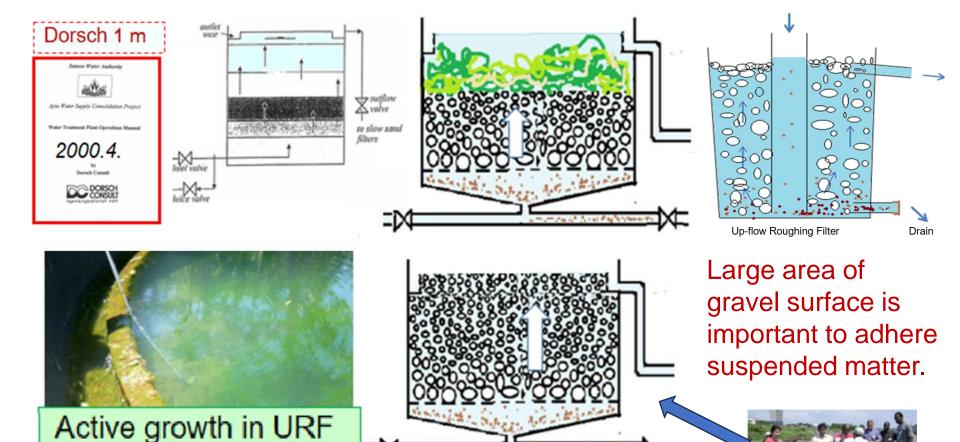
Points: shallow depth, enough radiation on the bottom, rapid growth, large size of sand.



Feb.7.(8th) 2013

Shallow depth: Algae grow well

Feb.14.(15th)





Full gravel with small crushed stones.

Clear water in river bed.

Improvements to the Purification Function. Advise for a better plant system to Samoa Make shallow depth Thicker gravel media Reduce inflow ⇒ Activate algae ⇒Expand active area ⇒Easy to settling Shallow depth is better for algal activity. March 18-19, 2008 20 → 5cm → 25cm → 45cm → 65cm 를 15

Small organisms active on the stone surface.

July 29-30, 2008

--- 25cm ---- 45cm ---- 65cm

Elasped Time in Hours

300

200

Suitable

time

settling

for

residence





Chemical Free Eco-friendly

Ecological Purification System (EPS)

0. Introduction: Phytoplankton, Reservoir study, Meet Slow Sand Filter, Importance of Ecological point. JICA training 植物プランクトン、貯水池研究、緩速ろ過、生態学の視点、JICA研修へ



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18-26

5. From JICA training in Miyako-jima, Okinawa to Samoa 宮古島JICA研修からサモアへ







16

101-

2. Key of purification in nature is food chain. Refocus to Slow Sand Filter. 浄化は食物連鎖が鍵、緩速ろ過の再認識







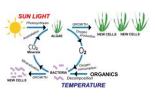


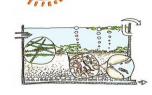


117-138

22

3. Algae and animals in Slow Sand Filter. 緩速ろ過池の藻類と動物





52-73

22



6. Safe water for rural people by EPS in Fiji

フィジーの展開:生物浄化法で地方給水へ



139-148

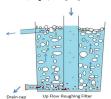
生物浄化法は酸素が必須





10

4. Up-flow Roughing Filter to reduce SS 濁り対策で上向き粗ろ過、モデルで解説





74-100

27

8. Confirm by yourself. Don't believe commercial. Trust your true sense. 自分で確かめよう。





149-163

15



He returned back to Fiji. he

Picture: ELIKI NUKUTABU



made a model to make safe

Water. Water source was rain

Kick off Workshop on Jan. 16.

Commander Francis B. Kean.

Ministry of Works, Transport,

drinking water by EPS

2013. at Holiday Inn.

Permanent Secretary,

harvest tank.

Public Utilities.

technology at the yard of Department of Sewage and

Mr. Vishwa Jeet from Fiji gave many questions to us.

The PM had attention for EPS display during the World Marine Time Day on Sept. 28, 2012. Our Director informed the PM on the functions of the EPS and reference to JICA was made.

The Fiji Times ONLINE

Quality water for all

Thursday, January 17, 2013

WITH the new Ecological Purification System (EPS) in the pipeline, water quality enjoyed by urban people can now also be made available in rural villages and communities.

A workshop on a new water treatment system, hosted by the Department for Water and in collaboration with the Japan International Cooperation Agency (JICA) in Suva yesterday, revealed that EPS was an economical and ecological way of purifying water.

Works permanent secretary Commander Francis Kean said the vision to provide safe adequate water and efficient sanitation to the whole population in Fiji was in government's roadmap.

'About 70 per cent of our rural population drink water directly from creeks and river sources which are most

Water treatment expert Dr Nakamoto Nobutada speaking at the Holiday Inn. 118



cleaner water



THE FIJIAN GOVERNMENT

EPS technology is our technology for ours. We can make it by ourselves.



KALOKOLEVU VILLAGERS WELCOME ACCESS TO CLEAN DRINKING WATER

7/17/2013

More than 270 villagers in Lami now have access to clean and safe drinking water the ecological purification system (EPS), thanks to the partnership between the Departm and Sewerage, the Water Authority of Fiji (WAF) and the Japan International Cooperation (JICA).

The EPS, which is the first of its kind to be installed in a local rural setting, was comr the Ministry of Works, Transport and Public Utilities permanent secretary Commande in Kalokolevu village, Lami yesterday.

Ecological Purification System in Fiji, 2013 for Safe Drinking Water -

YouTube/ 3:05

https://www.youtube.com/watch?v

=kbCaSAACQZ0

proving accessibility

Beginning of Ecological Purification Government in parti System (EPS) to make safe drinking

water in Fiji / 1:45

igh better accessibility to Change, Peace and Progress

https://www.youtube.com/

watch?v=wxAGhjx7e40











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able Deve

EPS technology is our technology for ours. We can make it by ourselves.



THE FIJIAN GOVERNMENT

Opening ceremony of public tap on September 11, 2013. at 2nd Eps.



Clean, safe water brings joy to village



NAVATUVULA VILLAGERS GET ACCESS TO CLEAN DRINKING WATER

9/12/2013

Improving the living standards of the rural communities through better accessibility to c safe drinking water and sanitation is one of the key priorities of the Fijian Government.

This was highlighted today by the Ministry for Works, Transport and Public Utilities perm secretary, Mr Francis Kean at the commissioning of the second ecological water purifical (EPS) at Navatuvula village in Sawani, Naitasiri.

The first EPS was commissioned at Kalokolevu village in Lami about two months ago.

Mr Kean said his ministry's aim is to install EPS into rural water supply systems to ensur removal of contaminants before water is consumed.

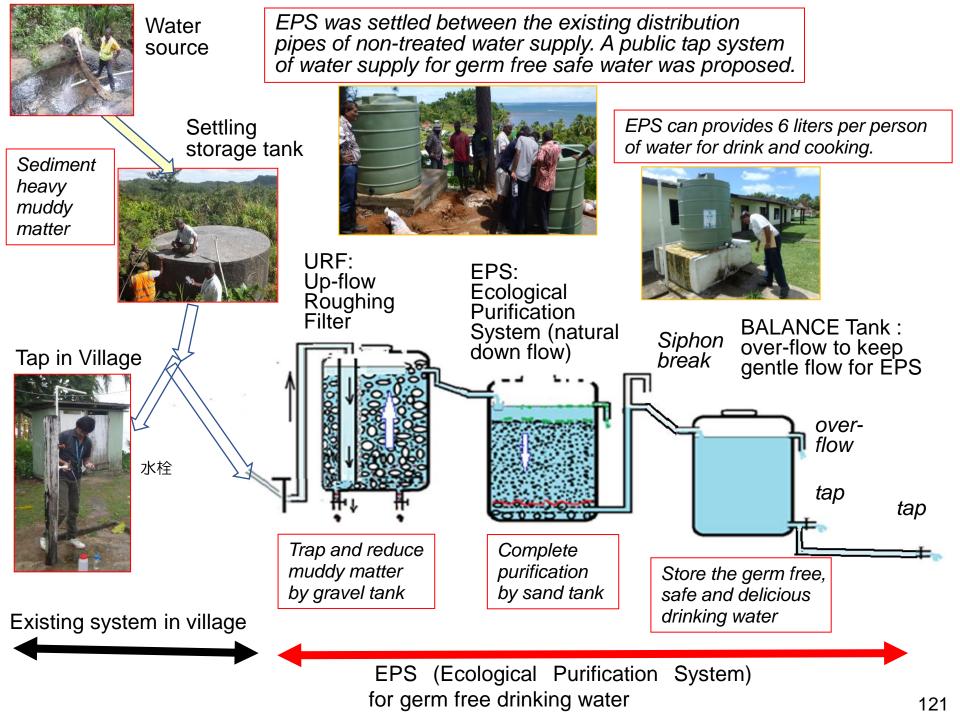
"The incorporation of the EPS into rural water projects will take place after further monithe results of the pilot projects by the Water Authority of Fiji (WAF)," Mr Kean added.

Villagers of Navatuvula, Naitasiri have a reason to smile, thanks to the governments of Fiji and Japan. From yesterday the villagers started drinking safe and clean water, commissioned by the Permanent Secretary for Works, Commander Francis Kean. The water is supplied through an ecological purification system (EPS) – similar to traditional mineral water production.

https://www.youtube.com/watch?v=Vrr2EOS1PMA

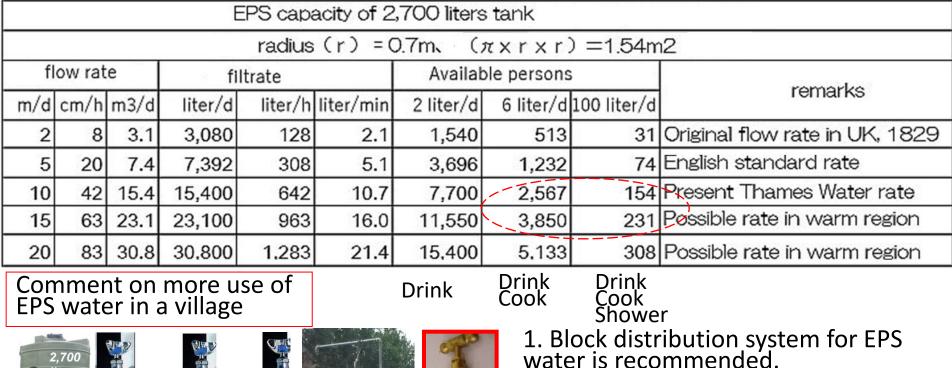
Quality Water for All: Safe and Clean Water Project in Fiji, 2013 - YouTube/ 7:43









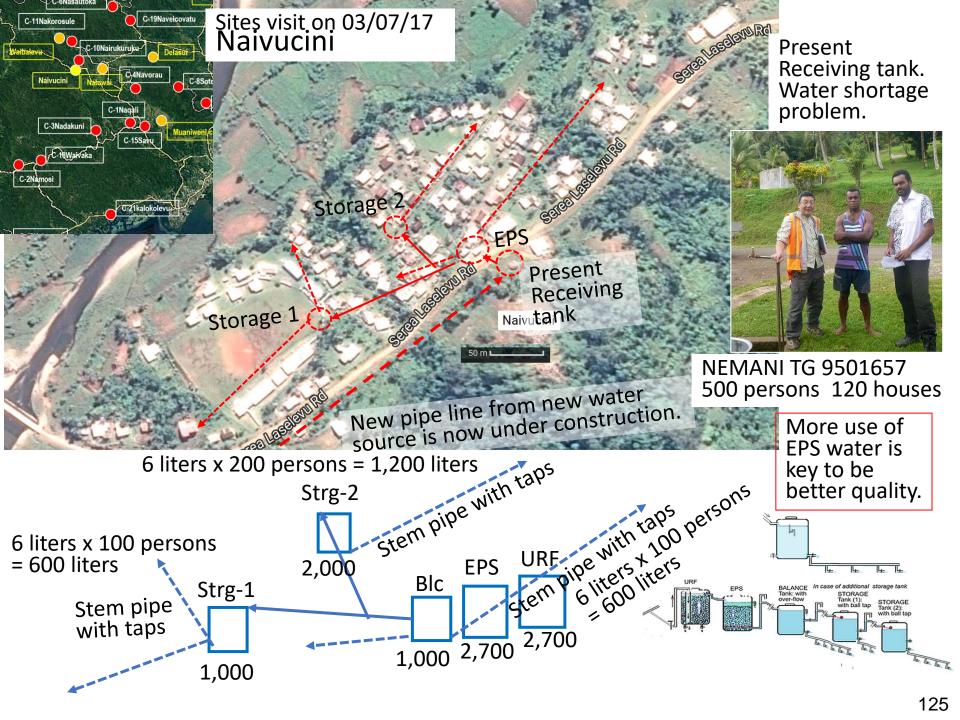




There is non-detected leak, therefore we have to install EPS pipe with may public taps in a small village (even up to 200 persons).

Tank 3

If there is absolutely no leak problem, we may connect to present distribution pipe in case of a small village. But this is risky. I cannot recommend this connection. 124

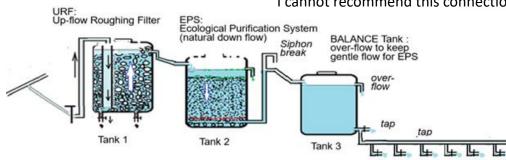


Comment on more use of EPS water in a village

Up to 200 persons in a village

If there is no leak problem, we may connect to present distribution pipe in case of a small village. But this is risky. I cannot recommend this connection.

There is non-detected leak, therefore we have to install EPS pipe with may public taps in a small village.





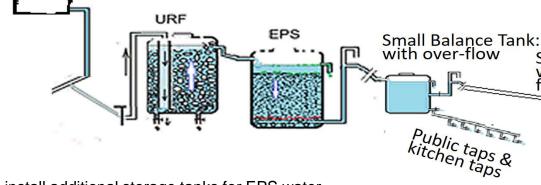


200 to 500 persons in a village

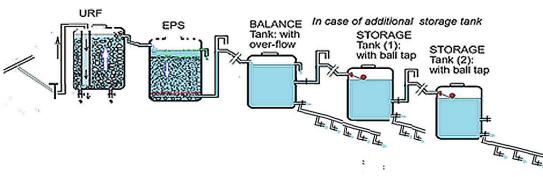
We supply EPS water by new EPS pipe line with many public taps. Or we install additional storage tanks for EPS water. And we supply EPS water by new EPS pipe line with many public taps.

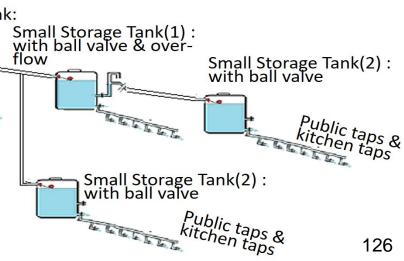
More 500 persons in a village

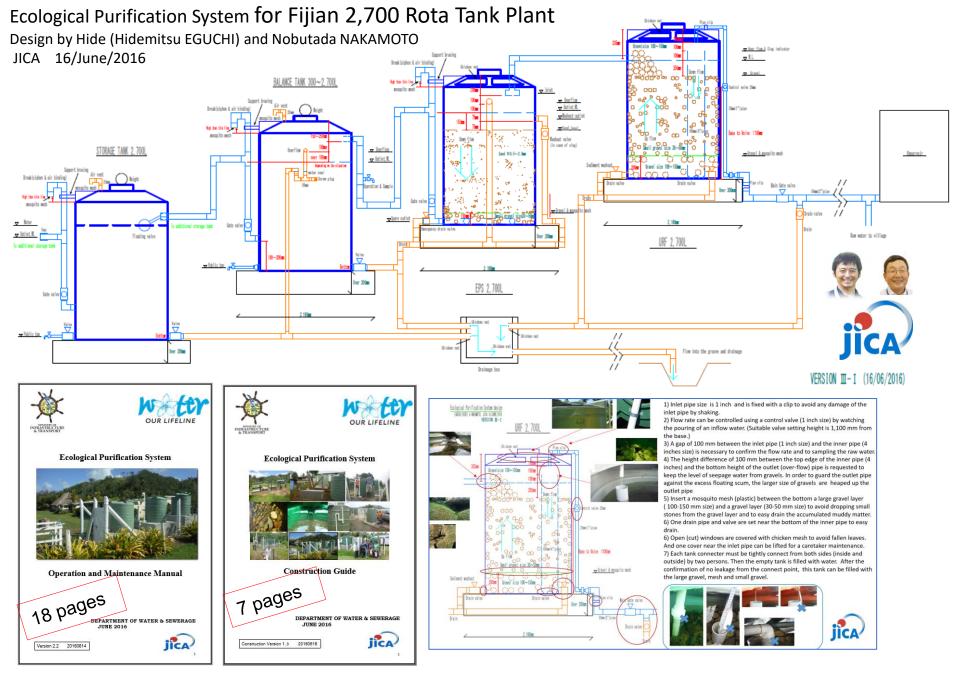
Present receiving tank

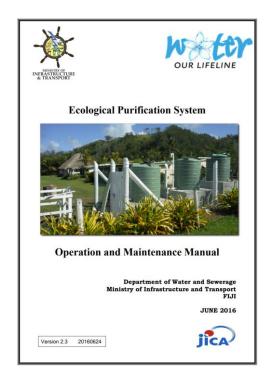


We install additional storage tanks for EPS water. And we supply EPS water by new EPS pipe line with many public taps.





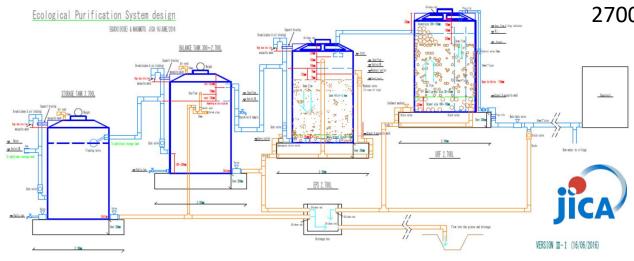




http://www.cwsc.or.jp/files/pdf/Fiji/160614-Eng-Fiji-EPS-Manual.pdf



http://www.cwsc.or.jp/file s/pdf/Fiji/Fiji%20EPS%202 016%20tank300-2700CAD-Design.pdf







- 1) Inlet pipe size is 1 inch and is fixed with a clip to avoid any damage of the inlet pipe by shaking.
- 2) Flow rate can be controlled using a control valve (1 inch size) by watching the pouring of an inflow water. (Suitable valve setting height is 1,100 mm from the base.)
- 3) A gap of 100 mm between the inlet pipe (1 inch size) and the inner pipe (4 inches size) is necessary to confirm the flow rate and to sampling the raw water.
- 4) The height difference of 100 mm between the top edge of the inner pipe (4 inches) and the bottom height of the outlet (over-flow) pipe is requested to keep the level of seepage water from gravels. In order to guard the outlet pipe against the excess floating scum, the larger size of gravels are heaped up the outlet pipe
- 5) Insert a mosquito mesh (plastic) between the bottom a large gravel layer (100-150 mm size) and a gravel layer (30-50 mm size) to avoid dropping small stones from the gravel layer and to easy drain the accumulated muddy matter.
- 6) One drain pipe and valve are set near the bottom of the inner pipe to easy drain.
- 6) Open (cut) windows are covered with chicken mesh to avoid fallen leaves. And one cover near the inlet pipe can be lifted for a caretaker maintenance.
- 7) Each tank connecter must be tightly connect from both sides (inside and outside) by two persons. Then the empty tank is filled with water. After the confirmation of no leakage from the connect point, this tank can be filled with the large gravel, mesh and small gravel.



Fiii上下水道局はモデルを使ってEPS事業を積極的に解説をしている。

WHAT IS AN ECOLOGICAL PURIFICATION SYSTEM?

An Ecological Purification System or EPS is a method of purifying water using natural resources such as stones, gravel and sand stored in two or three different tanks where water will filter through the stones, gravel and sand as a purification process before it is ready for drinking or consumption.

Algae grows on the sand surface to provide oxygen and trap particles and remove nutrients. Other microorganisms decompose organic matters. This food web results in the removal of impurities (organic/inorganic and pathogenic) in the process, resulting in purified water.

This system does not require power or chemicals. It is cost effective and easy to construct.





LAU VILLAGER DRINKING WATER THAT HAD BEEN TREATED BY EPS

Contact Address Level 3 Nasiiivata House, Samahola, Suva. Phone: (679) 3310 575 Fax: (679) 3310672



ECOLOGICAL PURIFICATION SYSTEM

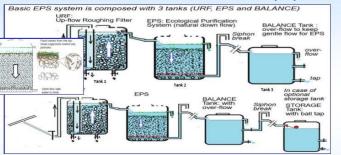


The Department of Water and Sewerage is responsible for the implementation of Ecological Purification Systems in Fiji using biological processes of nature to clean and purify water for

human consumption.

COMPLETE SERVICE DELIVERY THAT IS ACCESSIBLE TO ALL

UNDERSTANDING HOW THE ECOLOGICAL PURIFICATION SYSTEM (EPS) WORKS:



- Water flows from source into the Upflow Roughening Filter
 Tank (URF) which has gravel.
- From the URF Tank, water then flows into the Ecological Purification System Tank (EPS) which consists of sand with
- algae growth and other micro-organisms (established ecosystem) present to purify water.
- With the slow filtering, water then passes into a storage tank ready for consumption.

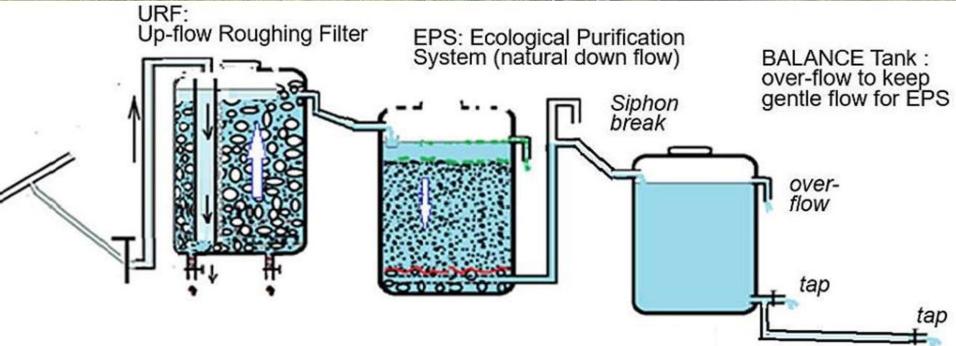
ACCESSIBLE, SAFE, AFFORDABLE DRINKING WATER AND SANITATION FOR FIJI.

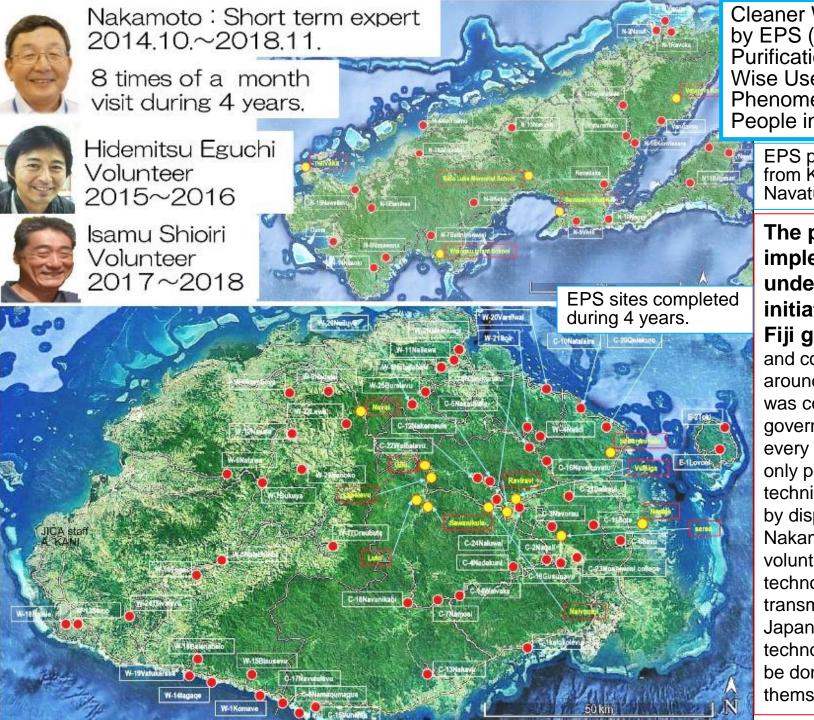




New movement to make more large scale EPS plant arises by own activities of a rural village in March, 2018.







Cleaner Water Project by EPS (Ecological Purification System: Wise Use of Natural Phenomena) for Rural People in Fiji

EPS project started from Kalokolevu and Navatuvula in 2013

The project was implemented under the initiative of the Fiji government, and construction of around 30 plants was covered by the government budget every year, and JICA only provided technical cooperation by dispatching Nakamoto and volunteers. EPS technology has been transmitted from Japan to Fiji as a technology that can be done by themselves. 132



EPS Fiji Wksp 2019 for safe water/ 7:08

https://www.youtube.com /watch?v=vji0ay-7GA8





Public Seminar/ Workshop

" An approach to securing the safe water "

Reviewing Fiji's successful EPS implementation at Rural Area and future perspective of implementation in PICs

12 & 13 March 2019

@ Japan-Pacific ICT Centre, USP Laucala Campus





EPS Seminar/ Wksp at USP, Suva, Fiji March 2019/ 4:32 Day 1 09:30~17:00 Public Seminar (Inc. refreshments & Lunch)

https://www.youtube .com/watch?v=fEl5gh BzfMw&t=23s



Main Presenter - Dr Nobutada NAKAMOTO

JICA Expert, EPS advisor for Rural Water Supply Professor Emeritus of Shinshu University, Japan * Live lecture from JICA HQ. Tokyo Japa

Day 2 09:00~18:30 Workshop & Study Tour (Inc. lunch)** Workshop - Demonstration of EPS Construction By Mr Makoto YANO, Okinawa Blue Water, Japan

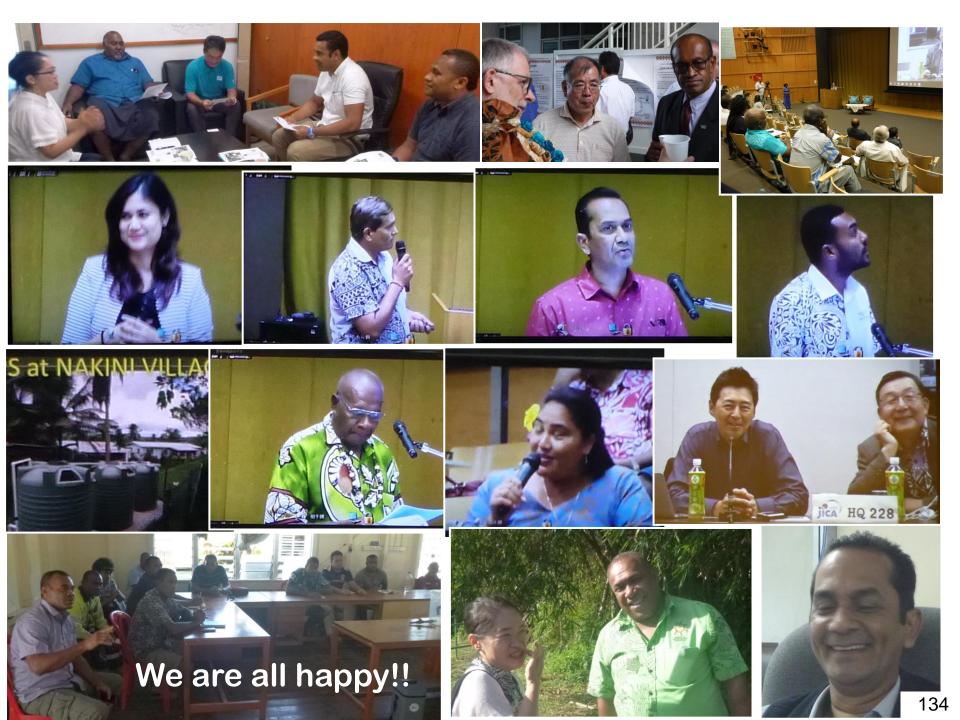
Study Tour - EPS Site Visit to NAKINI Village

18:30~20:00 - Evening Reception (Cocktail Party)



** Pre-registration is required at Day 1 (close at 11:30) due to limited space.

For further details, please contact JICA Fiji Office by email: jicafj-recept@jica.go.jp





Workshop

Fijian EPS Fijian to for rural Roroject for rural and the perspective of inherent tarted 12 people in 2019 2013. (e) Japane ICT Centre, USJ annount from











Ecological Purification System for Safe Drinking Water

Application of Natural Process -

Eco-friendly technique to make artificial spring water

NAKAMOTO Nobutada, Dr. Science Prof. Emeritus of Shinshu University, Japan



August 2018

Smart Treatment System to make artificial spring water by Eco-friendly technique.

Toward Zero Waste World by Chemical-free System JICA training







Microscopic organism is the key of EPS.







Biological activity was evaluated by the diurnal change of dissolved oxygen.

Ecological Purification System

NAKAMOTO 2018

http://www.cwsc.or.jp/files/pdf/EPStext-NC-2019.pdf



This is Fijian EPS project.
Fijian people made EPS by themselves.

JICA short term Expert N. NAKAMOTO Oct. 2014-Nov.2018

8 times: Each about one month



JICA Volunteer Hide EGUCHI 2015-2016

r JICA Volunteer Isamu SHIOIR 2017-2018









Chemical Free Eco-friendly

Ecological Purification System (EPS)

0. Introduction: Phytoplankton, Reservoir study, Meet Slow Sand Filter, Importance of Ecological point. JICA training 植物プランクトン、貯水池研究、緩速ろ過、生態学の視点、JICA研修へ



17

1. Water cycle, Safe water, Acceptable risk. 水循環、安全な水、許容できるリスク







27-51

18-26

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16

101-

2. Key of purification in nature is food chain. Refocus to Slow Sand Filter. 浄化は食物連鎖が鍵、緩速ろ過の再認識









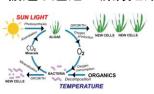
25



117-138

22

3. Algae and animals in Slow Sand Filter. 緩速ろ過池の藻類と動物





52-73

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7. Aerobic condition is essential for EPS. 生物浄化法は酸素が必須

6. Safe water for rural people by EPS in Fiji

フィジーの展開:生物浄化法で地方給水へ



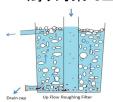




139-148

10

4. Up-flow Roughing Filter to reduce SS 濁り対策で上向き粗ろ過、モデルで解説





74-100

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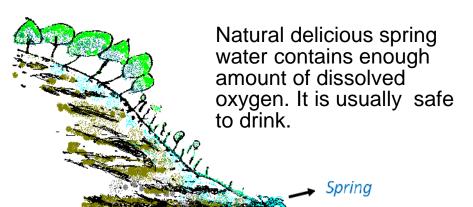


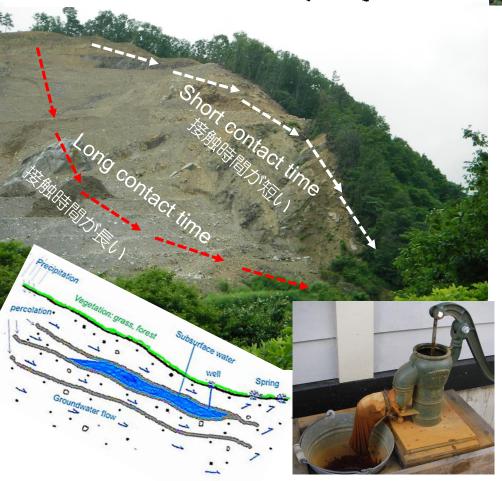




149-163

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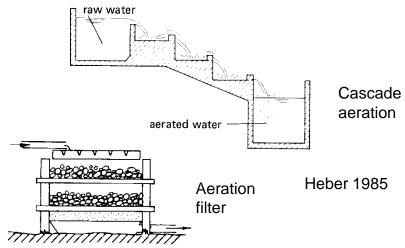




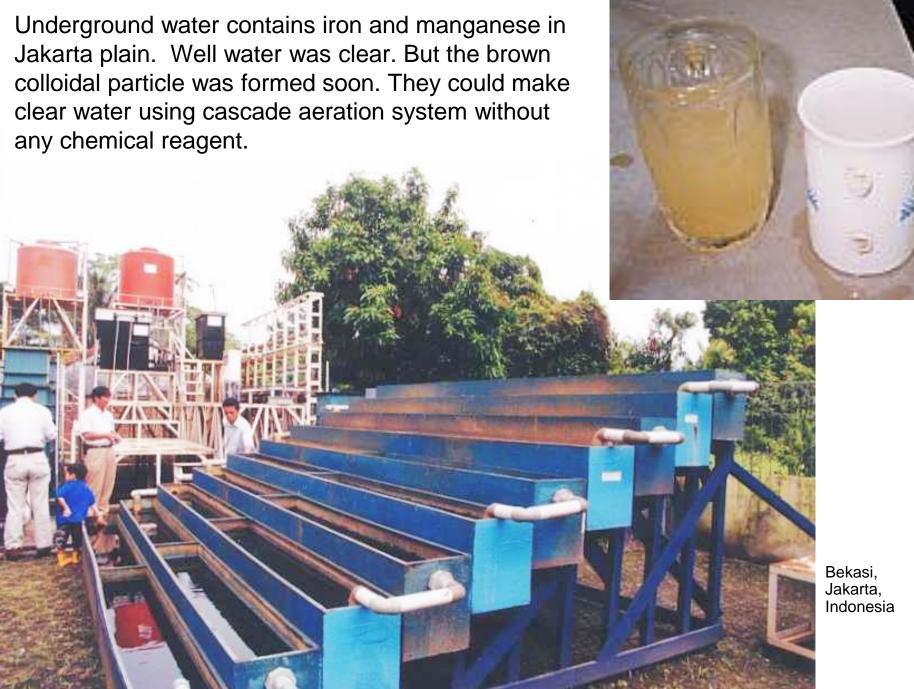


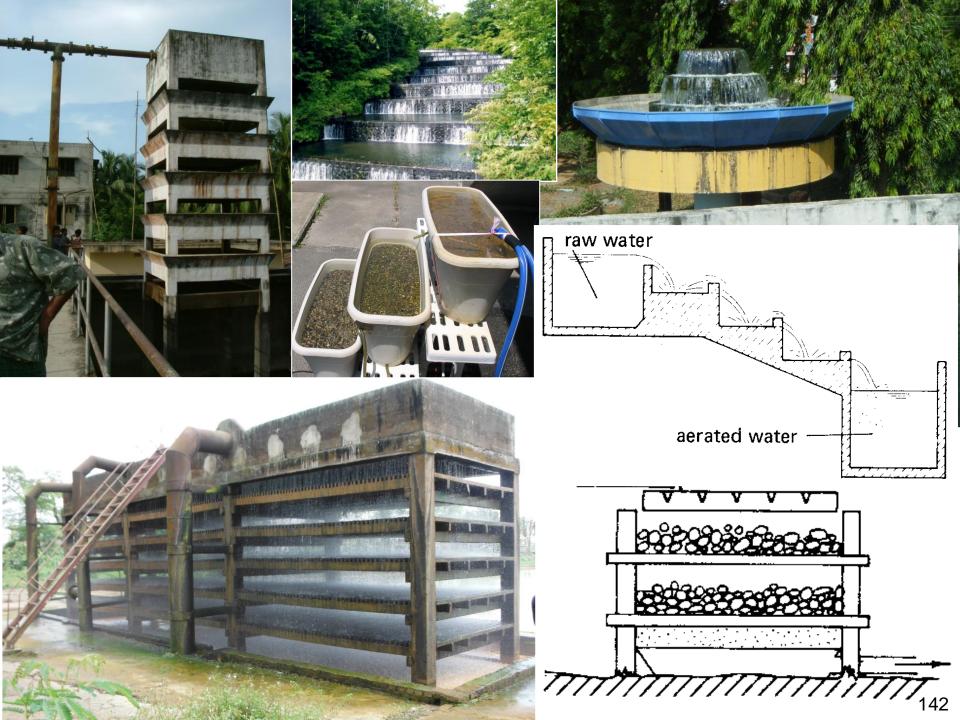


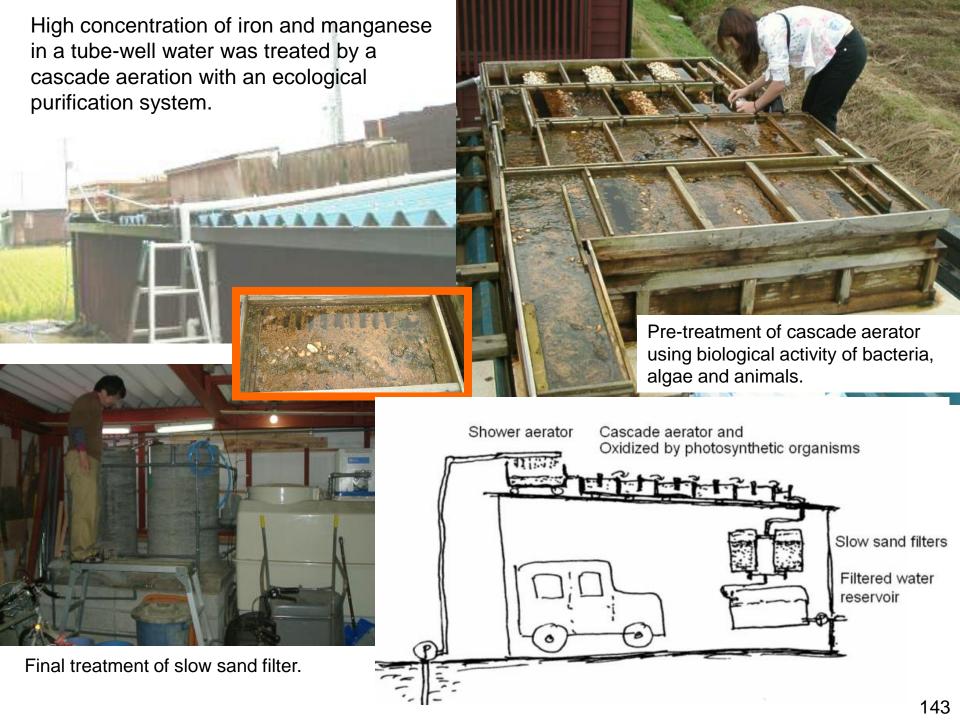
Addition of oxygen:
Aeration is frequently used for treatment of groundwater (reduction of unpleasant tastes and odors, discoloration, precipitation of iron and manganese).



Iron and manganese are oxidized and form nearly insoluble hydroxide sludge. They can be removed in a settling tank (a coarse filter). 140







Use of natural slope, drinking water could be made by EPS, Bolivia, 2008



After 4 days, filtered water became clear. After one month, the water became drinkable water, in which coli-form bacteria form was not detected.

Volunteer JICA's report, Horie, T. 2009

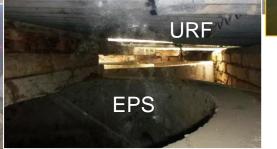


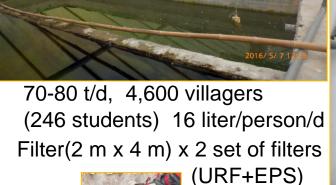


China: Mr Huo Daishan and his sons built EPS to made safe drinking water. (helped by Mr Jin sheng zhé)









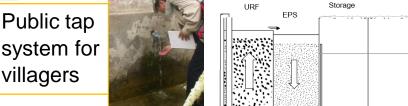


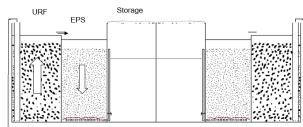
Presser tank

6 t/d, 500 persons. 12 liter/person/d

Supply to owner's kitchen.







Mr. Huo and his sons made 40 EPS by themselves.





Chemical Free Eco-friendly

Ecological Purification System (EPS)

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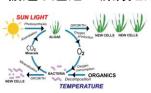




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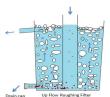


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74-100

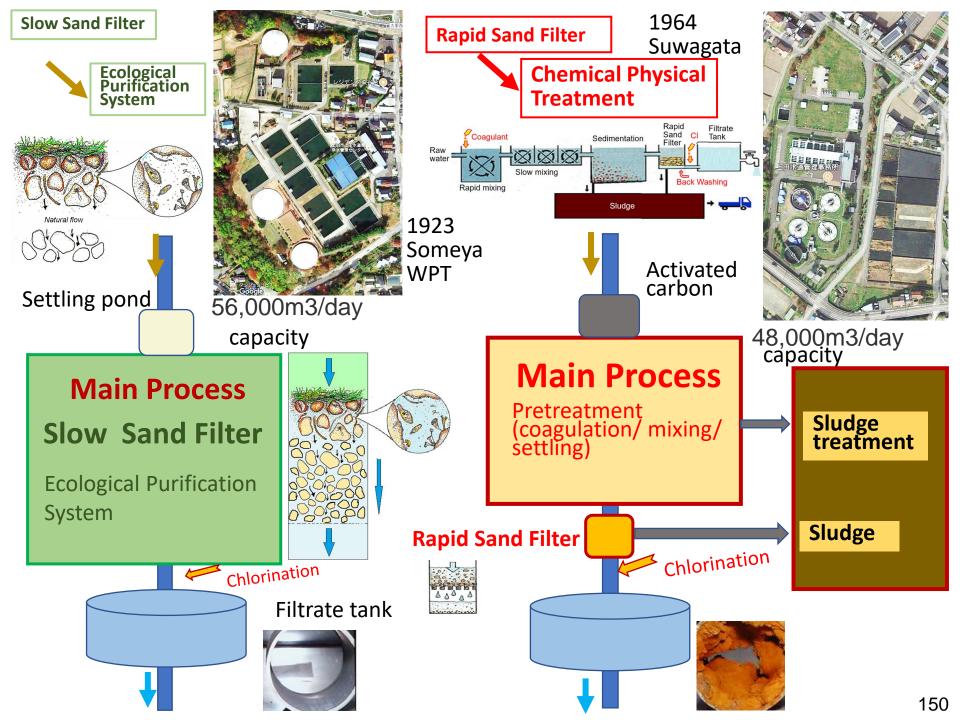
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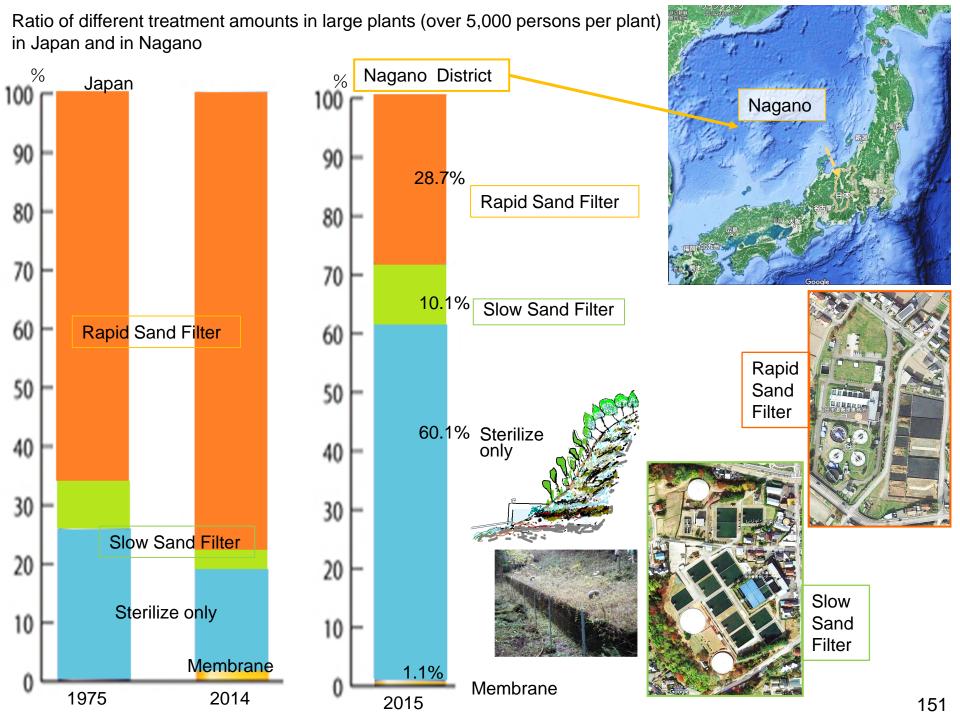




149-163

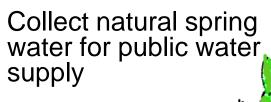
15











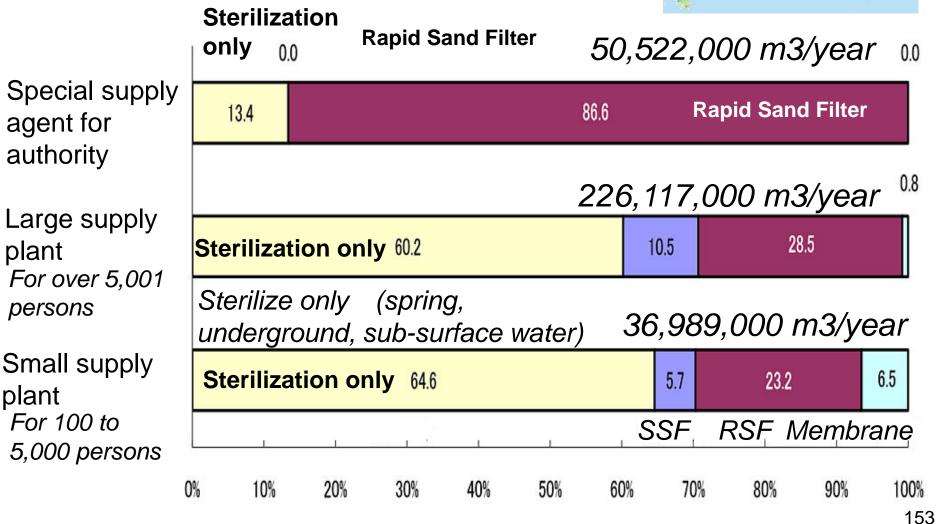






Statics of water supply in Nagano (2012) *Nagano is mountain region.*

Ratio(%) of water supply by different system.



日本

Surface water of River Ohta



Toita Intake +Settling

Settling + Sedimentation





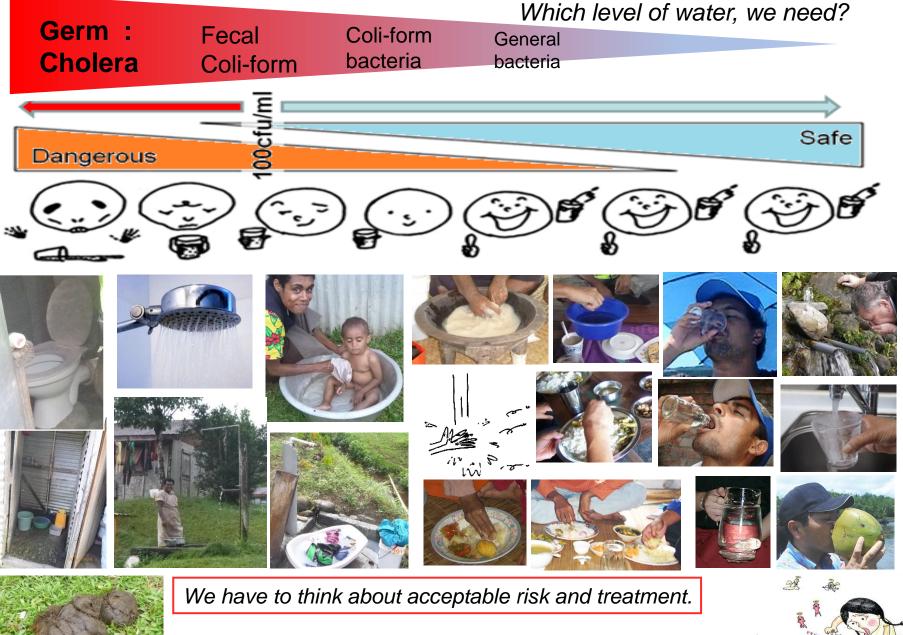
Fuchu WTP: 1965: capacity 27,000 m³/day

Fuchu WTP (Slow sand filter): From May 6, 1965 capacity 27,000 m³/day









Which level of treatment, we need?

Is this, safe or not?

156

When we can understand EPS, we can make the plant for our life by ourselves.



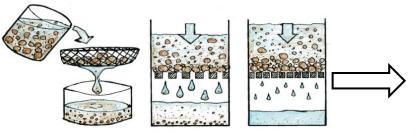
THIS is FOOD CHAIN

- 1 The present vertical type of slow sand filter was devised by James Simpson in 1829 after his 2,000 miles inspection trip all over the Britain.
- This filter provided safe drinking water, free of pathogens to residents in London. This vertical type of filter spread round the world and was known as the "English Filter".
- 3 Slow sand filter has been believed that it was a mechanical filter with fine sand under slow current.
- 4 However, the major contribution of the purification of the impurities is the food chain in this system.
- (5) The word of "slow" was "gentle for organisms".
- 6 Recently, the English filter of "Slow Sand Filter" has been recognized as "Ecological Purification System" in Japan.

collection, crush, grazing, fecal pelle producer, carrying up particles

Slow Sand Filter → Biological Filter → **Ecological Purification System**English Filter : Mechanical filter New Concept and New Name

Short time work Long term action





food chain

microbial activity, anaerobic condition, fermentation, decomposition of hardly decomposable matter

EPS -Use of Natural Process -Chemical Free : Gentle for small organisms



Remember Three Steps





- 1. Knowing is NOT enough, we must APPLY it to something useful.
- 2. Willingness is NOT enough, we must PUT it into the PLAN and ACTION.
- 3. Putting the PLAN into action is NOT enough, we must ACCOMPLISH the goals.













Chlorinated

water.

We need simple low technology.

People love a new technology. People imagine new world.





People trust natural spring water.





This water is purified by natural EPS.





Japanese Ministry of Foreign Affair and Japanese Government promote EPS for the world.

