

# Ecological Purification System

July 13 (Mon) am 10- pm 16. 2026,  
at JICA Tokyo Center

① 17 slides

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Dr. Science

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<https://eps.watervision.jp>

## Contents:

① Introduction : EPS

② Quest for Pure Water  
from **SSF** to **EPS**.

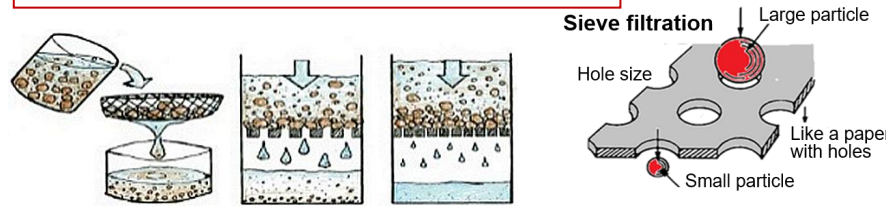
③ Water Cycle, Safe  
and Acceptable Risk.

④ Food Chain is Key.

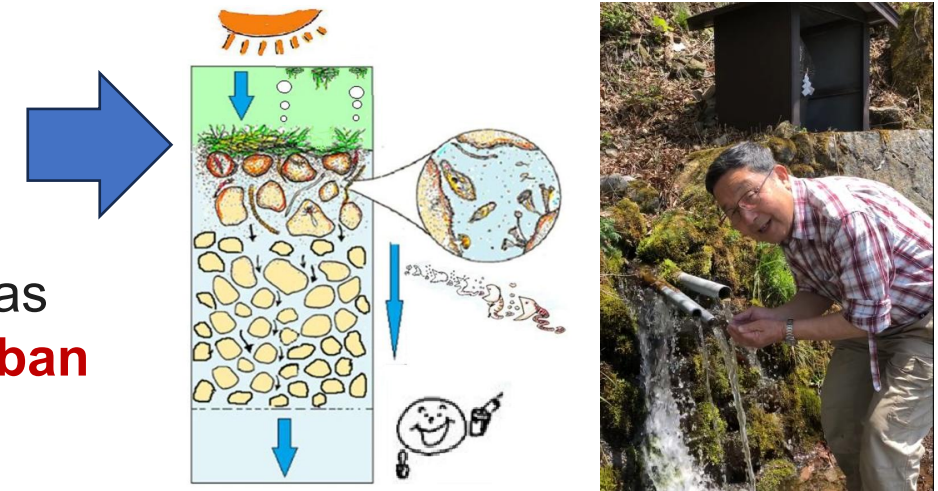
⑤ URF and EPS Model.

Purification mechanism of **SSF** was **misunderstood** under the name.

## Image of Slow Sand Filter



**200 years** have passed, since SSF was  
developed to supply clean water to **urban**  
areas in **London, UK**.



**SSF** is to make **artificial spring water**  
by biological community.

I, Nakamoto proposed **new name**  
of **EPS** instead of **SSF**.

Hiroshima City Waterworks Bureau  
(広島市水道局)

JICA-Hiroshima training on: Operation and  
Maintenance of **Urban Water Supply System**  
(Water Distribution and Service) from **July** to **Aug.**,  
**2026** JICA広島：都市上水道維持管理（給・配水）

⑥ EPS trial in Malaysia and Guyana

⑦ From Miyako Island to Samoa

⑧ From Okinawa to Fiji

⑨ EPS as the Social Contribution

⑩ Sri Lanka, Pakistan

⑪ EPS: Our Technology, Trust Our Sense



My background: Phytoplankton, Reservoir study,  
Meet Slow Sand Filter, Importance of Ecological point.

I was born in May, 1942 in Tokyo. 84 years old.

→ Tokyo Metropolitan Univ.: **Biology**

Plankton, pond, reservoir,  
ocean and stream.

1994-96  
**Thames Filter**

Odor problem  
of tap in Ueda  
city

→Shinshu Univ.: **Applied Biology, 1975**

→Eutrophication study on Reservoir

→Slow Sand Filter (SSF) from 1984

→Wise Use of Biological Phenomena

**Bad algae**

1975: Shinshu Univ.  
Reservoir study

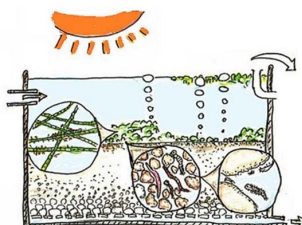
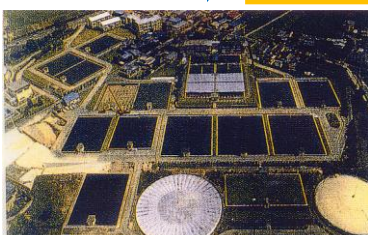
1984, April:  
Slow sand filter

Stop  
algaecide

Turn to delicious  
tap water

Role of  
algae

The growth period is short, and  
the hungry state is normal.  
Biological communities change  
at environmental boundaries.  
New organisms adapted to the  
new environment replace the  
old ones.



Retired in 2008,  
Prof. Emeritus.



Plankton study  
in Pacific 1969  
and Atlantic ocean 1970.

1969, Tahiti, South Pacific



1970,  
Miami, USA



JICA Expert to Fed.  
Univ. São Carlos  
and Univ. São  
Paulo in 1974,  
1976



dry season

Advice to  
ecosystem  
management  
of a reservoir  
in Brazil.



wet season

I found "Hungry  
condition is normal".

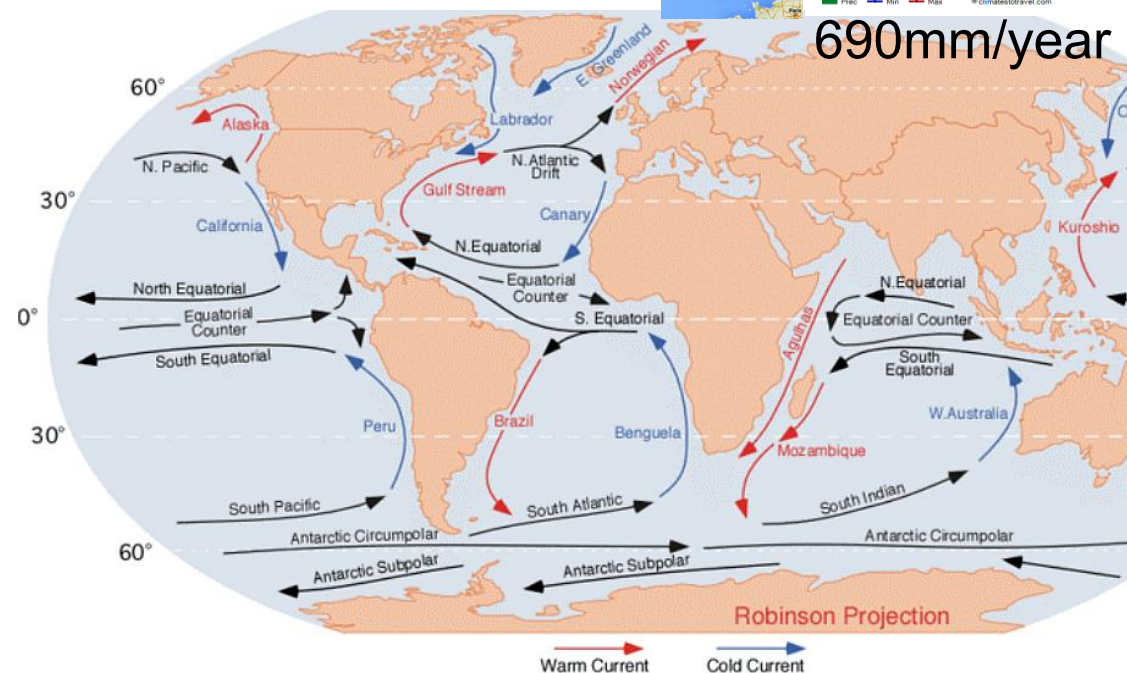


JICA Hiroshima Participants in 2026:

República Dominicana ドミニカ共和国(1)、Kenya ケニア(1)、Nepal ネパール(2)、Pakistan パキスタン(1)、Senegal セネガル(1)、Tanzania タンザニア(1)、Uganda ウガンダ(1)、Zambia ザンビア(1)



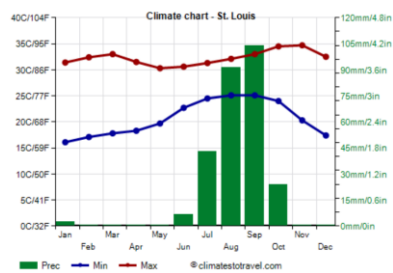
**SSF** developed in UK.  
Not severe winter. Small rain and no dry period.



Dry and wet periods are normal.

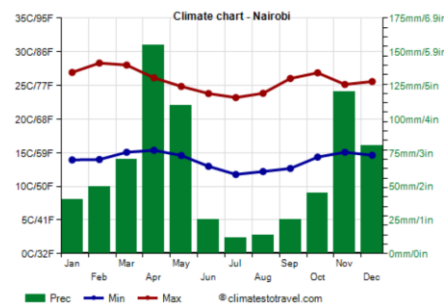


St. Luis, Senegal



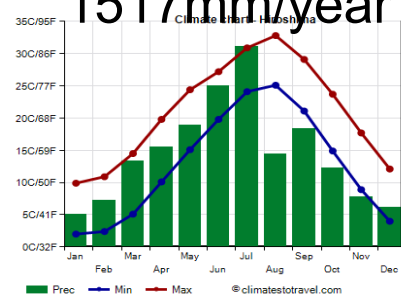
270mm/year

Nairobi, Kenya



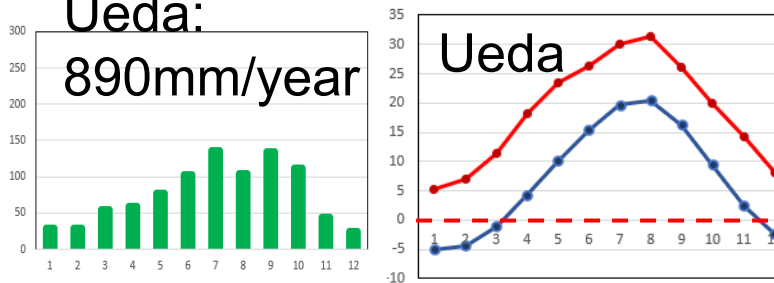
745mm/year

Hiroshima  
1517mm/year



Cool winter and hot summer.  
Wet in summer and dry in winter.

Ueda:  
890mm/year



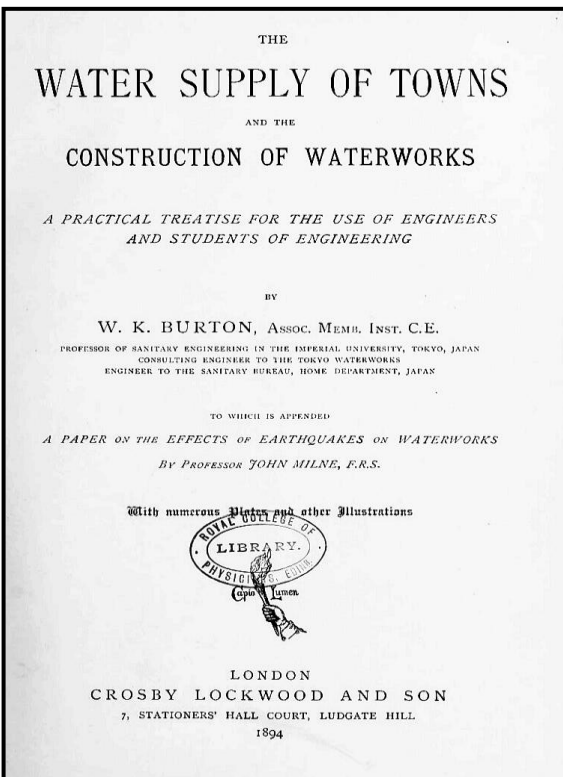
Always dry. Small rain. Cold in winter and hot summer.

## Modern Water Supply System of Slow Sand Filter System was developed in London, UK in 1829 during the industrial period.

William Kinnimond Burton was a Scottish engineer, born on 11 May 1856 in Scotland. He passed away on 5 August 1899 at the age of 43, in Tokyo.

He (31 years old) was invited in May 1887 by the Meiji government to assume the post of first unofficial professor of sanitary engineering at Tokyo Imperial University. He advised to major important towns (cities) in all over Japan during 12 years (from 1887 to 1899).

Burton published “The Water Supply of Towns and the Construction of Waterworks” in 1894 in London.



In April 1894 (Meiji 27), Hiroshima City asked Burton for guidance and advice to design a water supply system.

He visited Hiroshima from September 16 to 18, 1894 (Meiji 27). He submitted a plan to Hiroshima City in December of the same year. He submitted a plan to Hiroshima City in December of the same year (1894). Ushita Plant was completed in 25. Aug. 1889 (Meiji 31).



<https://wellcomecollection.org/works/da2p35kj/items>

Filtrate of SSF was germ free, safe water. SSF spread to the world. People in the city struggled to get clean water even in Japan.

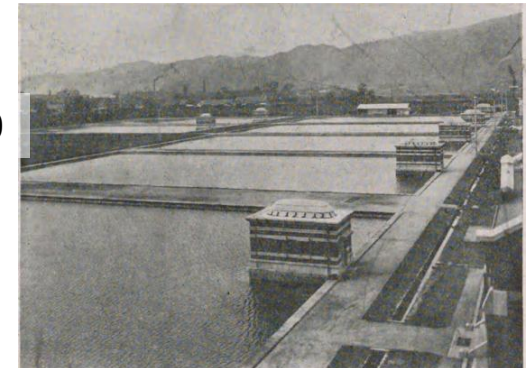
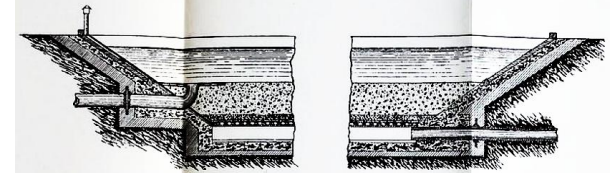


Photo 1930

Photo 1974

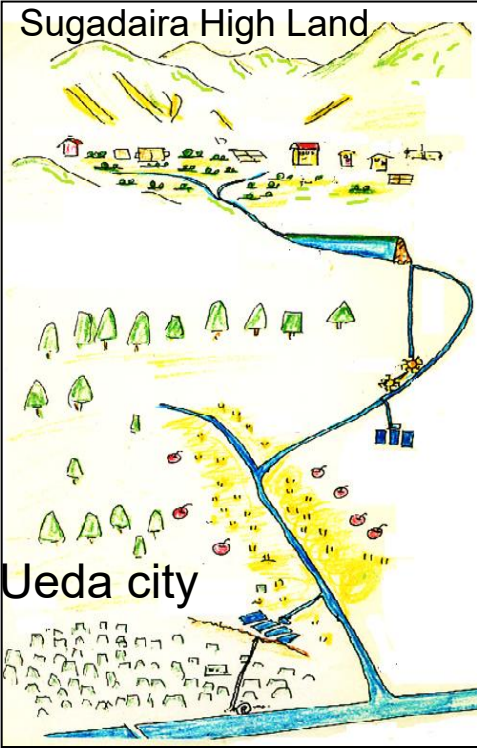
Urban water supply services expanded with the development of cities.



Odor problem of tap water happened in Ueda city.



Original Water source of Someya WTP was sub-surface water of Chikuma river in 1923 (103 years ago).  
Surface water of Kangawa was taken from 1953 (73 years ago).



Sugadaira Dam was constructed in 1964.



堤高	41.8m
堤長	149.7m
総貯水量	3,451,000
有効貯水量	3,242,000



Odor problem in tap water in Ueda city.

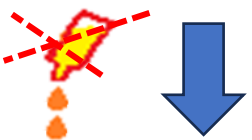
From 1975, I worked as a teaching staff of Shinshu University at Ueda Campus.

→Eutrophication study on Sugadaira Reservoir from 1975.

I explained on pollution and purification related with biological activity in Ueda city.



They (Ueda WTP) stopped algicide.

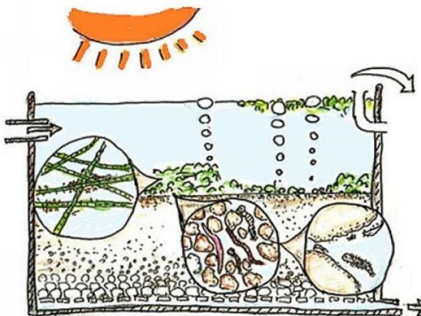


Plant manager said **Good Algae** in filter pond but **Bad Algae** in the reservoir.

Delicious tap water



Heavy Algal bloom in a slow sand filter pond.



I started to study **Role of algae in SSF** from 1984.

I noticed they misunderstood the purification mechanism in SSF.





Idea of **Ecological Purification System** was born from this plant, in Ueda, Nagano, Japan.



53 seconds

Invitation to the original plant of EPS of Someya Plant

<https://www.youtube.com/watch?v=b7wPQIKVIMY>

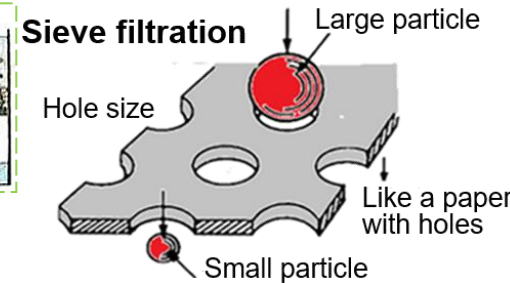
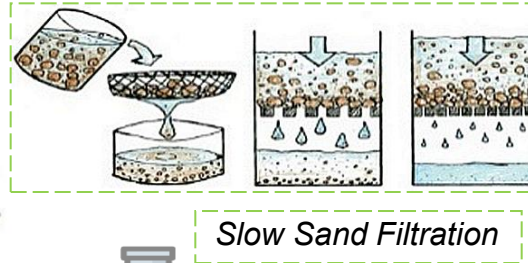
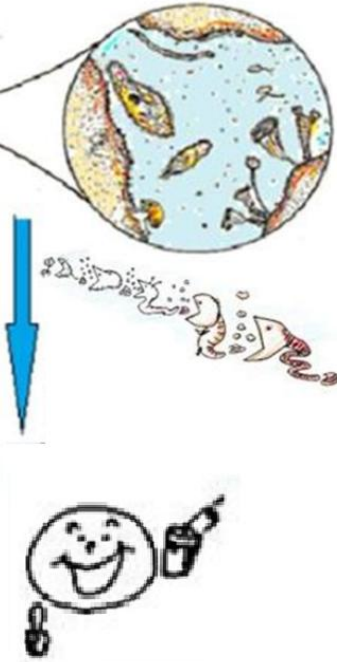
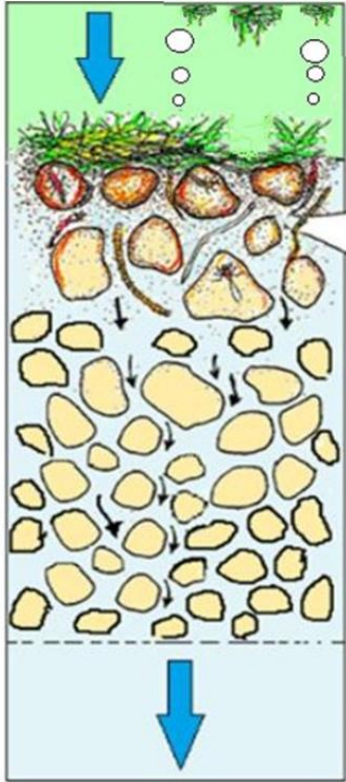




# Slow Sand Filter is Wise Use of Natural Purification System to make artificial spring water.



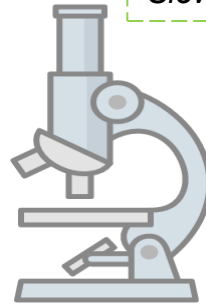
**Microorganisms** trap and decompose dirt in water near the surface of the sand layer of slow sand filter (SSF).



I noticed that **Slow Sand Filter** has been **misunderstood** by the name in the world.

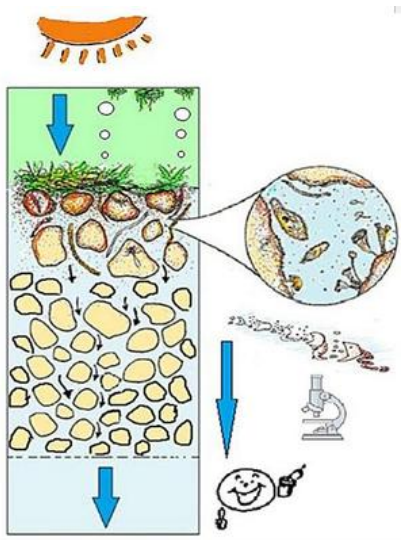
I proposed **Ecological Purification System (EPS)** in **2004** instead of the name of **Slow Sand Filter**.

The **filtrate** is **clean** and **delicious water**.



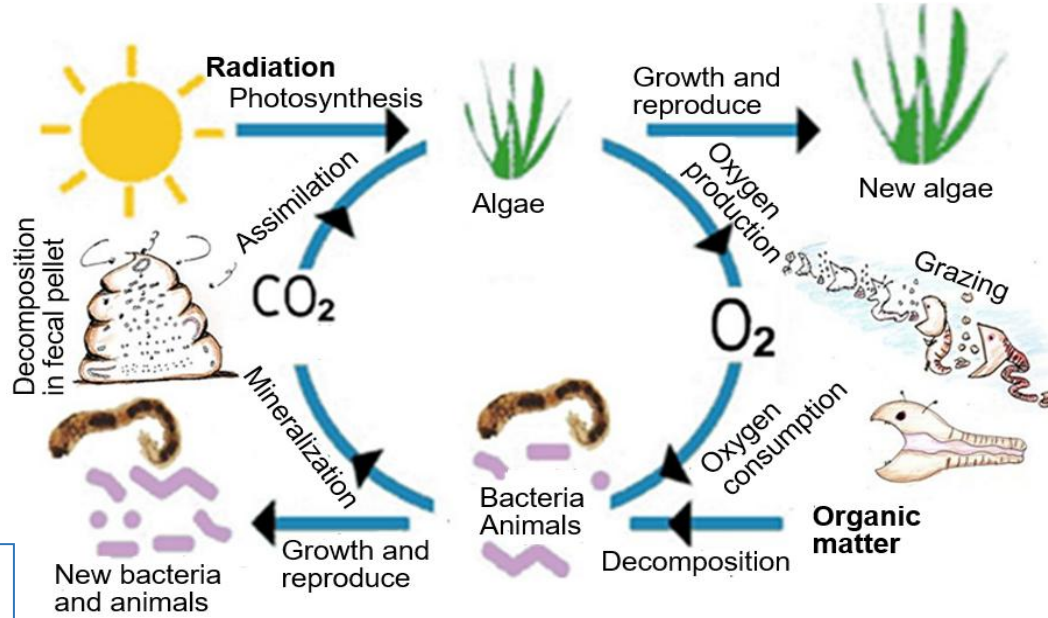
I, applied biologist, taught to the students that purification in nature and its application is called **slow sand filtration**. However, I pointed out that the name of **SSF** gave rise to a misunderstanding of how purification works. I have been teaching this **EPS** at JICA training **since 2006**.





The sand does not move even when the flow rate changes.

Slow sand filtration is a purification process that relies on the efforts of a biological community. **Algae produce oxygen** through photosynthesis, and **the presence of dissolved oxygen creates an environment in which heterotrophic organisms can thrive without worry**. Slow does not refer to speed, but to being gentle to the organisms.



Idea of EPS spreads from Japan to the world.

My first visit to Thames Water Company was on **August 19<sup>th</sup> in 1992**. I explained my study on the role of algae in SSF system in Ueda.



Ashford Common WTP

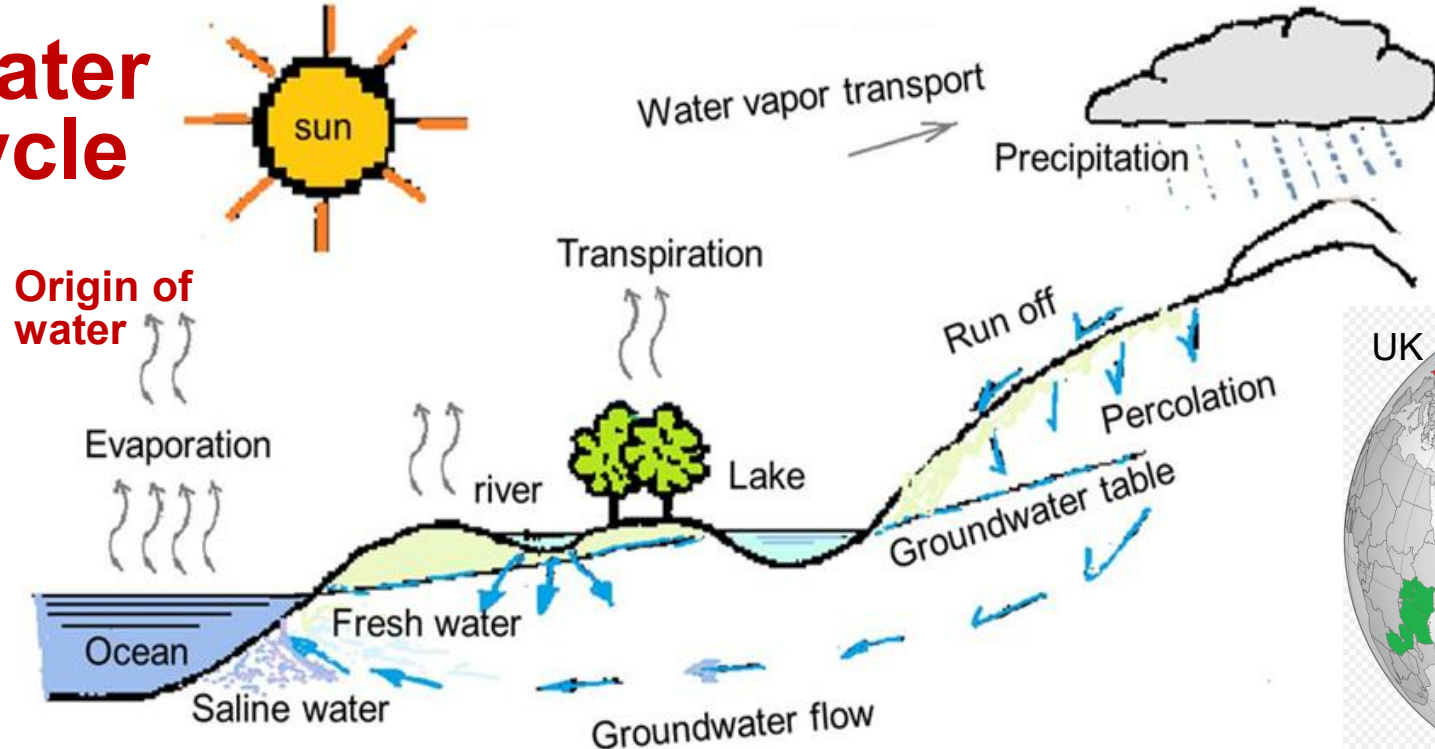
**About higher flow rate asked by N. Nakamoto**  
**Michael Chipps** Principal Research Scientist  
 2025/03/18

**Since your visit (Aug. 19th 1992) we have added DO and turbidity monitoring on the outlet of all SSFs.** Thames Water's asset standard says we can operate up to **0.5 m/h(12m/d)**, but in reality, we are usually in region of 0.25 to 0.35 m/h, but we can reach 0.4 m/h occasionally if we have to. We do have keep a careful eye on dissolved oxygen (DO).





# Water cycle



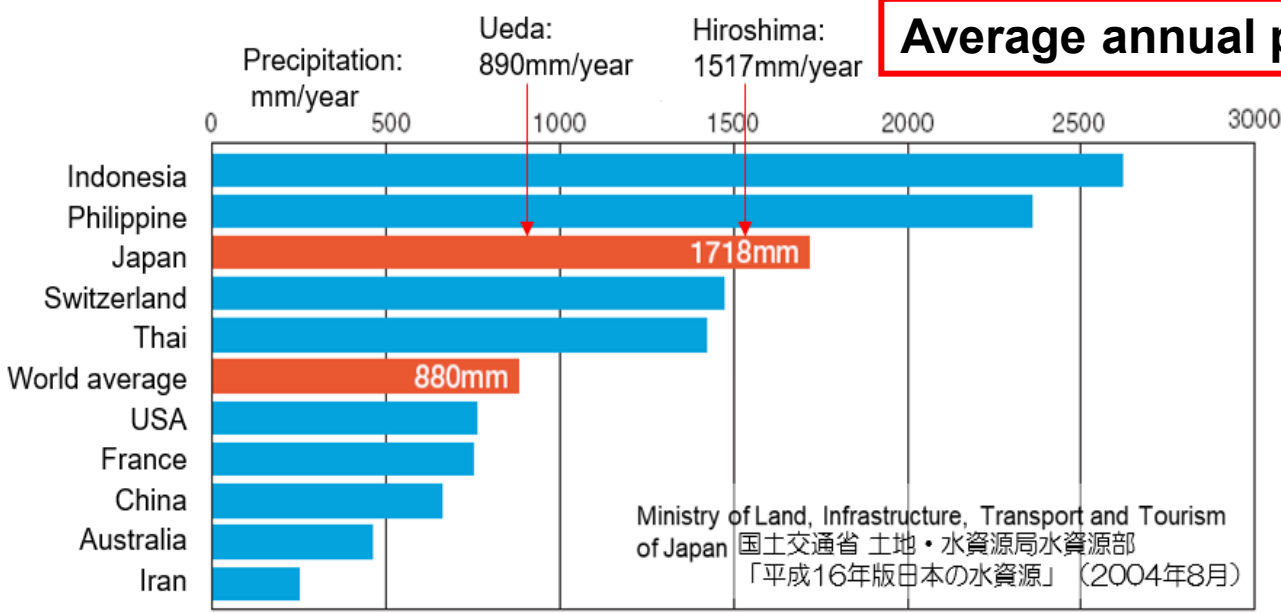
Where is available water.

Mountain:  
much  
precipitation



Spring water

Average annual precipitation varies in location.



Areas close to the equator, with a lot of sunlight and the influence of the ocean, experience a lot of precipitation.

Even in areas close to the equator, inland areas experience less precipitation.

High latitude areas with less sunlight and less precipitation.



Ecological Purification System (EPS) : This is Wise Use of Natural Phenomena.  
 This is Chemical Free System to make Artificial Delicious Spring Water.  
 This is a Smart and Eco-friendly technique.



Surface water of river



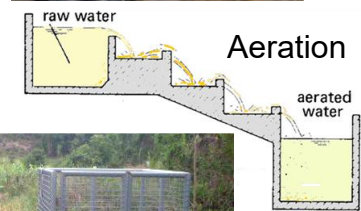
Reservoir, lake



Clear spring water



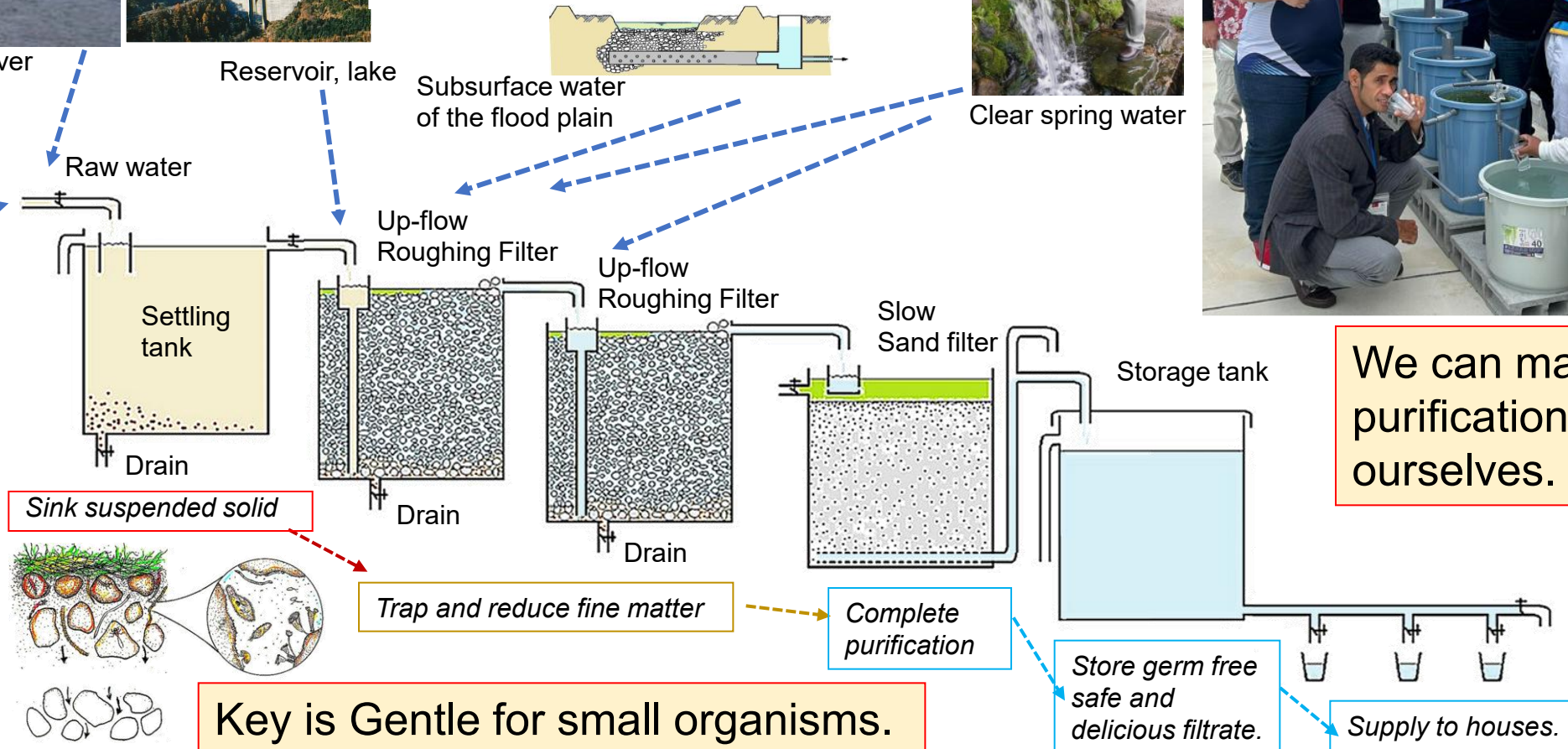
Well



Aeration



Aeration



Key is Gentle for small organisms.

We can make EPS purification device ourselves.



JICA-Hiroshima, July, 2018

Microscopic organisms



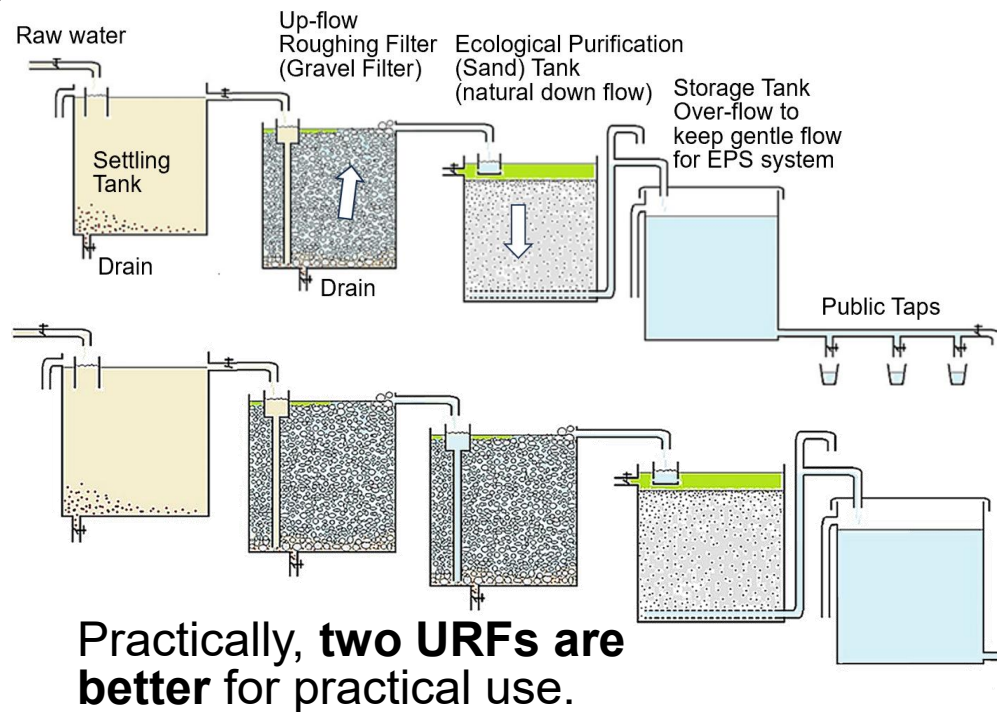
2018/ 7/ 2 10:33



July 2.  
2018.

EPS mini model

2018/ 7/ 2



Practically, **two URFs are better** for practical use.



EPS mini model

*This is just model to explain the function of each part.*



Aug. 9. 2018.

2018/ 8/ 9 6:55

11<sup>th</sup> Pacific Water and Waste water conference,  
Noumea, New Caledonia, August, 2018



This is a concise English manual on EPS. You can download from the following address.



11<sup>th</sup> Pacific Water and Waste water conference, Nouméa, New Caledonia, August, 2018.



# 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

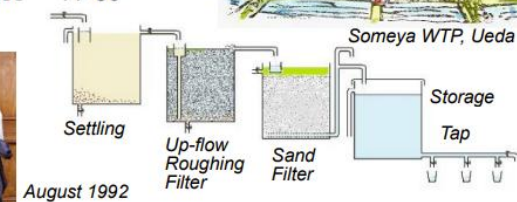
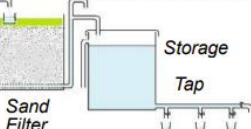
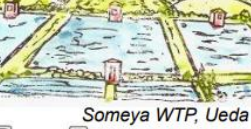
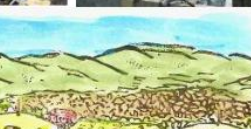


Fig.0. Fijian EPS using rain harvest tanks in a village.

August 2018

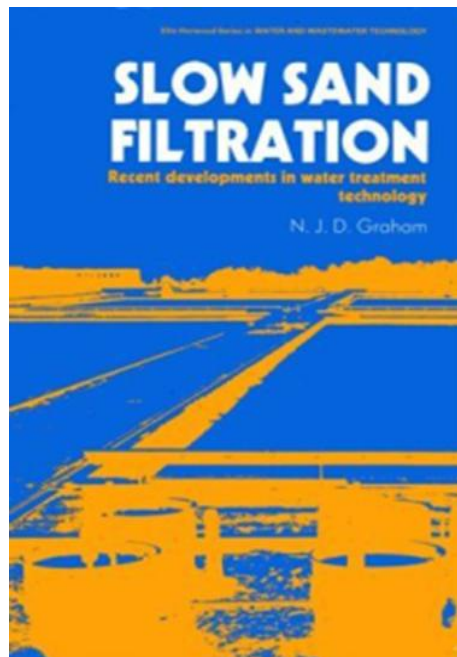
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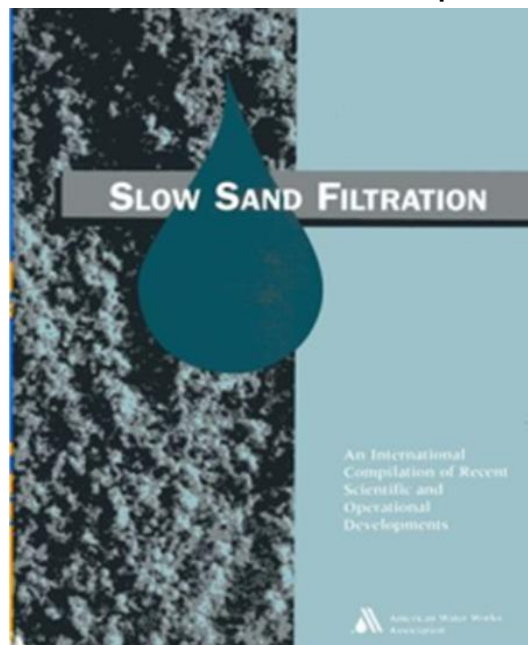




# Focus to Slow Sand Filter from Chemical treatment of Rapid Sand Filter in the world.



1988, Nov.  
1st. SSF  
Conf. in  
London,  
UK



1991, Oct. 2nd.  
SSF Conf. in  
New Hampshire,  
USA



My first visit to Thames  
Filter was Aug. 1992.



I could study on Thames  
Filters during 1994 to 1996.

1996 April, 3rd SSF  
Conf. in London, UK

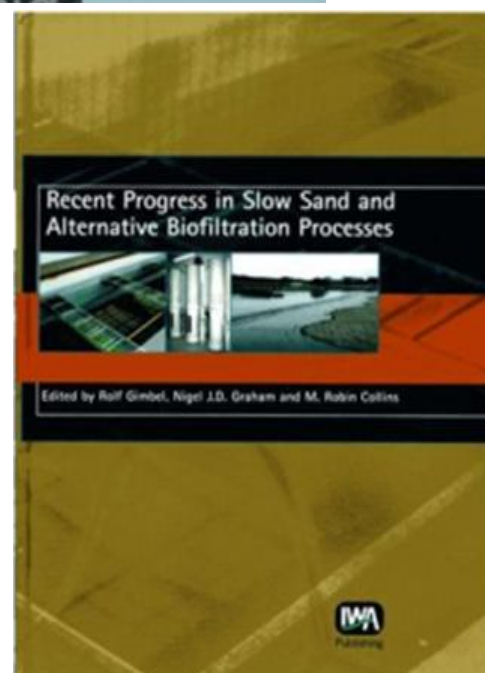


Key speech of Global  
100 Eco-Tech Awards  
Ceremony, 2005  
World Expo. Aichi,  
Japan.

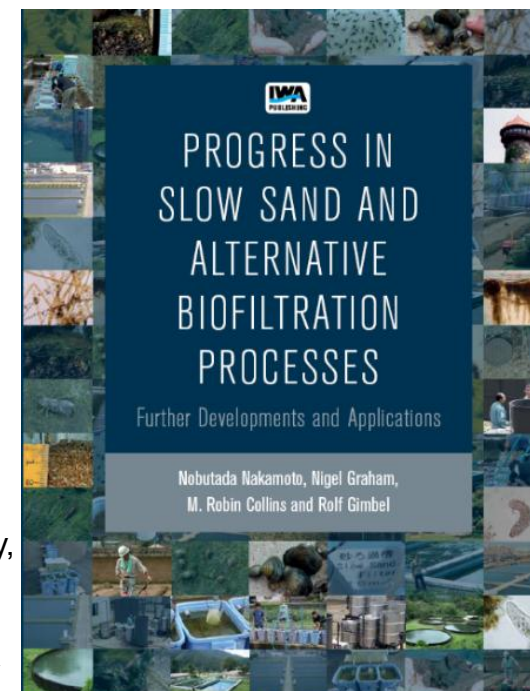


Slow Sand Filtration Technology  
Focusing on Algal Production

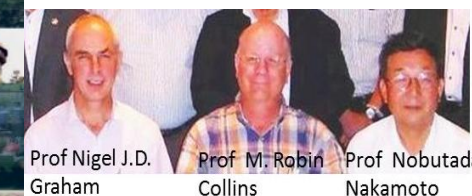
<https://www.youtube.com/watch?v=Xf2HOJ7y7c8&t=21s>  
8 min 32 seconds



2006 May,  
4th SSF  
Conf. in  
Mulheim,  
Germany



Ecological Purification System was focused  
and recognized.



2014 June, 5th SSF Conf.  
in Nagoya, Japan

[https://www.youtube.com/results?search\\_query=5ssabc](https://www.youtube.com/results?search_query=5ssabc)



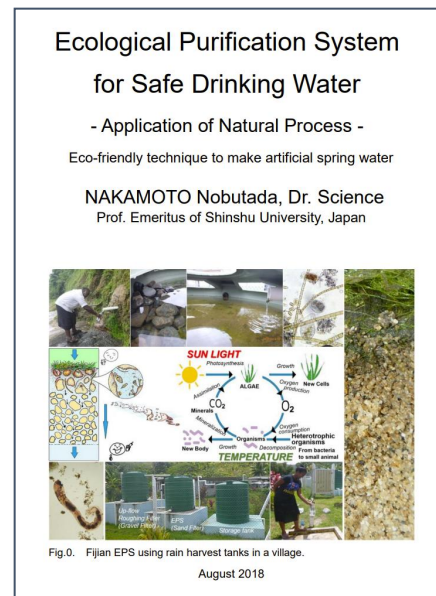


JICA supports EPS as Japanese innovation for the people.



How to make drinking water by **Ecological purification system**

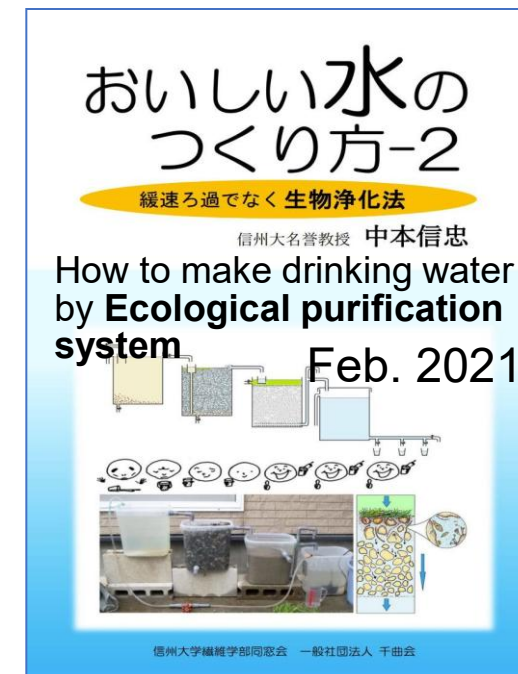
Aug. 2005.



August, 2018

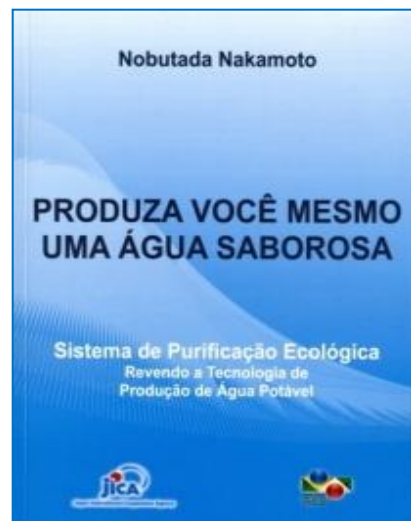


<https://eps.watervision.jp/wp-content/uploads/2025/04/EPStext-NC-2019.pdf>



How to make drinking water by **Ecological purification system**

Feb. 2021.



July 2010.

Portuguese, Brazil



Internet text by JICA

Slow sand filtration: creating clean, safe water



(26 min Full)  
[https://www.youtube.com/watch?v=V6\\_uDZE\\_I8E&t=423s](https://www.youtube.com/watch?v=V6_uDZE_I8E&t=423s)



(3 min Digest)

<https://www.youtube.com/watch?v=QAH1SoAgfL0&t=27s>



<https://eps.watervision.jp/wp-content/uploads/2025/04/TratamentoEcologicoTexto.pdf>



International Contribution Award of the 21<sup>st</sup> Japan Water Awards,  
Safe Drinking Water by Ecological Purification System

Chemical free purification system focused on food chain  
as a new treatment system from Japan.

25. June, 2019

[https://eps.watervision.jp/wp-content/uploads/2025/05/Document\\_Int.Contribution\\_Award\\_21stJapan\\_Water\\_Awards\\_EN.pdf](https://eps.watervision.jp/wp-content/uploads/2025/05/Document_Int.Contribution_Award_21stJapan_Water_Awards_EN.pdf)

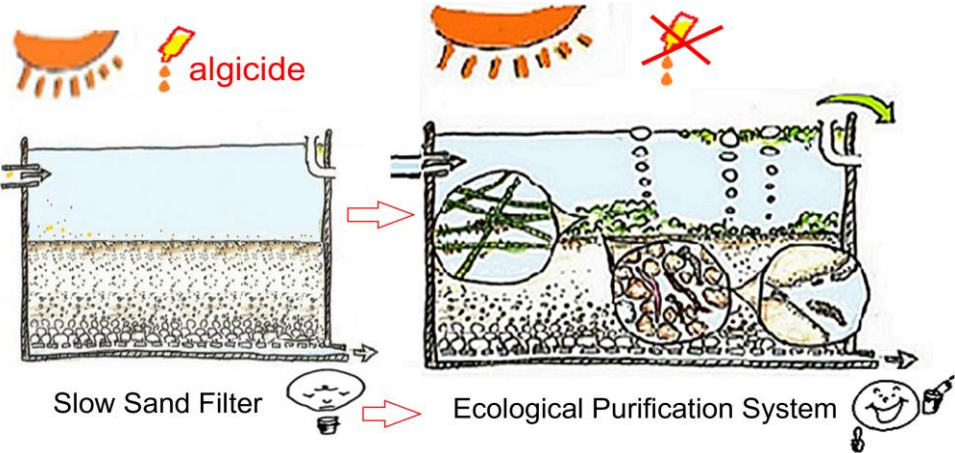


Fig. 1. Delicious water by stopping the algicide

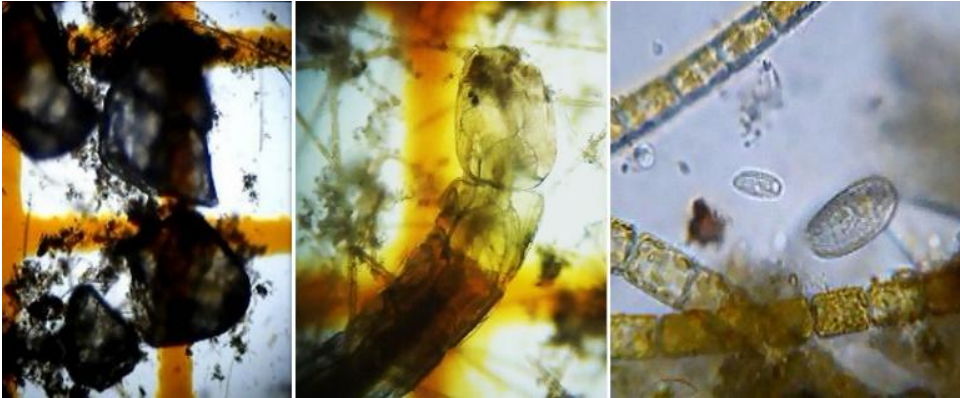


Fig. 2. Attention to the role of algae and micro-animals

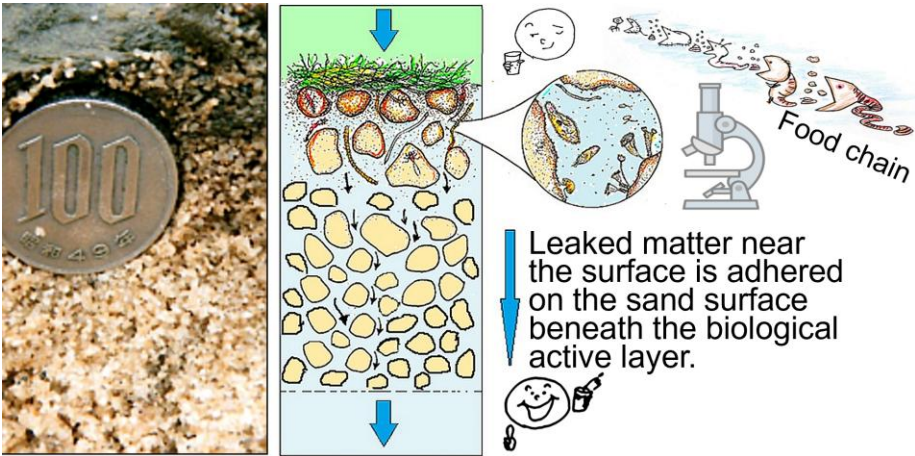


Fig. 3. Algae and small animals are active at the top

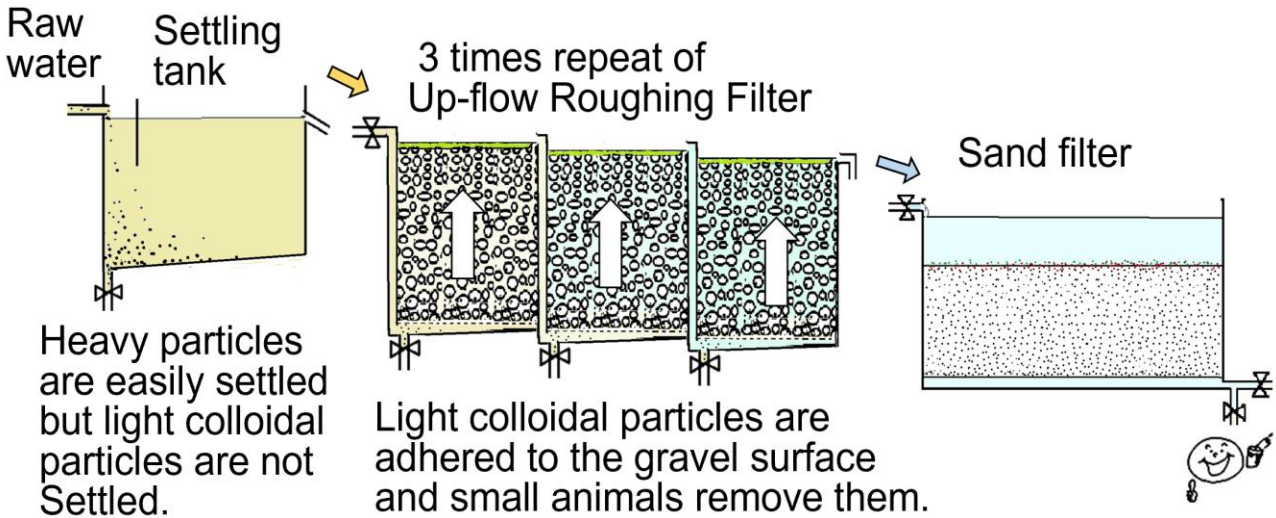


Fig. 4. Settling tank and URF for turbid reduction



Feb. 2021.

Clean drinking water is essential for life, but expensive water filtration systems are out of reach for many communities around the world. Japanese scientist NAKAMOTO Nobutada is unlocking the water-cleaning power of algae and microorganisms to bring down costs!



日本語

世界の水を  
きれいに



Clean Water  
for All

英語



ポルトガル語

Água Limpa  
para Todos



中国語

创造洁净水源—  
日本的净水技术



フランス語

De l'eau propre  
pour tout le monde



スペイン語

Agua limpia  
para todos



アラビア語

المياه النظيفة للجميع

<https://www.youtube.com/watch?v=ki8Qyb2lZ10>







Health & Welfare

# Utilizing Microorganisms to Purify Water and Enhance Public Health

07/07/2023

A Japanese researcher has been promoting a method called the ecological purification system to purify water utilizing the activities of small organisms. **What is this low-tech but smart solution that produces safe and affordable drinking water to help protect people's health?**



“In places without safe access to this vital resource, slight improvements to water for drinking and cooking can reduce instances of diarrhea or dermatological



diseases. You'll then see a change in people's health awareness. **The key is promoting sustainable, do-it-yourself technologies and fostering awareness.**”