

UN-Habitat-Fukuoka Univ. joint Seminar

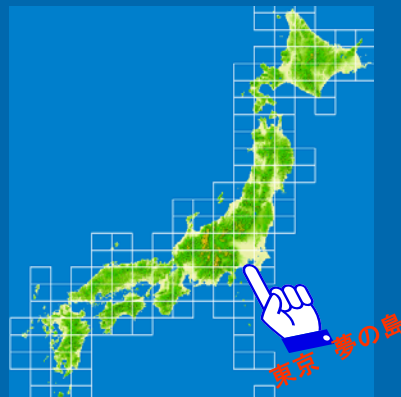
Transfer of Appropriate Technology by Semi-aerobic Landfill: Fukuoka Method



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"Dream Island" before **GARBAGE WAR** in Tokyo
1957-1971



2

"Dream Island, Tokyo" under **GARBAGE WAR** 1957-1971



Before Tokyo Olympic Game 1964



Open Burning **Dream Island** (1970)



Open Dumping under **GARBAGE WAR** (1971)

3

Open Dumping of Landfills in Fukuoka (1971)



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Intergraded Sanitary Landfills based on Fukuoka Method



Reuse of Completed Landfills in Fukuoka

跡地利用がすすむ今津埋立場 Where the Imazu Landfill Site Once Was...



今津運動公園 (テニスコート) Imazu Park tennis courts



今津養護学校 Imazu School of Special Education



今津運動公園 (アスレチック広場) Imazu Park walking course

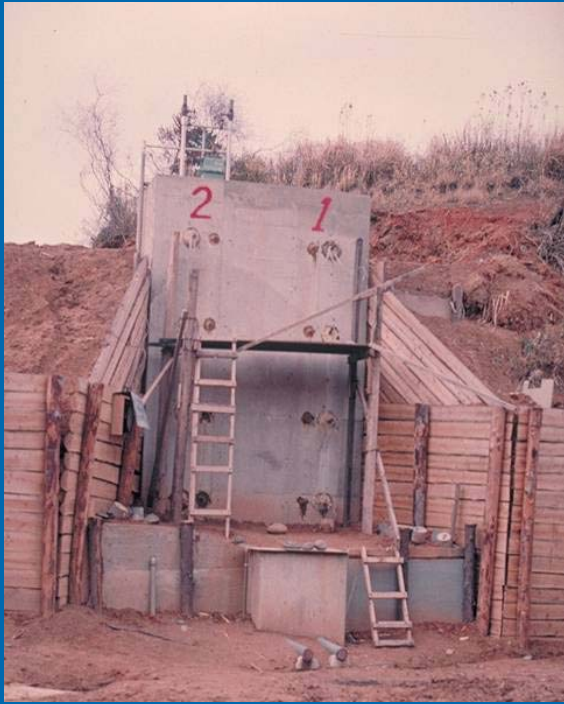


市民リフレッシュ農園 Public garden

A Road to Fukuoka Method & Co-benefit CDM

Challenging for Aerobic Landfill Type
using Landfill Model Lysimeter

Landfill Model Lysimeter of Fukuoka City



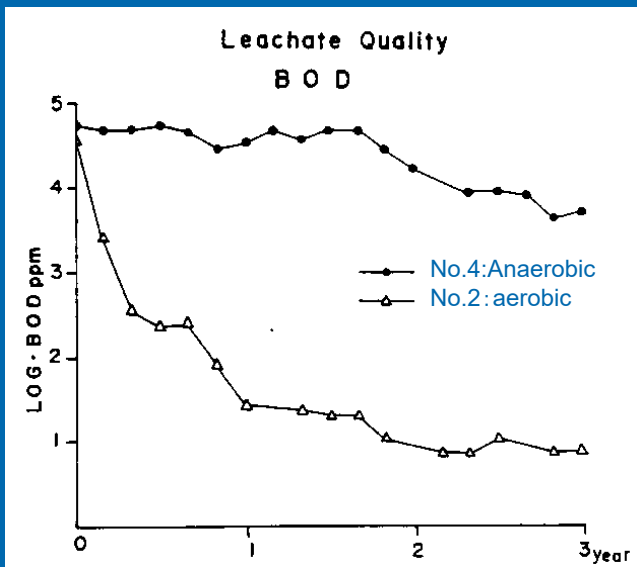
No.1 Anaerobic Type
No.2 Aerobic Type



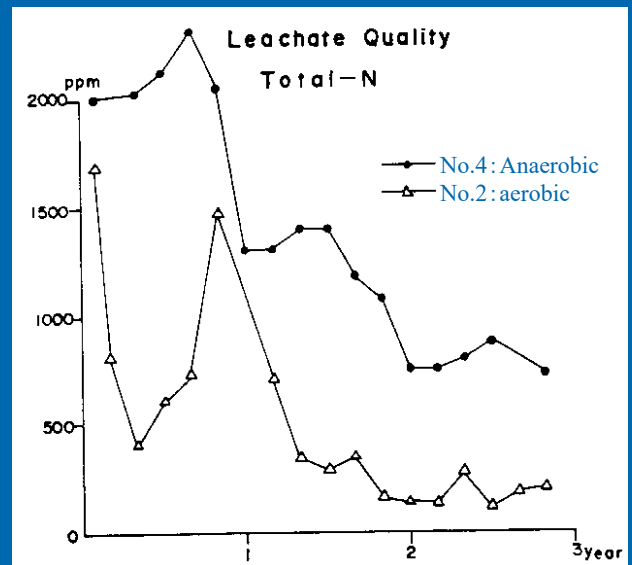
Anaerobic Aerobic



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BOD



TN

Comparison of Leachate Quality

Filed Study on Aerobic / Anaerobic Type in collaboration with Fukuoka Univ. ,Fukuoka City and Japanese Government (1973~1975)

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Pilot (Field) Study on Aerobic Landfill Type in collaboration with Fukuoka Univ. ,Fukuoka city and Japanese Government(1973)



II.: Aerobic

I: Anaerobic



Leachate

I

II

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Semiaerobic Landfill Concept was discovered through an aerobic landfill experiment

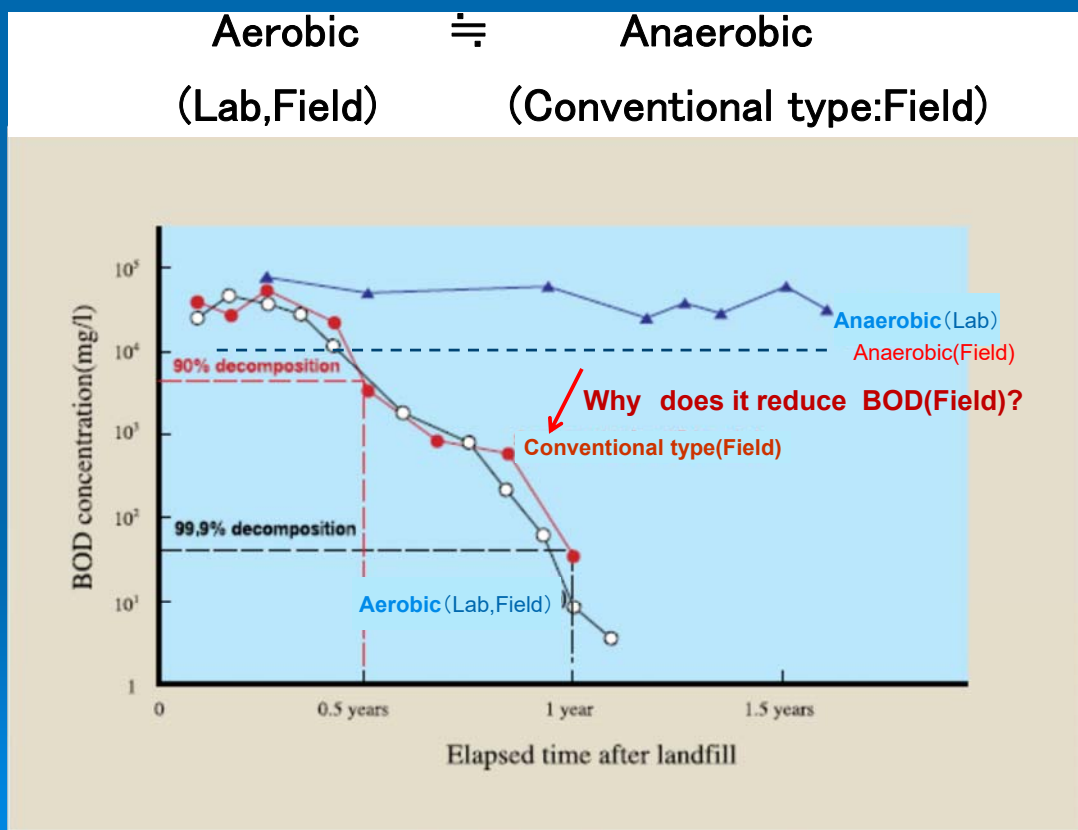
Basic Concept of Landfills;

Under Aerobic Condition of Landfills,
Landfills have not only Dumping Function
but also Treatment Function for Wastes

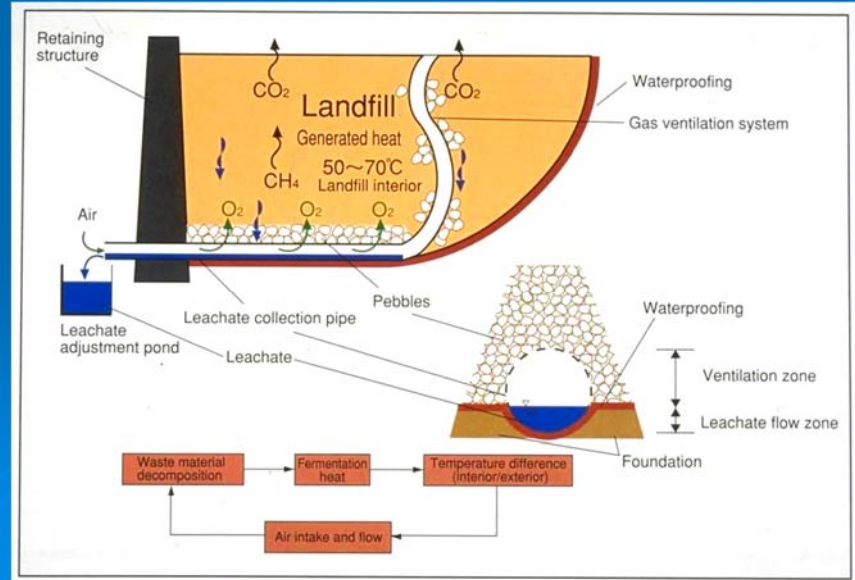
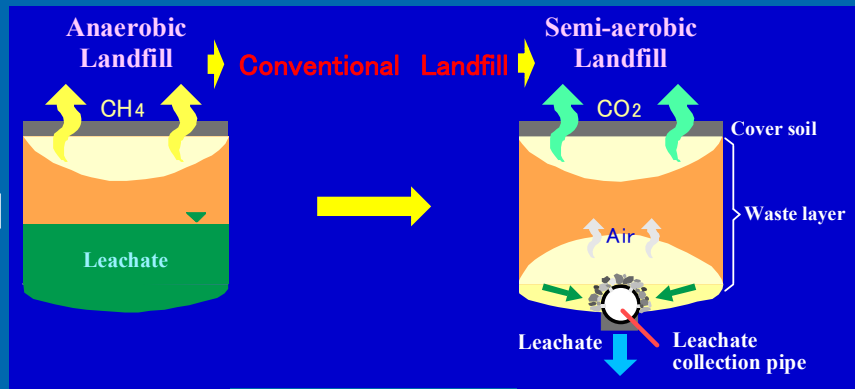


Semiaerobic Concept
Fukuoka Method(1975)

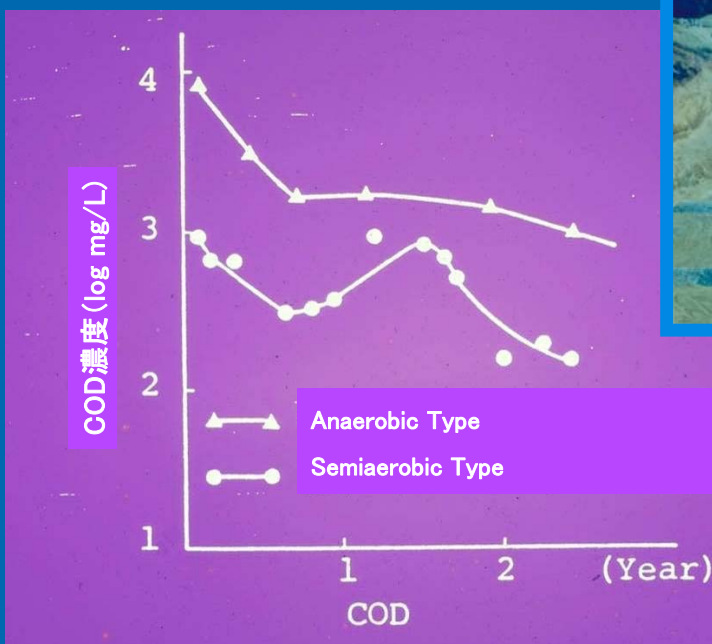
Relationship of Landfill Types and BOD concentration



Mechanism of Semiaerobic Landfill Type

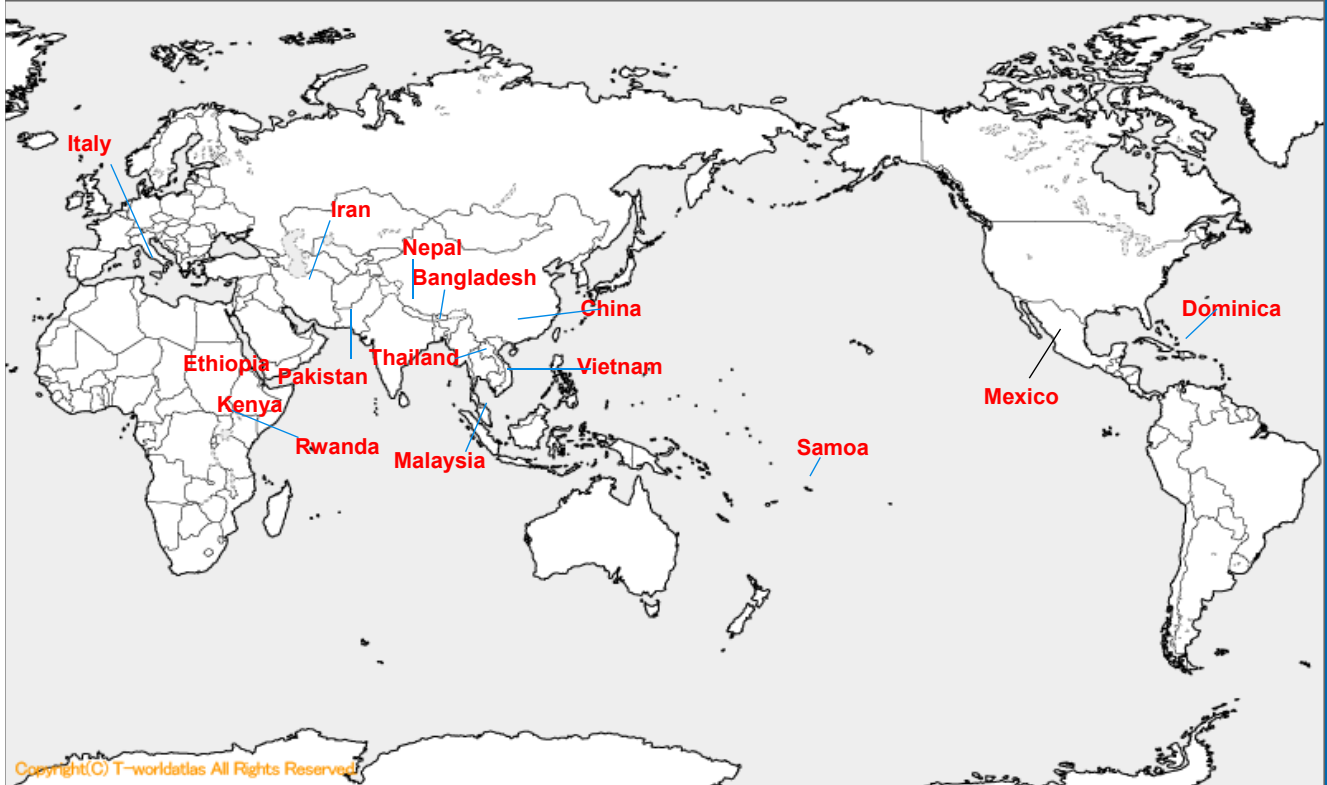


1st Trial SLF based on New Landfills based on Semiaerobic Concept by Fukuoka Univ. and Fukuoka City



Fukuoka method(1975)

Transfer Technology to Developing Countries based on Fukuoka Method



On going 13pilot projects

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1st Trial Improvement of Landfills based on Fukuoka Method in Malaysia



改善前のアンバンジャジャル埋立場 (1988年)



改善中途の埋立場



改善されたアンバンジャジャル埋立場 (1996年)



改善中途の埋立場



多目的酸化池での曝気 (1996年)

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Low-cost Leachate Treatment system in Malaysia



竹や廃ドラム缶を使った循環式準好気性埋立地



廃ドラム缶を使ったガス抜き設備



ガス抜き設備の効果により、植生が回復



浸出水処理設備 (パイロットプラント)



廃活性炭を使用した吸着処理



浸出水 (1:原水、2:曝気後、3:ろ過・吸着処理後)

Improvement Process by F.M from Open Dumping to SLF



1988



1992

Malaysia



1996



2000



2003₁₈

Case-study based on F.M in Iran



Case-study based on F.M in Samoa



改善前の埋立地の状況 (2001年)



改善前の埋立地の状況 (2001年)



福岡方式に改善中の埋立場 (2003年)



現地の技術者にガス抜管設置を指導 (2004年)

Case-study based on F.M in China
 Agreement of Exchange Program
 based on F.M. together with F.U,
 Fukuoka City and Tsinghua Univ.



清華大学・福岡市・福岡大学によるごみ処理技術意見交換会
 (清華大学において) (2003年)



整備前の埋立地の状況(ごみが自然発火している) (2003年)



雲南省蒙自県で建設中の「福岡方式」埋立場 (2005年)



清華大学環境訪問団による福岡市長表敬 (2004年)

New Landfills by F.M in Pakistan

VIEW OF WEIGH BRIDGE & TRENCH AT SANITARY LANDFILL SITE (LFS) AT MOUZA HABIBA SAYAL MULTAN.



A VIEW OF TRENCH AT SANITARY LANDFILL SITE (LFS) AT MOUZA HABIBA SAYAL MULTAN.



Wrap up of demonstration by Japanese experts at LFS Multan on 17-08-2008

Pilot Project by F.M and Leachate Treatment in Veitnam



Eco-Fan



Tornado Treatment Facility

Pilot Project by F.M and Leachate Treatment in Kenya(2015)



Ethiopia-AddisAbaba Rehabilitation Project by UN-HABITAT, SWAN-Fukuoka funded by Japan



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Ethiopia-AddisAbaba Rehabilitation Project by UN-HABITAT, SWAN-Fukuoka funded by Japan



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Semiaerobic Concept

"If Landfill is under aerobic condition, Landfill have not only dumping function but also treatment function"



In near future, Landfill will be called "Depo-land (Deposit Landfill)"

That means,

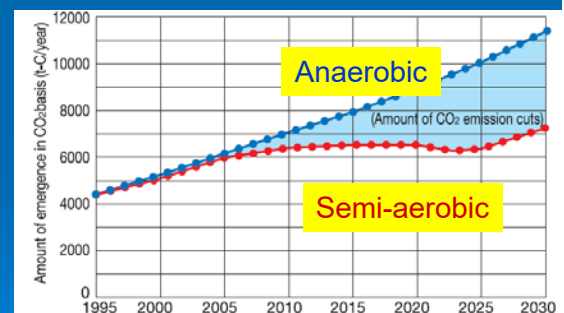
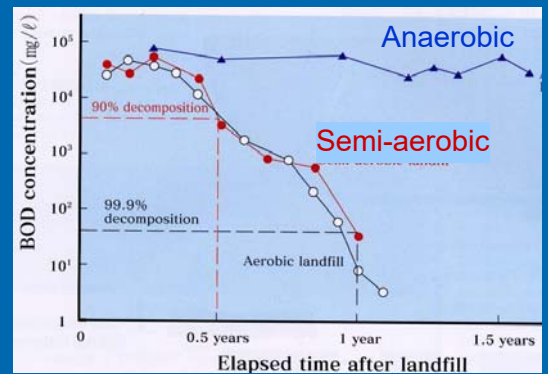
1. Dumping site
2. Treatment site
3. Store & Safe-keeping site



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Advantages of F.M

1. To reduce *Pollutant of Leachate*
2. To reduce *Methane Emission*
3. To reuse & recycle *Completed Landfills*



Co-benefit CDM

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Advantages of F.M

1. Low Cost
2. Simple
3. Eco-Friendly



1. Title: **NM0333**: Avoidance of landfill gas emissions by passive aeration of landfills
2. Approved date by UNFCCC : **July 15, 2011**
3. URL: <http://cdm.unfccc.int/EB/index.html>

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Example of Reuse of Completed Landfills by F.M in Fukuoka

跡地利用がすすむ今津埋立場 Where the Imazu Landfill Site Once Was...



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市民リフレッシュ農園 Public garden

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For Depo-Land to be Reborn A Landfill is a Living Creature!?

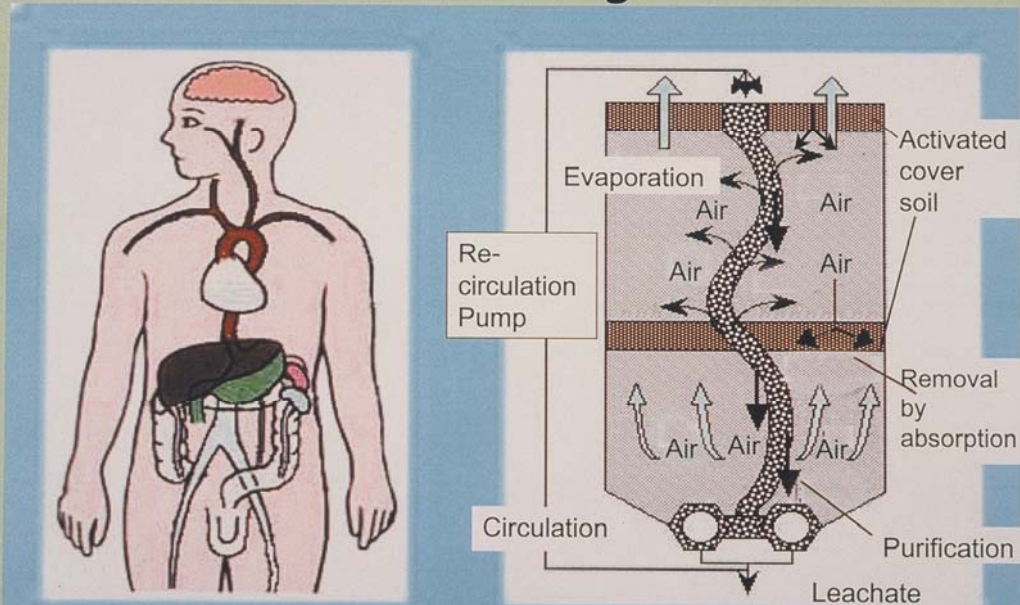


Fig. 9 Body and landfill functions

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Table 5. Comparison between landfill and human body

Landfill	Human body	Roles	Remarks
Activated cover soil	Liver	Detoxification	For organic waste
Lime/ash	Kidney	Scaling/filtering	For liquid, inorganic waste, salt, heavy metal
Leachate collection pipe	Blood vessels	Re-circulation	To purify
Re-circulation pump	Heart	Pressure	To control operation and management
Monitoring	Health check up	Function check	Risk management
Not available yet	Brain	Safety control	Total management

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Conclusion

Success of Fukuoka Method Transfer
is a road to

★ Peace

★ Friendship & Sustainable Society

of SWAPI (Solide Waste Management in
Asian Pacific Islands)



Win-Win Strategies for
Conservation of Environment



Thank you

有難うございました。

ご静聴ありがとうございました。



2015.08.24

Mass Balance of Landfilled Wastes for 3 years

	1	2	3	4
充填時の廃棄物	5,320.9	4,983.4	4,990.6	5,006.1
含水率 (%)	62.3	68.9	68.9	68.9
水分量 (kg)	3,314.9	3,433.6	3,438.5	3,449.2
廃棄物重量 (kg)	2,005.0	1,549.8	1,552.1	1,556.9
3年経過後の廃棄物	3,052.3	2,556.5	2,432.2	3,210.9
含水率 (%)	59.6	57.1	55.5	57.6
水分量 (kg)	1,819.6	1,459.8	1,349.9	1,849.5
廃棄物重量 (kg)	1,233.1	1,096.7	1,082.3	1,361.4
3年間の減少量	2,268.6	2,426.9	2,558.3	1,795.2
水分量 (kg)	1,495.7	1,973.8	2,088.5	1,599.7
廃棄物重量 (kg) (a)	772.9	453.1	469.9	195.5
浸出水への流出量 (kg) (b)	47.1	51.3	37.4	176.3
(浸出水の蒸発残留物量の累積値)				
ガス化量 (kg) (c)	725.8	401.8	432.5	19.2

$$(a) - (b) = (c)$$

Leachate Quality <<
Gasification Rate >>
CO₂ >> CH₄