SDGs International Forum 2024 Climate Change × Disaster Reduction New developments in disaster prevention and reconstruction in the age of a climate crisis - from the perspective of disaster waste~

# Disaster Waste Management and Sustainability



Anniversary NIES JAPAN



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### Self Introduction



1963 Born in Kagoshima Prefecture, Japan

Director, Material Cycles Division at the National Institute for Environmental Studies from 2011 to March 2024, currently Fellow.

Specialized in resource recycling and waste management, Doctor of Engineering (Kyoto University, Sanitary Engineering)Research in the field of resource circulation and waste management in general, and since the nuclear power plant accident, engaged in research on recovery from environmental contamination caused by radioactivity.

Former President of the Japan Society of Material Cycles and Waste Management, President of The Society for Remediation of Radioactive Contamination in the Environment

# Building damage in the Noto Peninsula earthquake disaster (survey conducted in late July)



# Temporary storage site for disaster waste (survey conducted in late July, Suzu City)









# Building damage and temporary storage site (survey in mid-November)









# Temporary storage site for disaster waste (survey in mid-November)









### **Storyline of this lecture**

### 1. Essentials of disaster waste management

- 1) Recent natural disasters and the generation of disaster waste
- 2) Disaster waste management flow and basic direction
- 3) Properties and treatment of disaster waste
- 4) Organizational Implementation system for disaster waste management

### 2. Preparedness for the future

 $\sim$ Towards a sustainable society with resilience

8 cases related to strengthening disaster waste management

#### Natural Disaster and Japanese History

Great East Japan Earthquake (in 2011)
Great Hanshin-Awaji Earthquake (in 1995)

Showa Tonankai Earthquake (in 1944) Showa Nankai Earthquake (in 1946) Great Kanto Earthquake (in 1923)

Meiji Sanriku Tsunami (in 1896) Nobi Earthquake (in 1891)

Ansei Tokai Earthquake (in 1854)
Ansei Nankai Earthquake (in 1854)
Ansei Edo Earthquake (in 1855)
Ansei Iga-Ueno Earthquake (in 1854)

Transition to a sustainable society

What about Japan in the 21st century?

Post-war reconstruction and rapid economic growth

Defeat in World War II (in 1945)

Towards a modern nation

Meiji Restoration (in 1868)



Genroku Earthquake (in 1703) Hoei Earthquake (in 1707) Mt.Fuji Hoei Eruption (in 1707)

Jogan Earthquake (in 869)

Mt.Fuji Jogan Eruption (in 864)

1) Recent natural disasters and the generation of disaster waste

### Major natural disasters in recent years

	2024.1 2023	Noto peninsula earthquake  Noto earthquake (May) Rainy season fronts and typhoons 2 and 13 (June-Sep.)  Fukushima earthquake, 2022  Heavy rainfall caused by the August 2021 front					
	2022.3 2021.8						
	2020.7	Torrential rain in July 2020					
Natural disasters are no	2019.10	Typhoon No. 19					
	2019.9	Typhoon No. 15					
longer extraordinary	2019.8	Torrential rain in northern Kyushu					
	2018.9	Hokkaido Iburi Eastern Earthquake					
	2018.7	Torrential rain in July 2008 (West Japan)					
	2017.7	Torrential rain disaster in northern Kyushu					
	2016.10	Tottori earthquake					
	2016.8	Typhoon No.10 in 2016					
No open a curprice	2016.4	Kumamoto earthquake					
No longer a surprise	2015.9	Kanto&Tohoku torrential rain					
when and where they	2014.11	Northern Nagano Fault Earthquake					
occur	2014.8	Hiroshima landslide disaster					
	2014.8	Torrential rain in August 2014					
	2013.10	Izu Oshima landslide disaster					
	2012.7	Torrential rain disaster in northern Kyushu					
	2011.8	Great Kii Peninsula flood disaster					
	2011.3	Great East Japan Earthquake					

#### 1) Recent disasters and disaster waste generation



## Amount of disaster waste generated and disposal period in recent large-scale natural disasters

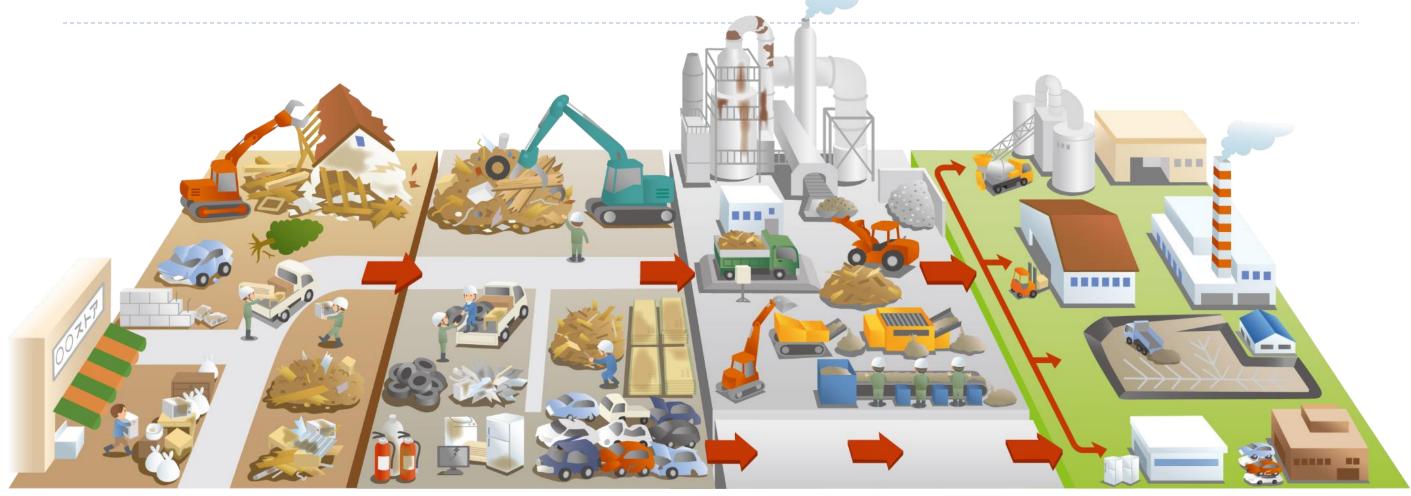


Name of disaste	er	Туре	Date To	otally	er of ho	Partially	•		Burnt or pure	Amount of Waste (10 thousand)	Disposal period(years)
Great East Japan Earthquake		thquake/ sunami	2011.3	122,005	collapse 283,156	damada	floor level 1,489		火災 (330件)	3,100 (津波堆積物 1,100を含む)	約3年 (福島県を除く)
Great Hanshin Awaji Earthquake		hquake	1995.1	104,906	144,274	390,506			7,574	1,500	約3年
Kumamoto Earthquake	Eart	hquake	2016.4	8,657	34,491	155,095			火災 (15件)	311	約2年
Torrential rain in July 2008 (West Japan) Boso Peninsula Typhoon a East Japan Typhoon in 201		Flood	2018.7	6,603	10,012	3,457	5,011	13,737		190(**5)	約2年
		Flood	2019.9-10	3,650	33,951	107,717	8,256	23,010		109(**7)	約2.5年
Nigata Pref. Chuetsu Earthquake	Eart	hquake	2004.10	3,175	13,810	105,682			建物火災 (9件)	60	約3年
Torrential rain in 2020	).7	Flood	2020.7	1,627	4,535	2,116	1,741	6,266		<b>42.4</b> <sup>(※10)</sup> (土砂混じり がれきを含む)	約2.5年
Fukushima Earthquake	Eart	thquake	2022.3	224	4,630	52,388				37.0(**12)	

Source: Ministry of the Environment

2) Disaster waste management flow and basic direction

Disaster Waste management



Occurrence site

Ist temporary storage

2<sup>nd</sup> temporary storage Treatment & disposal



Disposal of domestic waste and manure (including shelter handling)

Disaster waste disposal is the responsibility of the basic local authorities (municipalities)

#### 3) Properties and treatment of disaster waste (Major methods shown below)











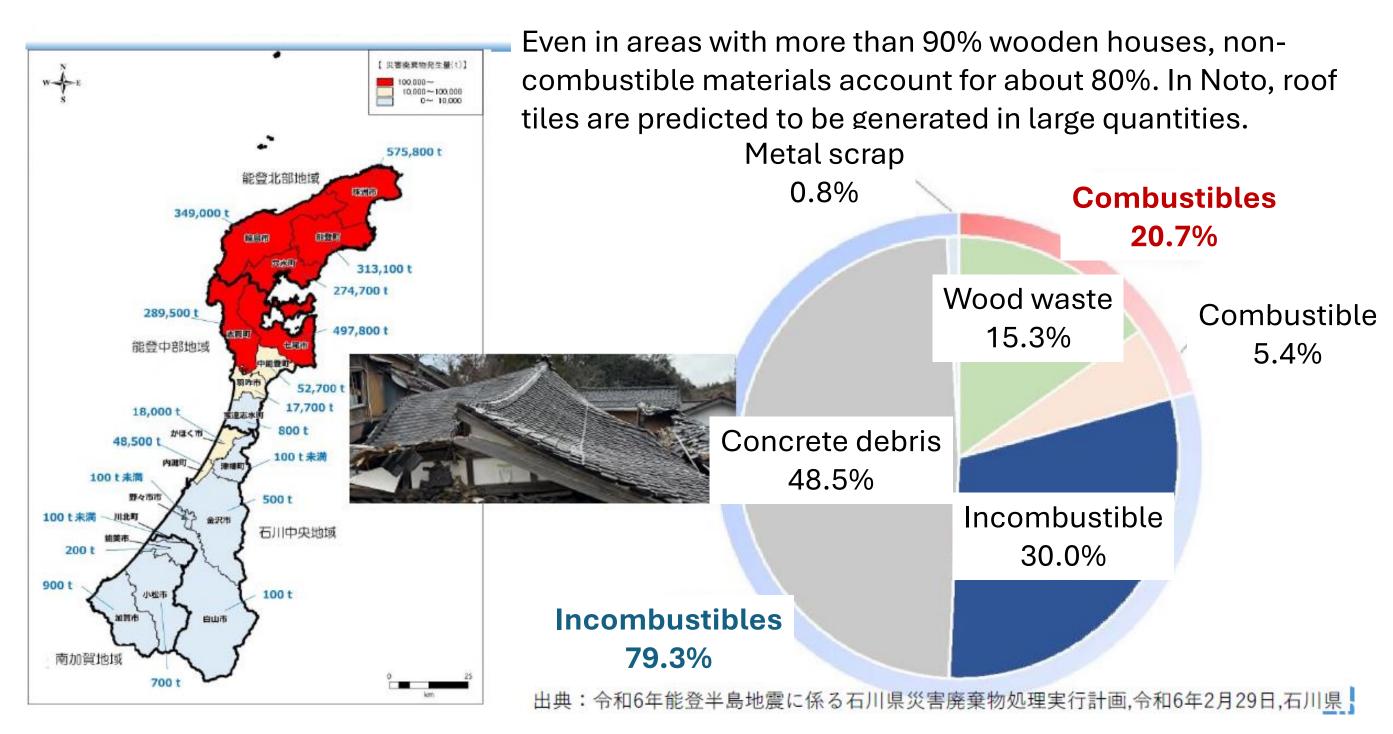






3) Properties and treatment of disaster waste

# Composition ratio of disaster waste [issued by Ishikawa Prefecture]



Source: Ishikawa Prefecture Disaster Waste management Implementation Plan for the 2024 Noto Peninsula Earthquake.

#### Properties and treatment of disaster waste

Ishikawa Prefecture Disaster Waste management Implementation Plan for the 2024 Noto Peninsula Earthquake

Plan for transport and treatment of disaster waste (Ishikawa Pref.)

Separate at the source, sort by the machine and recycle as much as possible. Utilize treatment facilities in the prefecture and use marine transport to complete treatment within the disposal target period, and widearea treatment outside the prefecture.



区分

約124万t

**Treatment** 

種類別

可燃物

約13万t

木くず

約38万t

不燃物

約73万t

県外

**Upper:** within the pref.

約7万t

県内約17万t

県外 約21万t

県内 約63万t

Lower: outside the pref.

**Combustible** 

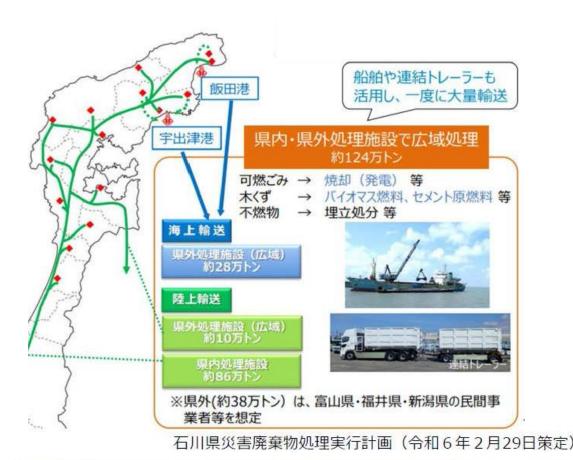
**Wood waste** 

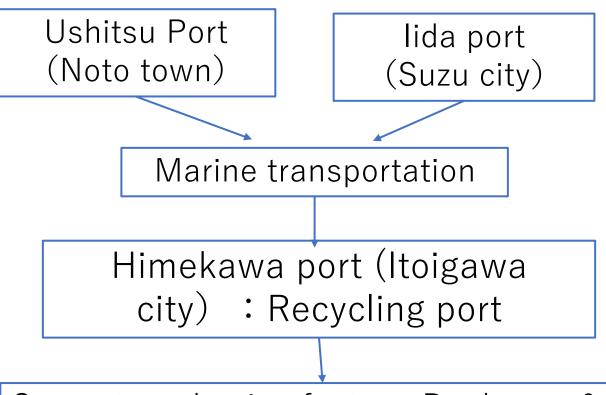
**Incombustible** 

#### 3) Properties and treatment of disaster waste

Wide-area treatment using marine transport and

recycling ports





Cement production factory: Denka co. & Myojyo Cement co.



Loading of wood waste



Arrival at the port



**Unloading** 

3) Properties and treatment of disaster waste

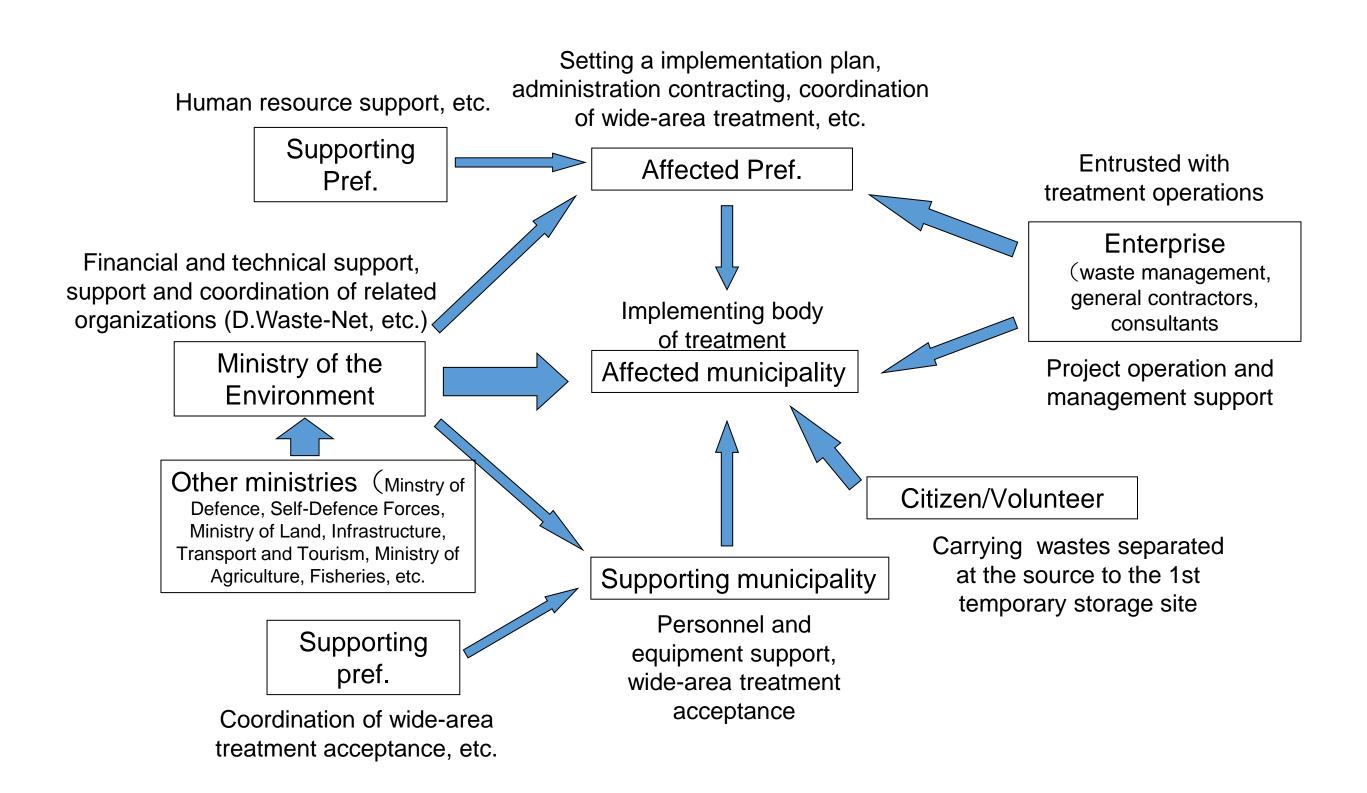
# Loading out and marine transport of disaster debris (At the time of the survey in late July, at the port of Ushitsu, Noto Town)





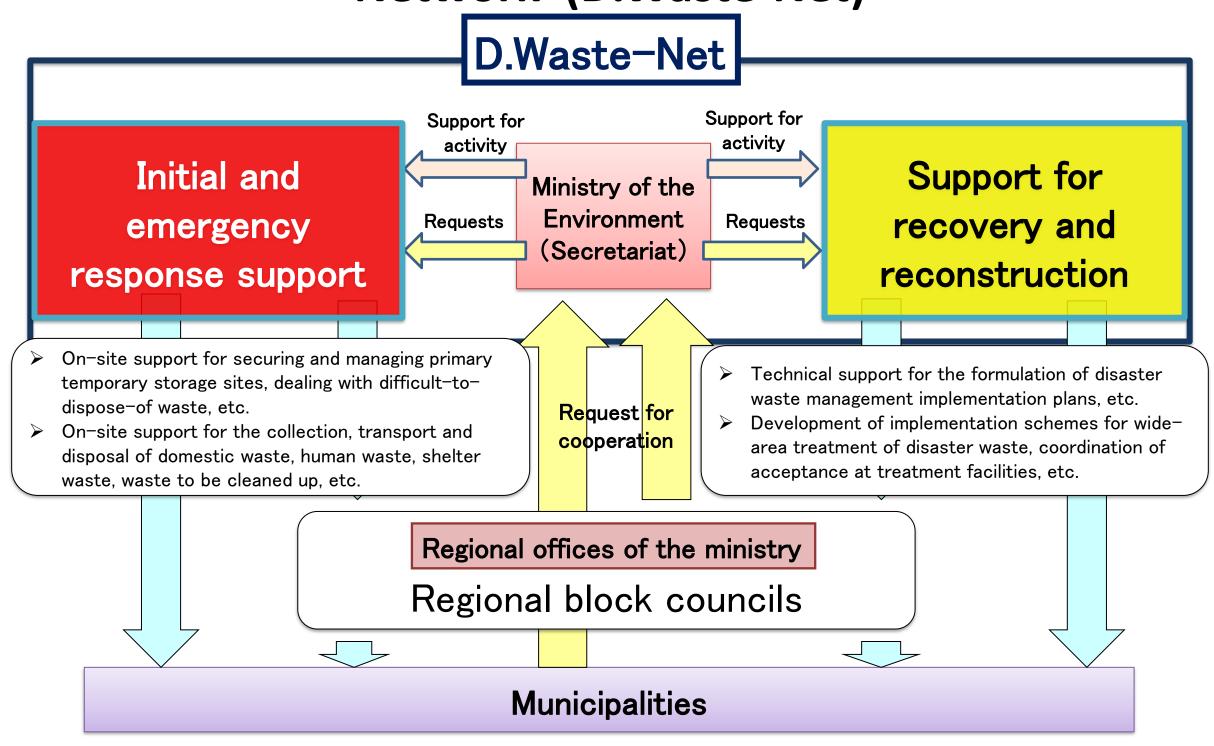
#### 4) Organizational Implementation system for disaster waste management

#### Roles of various actors in disaster waste management



4) Organizational Implementation system for disaster waste management

### Supporting system by Disaster Waste Management Support Network (D.Waste-Net)



Another supporting system is the human resource bank of municipalities with past disaster experience set up by the Ministry of the Environment.

### 2. Preparedness for the future



~Towards a sustainable society with resilience

**Key concept**: increase the sustainability and at the same time the resilience of technical and social systems





### 1) Sustainable systems with resilience (treatment infrastructure)

Energy security during disasters

Disaster prevention center



Reginal energy hub

Decarbonization

Treatment infrastructure (Incineration plant)



### 2) Sustainable systems with resilience (treatment infrastructure)

Final disposal of Disaster Waste

Land creation
Urban development



Final disposal

Sea reclamation Land development

Treatment infrastructure (Landfill, reclamation)

8 cases related to strengthening disaster waste management



### 3) Sustainable systems with resilience (treatment infrastructure)

Rapid treatment and early reconstruction

Decarbonization and circular economy

Mass acceptance of disaster debris



国立環境研究所肴倉氏提供

筆者攝影

Treatment infrastructure

(Cement production factory Biomass power plant, etc.)

Resource recycling and energy recovery in peacetime



### 4) Sustainable systems with resilience (Construction stock management)



8 cases related to strengthening disaster waste management



5) Sustainable systems with resilience (Road infrastructure management)

Early recovery and reconstruction

Efficient disaster waste transport

高速国道(S41計画)
高速国道(S62計画追加分)
一般国道自動車専用道路
(S62計画追加分)
大都市圏環状道路)

Road network development, high-standard roads

Road infrastructure management

Economic growth, tourism, regional security, low carbon



出典:国土交通省、自動物流道路関連資料より

Infrastructure development for the automated system e.g. automated driving and logistics roads



出典:国土交通省、自動物流道路関連資料より

8 cases related to strengthening disaster waste management

ストレージ・クラウド



**WOOMS PORTAL** 

出典:https://www.wooms.jp/

6) Sustainable systems with resilience (Information infrastructure, DX) Productivity

Information sharing and management efficiency



筆者撮影、応用地質㈱協力

Introduction of DX into disaster management



筆者撮影、応用地質㈱協力



Introduction of DX into waste management

improvement/resolution of

numan resource shortages

①ルート管理

Information infrastructure Introduction of DX

OCR RPA



③電子情報化

AI-OCR

職員

4確認

RPA(LuPa)

⑤自動集計



### 7) Sustainable systems with resilience (Community management)

Early recovery and livelihood reconstruction

Cooperation and support for clearance and transport



Community management

Public and mutual aid in ageing societies



Cooperation in source separation and support for elderly people to discharge





# 8) Sustainable systems with resilience (Human and organizational system development)

Strengthening disaster response capacity

Disaster management planning and human resource development



Strengthening waste management capacity

3R & proper management planning and human resource development

Human and organizational system development



The need to create sustainable material cycles and waste management with resilience to disasters and a sustainable society through seamless measures that are useful both in normal times and in times of disaster.

Thank you for your kind attention!

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