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Bio-energy technology towards circular economy ~ Case of Japan



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Goal 7 : Ensure access to affordable, reliable, sustainable and modern energy for all

- ❑ Modern society depends on reliable and affordable energy services to function smoothly and to develop equitably.
- ❑ The new, clean technologies are available that can reorient development along a more sustainable trajectory.
- ❑ Key important points addressed by SDG 7:
 - ✓ Electricity access
 - ✓ Electricity availability and reliability
 - ✓ Renewable energy
 - ✓ Energy efficiency
 - ✓ Infrastructure investments
 - ✓ Environmental investments



Source: <https://unstats.un.org/sdgs/report/2016/goal-07/> and adapted from <https://wasteaid.org/waste-sustainable-development-goals/>

Brief Introduction: Biomass and its utilization

- ❑ Biomass resources are potentially the world's largest sustainable source of fuel and chemicals
- ❑ Globally, 1 billion tonnes of agricultural waste is produced yearly
- ❑ 17 trillion dollars biomass economy
- ❑ Fast emerging biomass trades: woodchips, sawdust and pallets
- ❑ China is the biggest biomass producer in Asia Pacific with annual generation of 587 million tonnes



Advantages of Green Energy

- Carbon Neutral
- Renewable
- New Industry Development in rural area

Source: 6th Regional 3R Forum 2015, Maldives



Major Developments of Biomass Policy in Japan

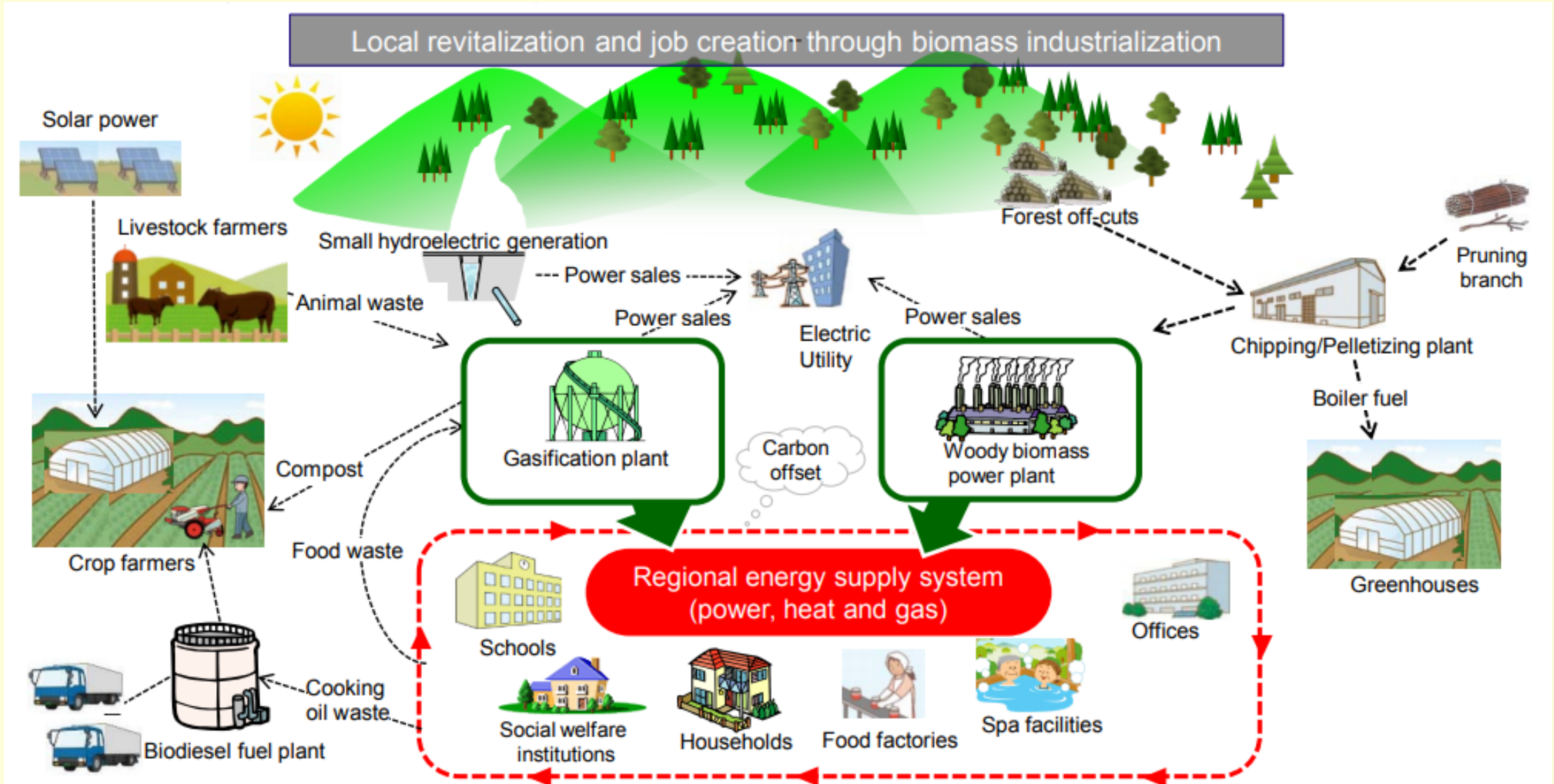
Biomass utilization promotion was incorporated in basic national strategy in 2002, and the Basic Act was established in 2009.

After the Great East Japan Earthquake and subsequent nuclear accident happened, the biomass industrialization strategy was drawn as principle to create regional green industry and fortify an independent and distributed energy supply system.

Three National targets (2020)

- ❑ The National Plan for the Promotion of Biomass Utilization sets up three numerical targets for biomass utilization by the year 2020.
- ❑ National target of average utilization ratio is set for each type of biomass to promote high utilization biomass based on their types and to clarify the necessary measures to be taken on the national level.
- ❑ The policies below are designed to develop effective utilization technologies, and promote establishment of comprehensive technology system encompassing each process from biomass collection and transportation to conversion and use.

Model: Biomass Industrial Community in Japan



Concept of Biomass town

Since biomass is renewable resource, biomass utilization to produce energy can contribute greatly to prevention of global warming and to the recycle-based societies.

The Biomass Town is an area where a comprehensive biomass utilization system is established and operated through the cooperation of various stakeholders in the area.

Sado, Niigata Prefecture

Using regional resources for an island to live people and wild ibis together

Sado is aiming to make its island more energy self-feeding and environmental-friendly using woody biomass and food oil waste. The goal is to cover the island's energy needs using resources generated in the island.



Source: Sado Ibis Conservation Center

Kasai, Hyogo Prefecture

The Symbol of Regional Recycling: The "Field mustard blossom train"

BDF* trains and public vehicles trigger to realize environmental-friendly and sustainable lifestyle such as biomass utilization in the all city
BDF: biodiesel fuel



Maniwa, Okayama Prefecture

The birthplace of the Biomass Town Tour

The "Industrial sightseeing tour" takes visitors to facilities utilizing woody biomass, and promotes biomass industries with urban-rural interchange and revitalization of recycling-based industries.



Oku, Fukuoka Prefecture

Creating an environmental town through reducing waste

Sludge from septic tanks, and food/human waste are fermented and converted into energy and liquid fertilizer. The latter is used in fields and paddies. Creation the biomass town based on recycling-society Concept activities, for example, environment learning at biomass utilizing facilities.



Shimokawa, Hokkaido

Living together with forests; leading low-carbon society

By implementing self-reliant and economic system utilizing woody biomass, and challenging fast-growing willow trees as fuel source, Shimokawa has made it Woody Biomass Refinery town.



Kosaka, Akita Prefecture

Effective biomass utilization in a 3R (reduce, reuse and recycle) town.

With the towns' expedience related to mining, refining mine and recycling industries, Field mustard blossom growing project and others are carried out for recycling resource suited to the town capacity.



Motegi, Tochigi Prefecture

Locally-produced/locally-consumed "Midori" compost and agricultural products

"Midori" compost is made from a biomass, including fallen leaves from mountain forests and organic resources from farms, and the is used to grow farm produce. The town's farm product brand has been successful, resulting in a system of local production/local consumption.



Hita, Oita Prefecture

Leading biomass resource department store

The town utilizes various types of biomass. The biomass-derived products are biogas, wood chips, feed and compost.



Shirakawa, Gifu Prefecture

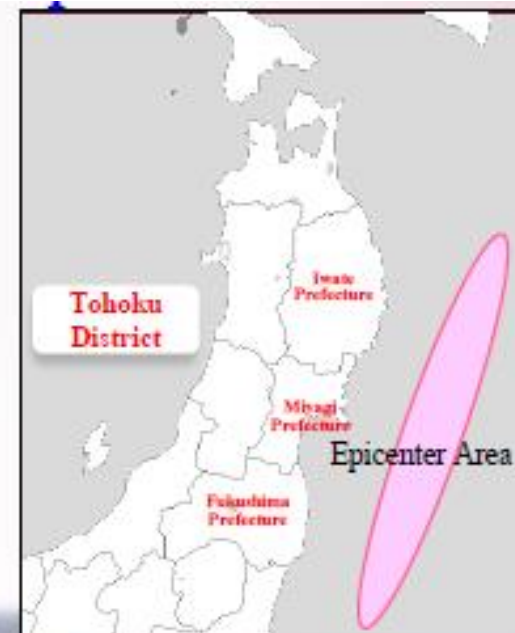
Forests & Energy: aiming for regional recycling

The Tono Hinoki Product Circulation Cooperative leads effective use of the woodchips and other scrap left behind by lumber mills, and converting it to energy. With this regional energy recycling system, the town has succeeded in revitalizing the lumber industry, a key industry.



(1) Scale

- Date: March 11, 2011 at 14:46 JST
- Epicenter: Bed of Pacific Ocean 100 kilometers off the coast of the Tohoku
- Scale: Magnitude 9.0,
Maximum Seismic Intensity 7
(The largest earthquake ever recorded in Japan)



(2) Damage (as of April 10, 2014)

- No. of Human Casualties: 24,674
 - Deceased 15,884
 - Missing 2,640
 - Injured 6,150
- No. of Damaged Buildings: 1,142,776
 - Completely Destroyed 126,631
 - Half Destroyed 272,653
 - Partially Destroyed 743,492



(3) Characteristics

- A wide-area and complex disaster due to the earthquake, tsunami and nuclear accident
- Majority of human casualties and damaged buildings were due to the tsunami

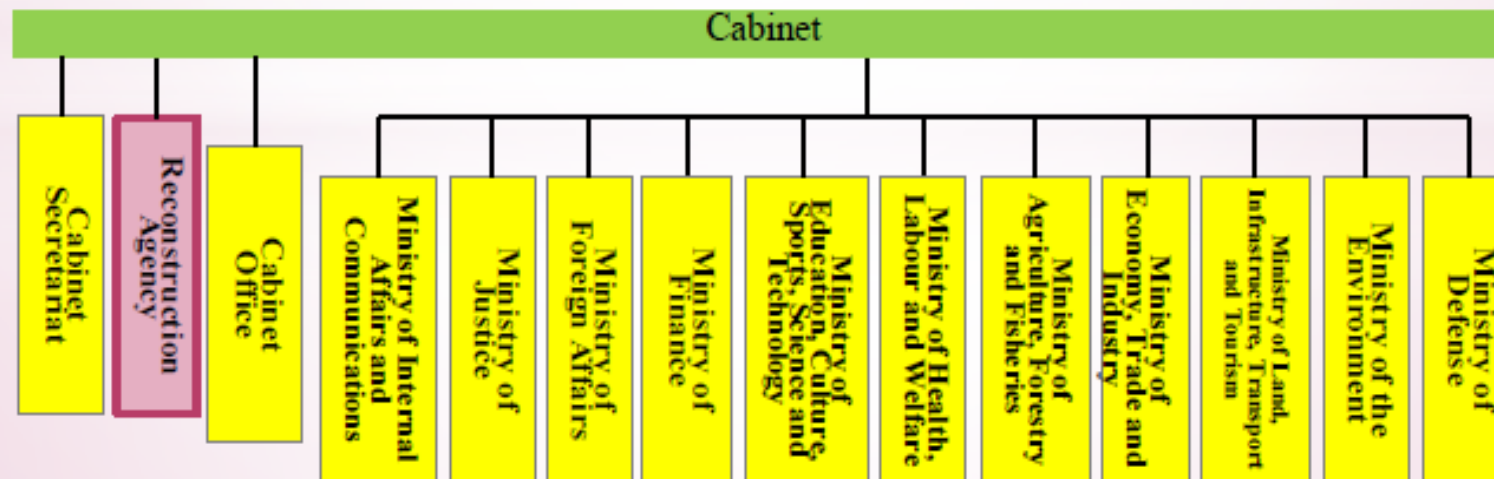


(1) Major Functions

- (1) Plan, propose and comprehensively coordinate reconstruction policies in response to the Great East Japan Earthquake
- (2) Promote implementation of government assistance for reconstruction conducted by local governments
- (3) Promote implementation of reconstruction measures conducted by other ministries and agencies

(2) Position within the Japanese Government

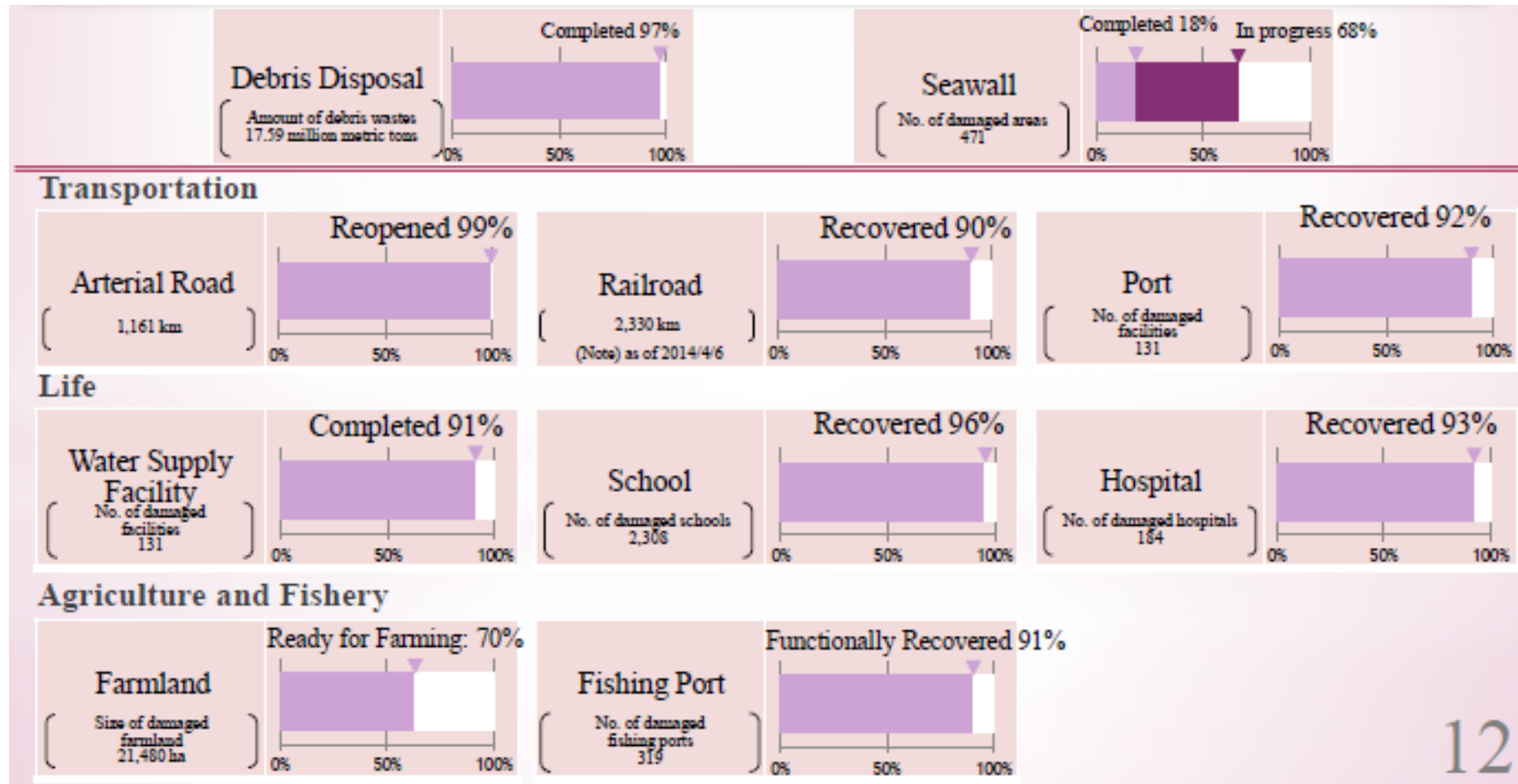
- (1) Ranked higher than other ministries and agencies
- (2) Minister for Reconstruction is authorized to request related ministries and agencies to provide necessary documents and explanation as well as to make recommendations as necessary.



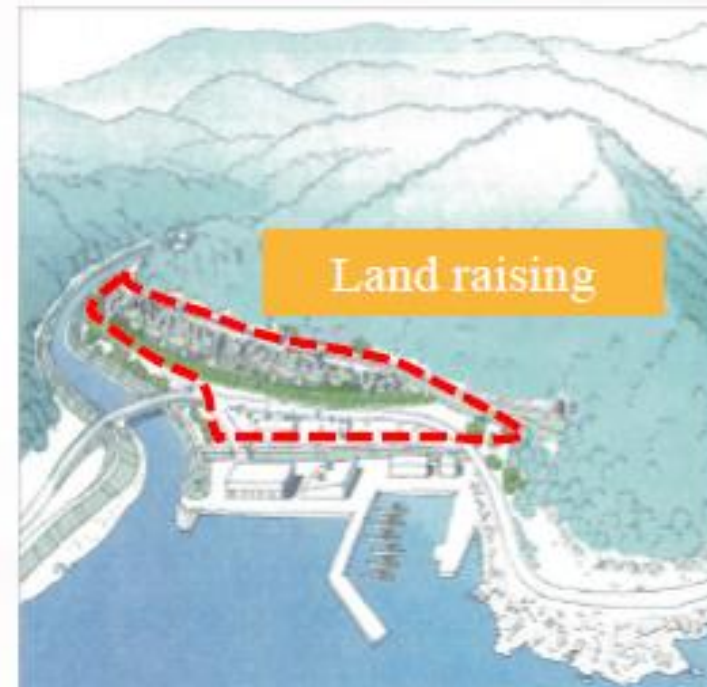
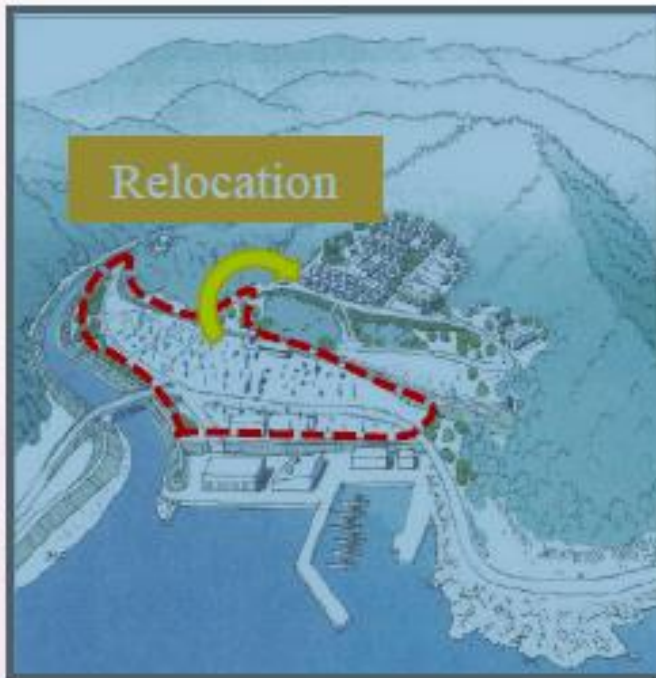
- March 11, 2011** The earthquake occurred, and **Emergency Disaster Response Headquarters** were established in the Japanese Government.
- May to November** **Supplementary budgets** for reconstruction were funded in series . (15 trillion yen (about \$150 billion) in total)
- July** **“Basic Guidelines for Reconstruction”** was issued.
- A timeframe for reconstruction was set to be 10 years, of which first 5 years were set as an intensive reconstruction period.
 - The scale of the budget for the intensive reconstruction period was set.
 - Special zones for reconstruction were set to implement special measures for reconstruction.
 - A new budget system was created for reconstruction.
- February 2012** **The Reconstruction Agency** was established.
- Established within the Cabinet
 - Coordinate reconstruction activities as a control tower
 - A time-bound organization for no more than 10 years

The total budget for reconstruction measures and activities for the ten-year planned period (from FY 2011 to FY 2020) was set at 32 trillion yen (about 320 billion dollars).

Reconstruction Agency undertakes project management to facilitate implementation of reconstruction project. (Figure shown below is the sample of reconstruction progress as of March 2014)



- Patterns of Urban Area Reconstruction in Tsunami-struck Areas
(32 municipalities)
- | | |
|--|---------------------|
| (1) Relocation to upland or inland | 60% (339 districts) |
| (2) Reconstruction at the original place | 20% |
| (3) Raising the ground level of land | 10% (51 districts) |
| (4) Others (relocating within the original place, relocation + Land raising) | |

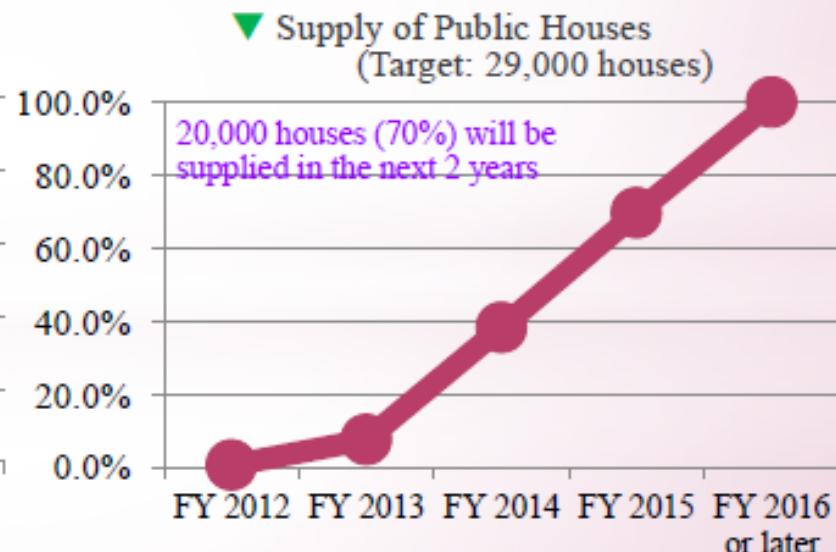
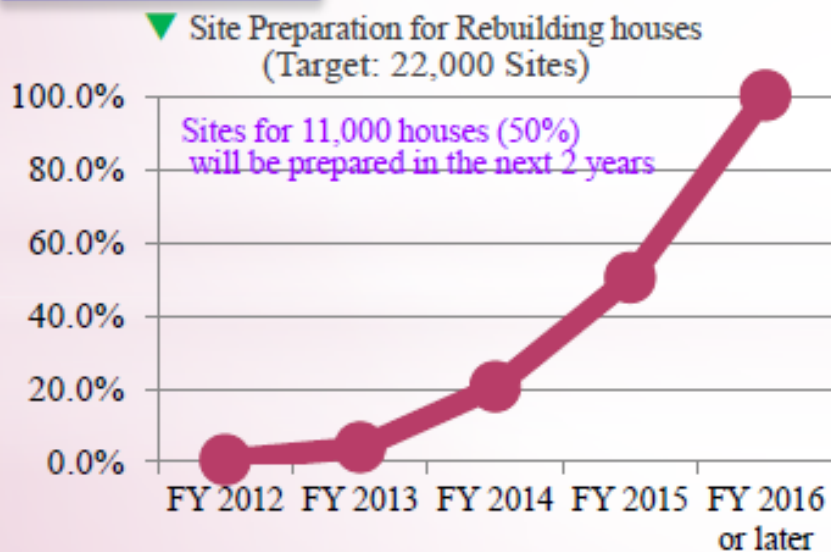


- Generally, consensus building on relocation or land-raising may take longer than that on reconstruction at original place.

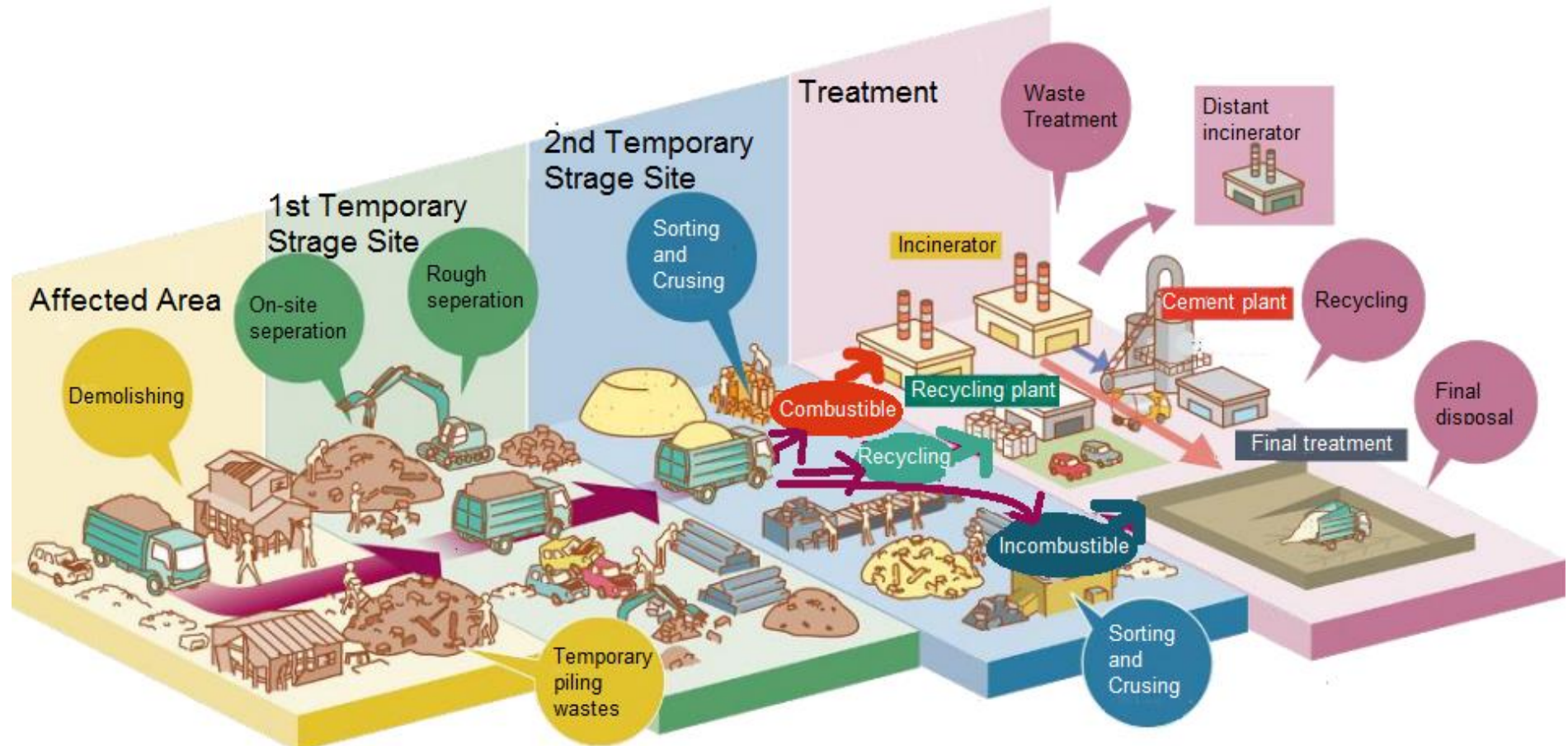
Reconstruction Agency undertakes project management to facilitate implementation of reconstruction project. (Figure shown below is the sample of reconstruction progress as of March 2014)

- (1) Site Preparation for Rebuilding houses on their own:
 Planning 100%, In Progress 87%, Completed 13%
- (2) Supply of Public Housing:
 Planning 100%, Land Acquisition 72%, Completed 10%

Future Outlook



Disaster Waste Treatment Flow



Cleaning and Collection

Storage and Separation

Treatment, Recycle and Final Disposal

3R for Reconstruction

- “Mixed waste” accounts for about 60% of disaster waste
- Resources are sorted and recycled from the mixed waste as much as possible (wood chips, concrete rubble, scrap metal etc.).



Utilizing biomass of disaster waste

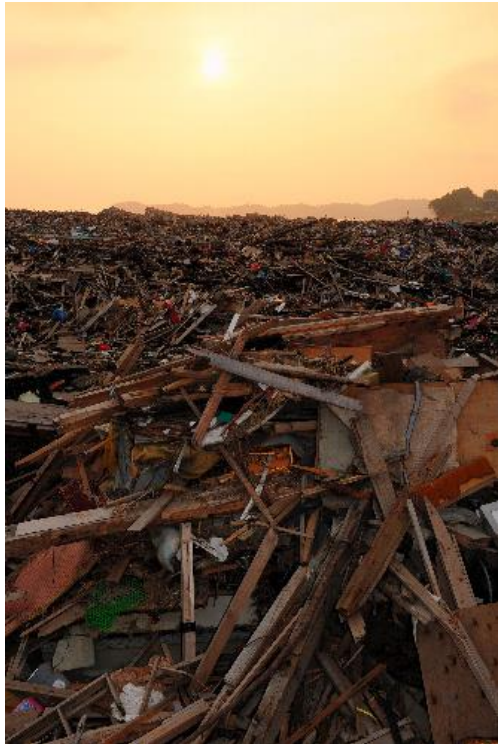


Photo:

<http://www.asahi.com/special/10005/TKY201106150609.html>

Good utilization of biomass from disaster waste for reconstruction of community.

Sorting wooden biomass from mixed disaster waste.

Using sorted wooden resource for heating energy.

Promote forestry in Iwate prefecture.

Waste to Energy



Sorted timbers from mixed disaster waste



Pellet fuel/ Woodchips



Fuel for domestic heating



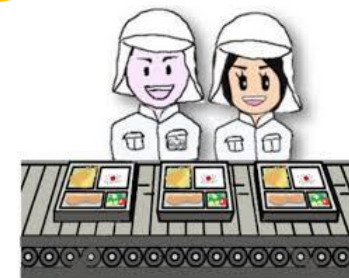
Boiler and heating systems



Senior residences
Hospitals



Public baths
Swimming pools



Industries

Iwate prefecture:

http://www.pref.iwate.jp/dbps_data/_material/_files/000/000/033/746/shishin-low02.pdf

Thank you very much