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Competition of wood resource procurement among biomass power plants: Japan's experience

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Nishiwaga Iwate Pref.
Photo: Daisuke Sawauchi

1. Backgrounds and purposes

- Utilization of solid biomass in Japan
 - Some wood biomass power plants are in operation and some more plants are planned and being constructed after FIT scheme was introduced in 2012
 - Plant owners individually build their own plans for biomass collection
 - Probably they consider collecting biomass from nearby forest which is more cost efficient
 - But, the power plants are located densely in the area which has larger forest and no coordination scheme among multiple plants is made so far
 - So, there is a possibility to occur competitions of biomass procurement among the plants
 - After all, the plants might not be able to obtain enough amount of biomass needed to keep their plants in operation

1. Backgrounds and purposes

- Purposes

- To investigate the situation of competition of biomass procurement among multiple wood biomass power plants in Iwate prefecture, Japan
- To identify factors causing the competition and to show lessons learned from it
 - Why the competition occurs?
 - What we should do to avoid the competition?

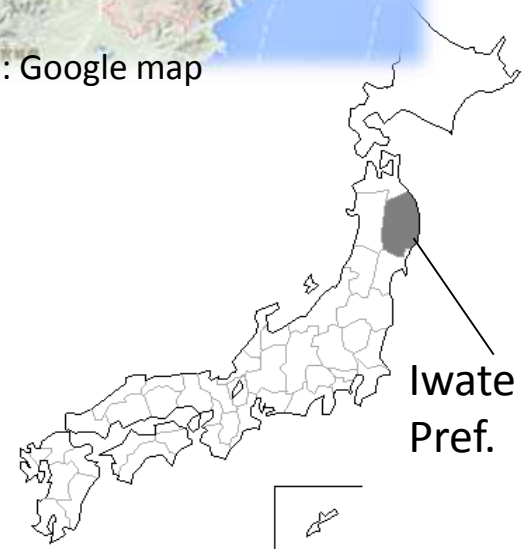


1. Backgrounds and purposes

- Iwate Pref.
 - Northeast part of Japan
 - Forest area is 4952 km²
 - 77 % of land is covered by forest
 - Coastal area was heavily attacked by tsunami in 2011
- FIT scheme
 - Introduced in 2012 reflecting the nuclear crisis in Fukushima
 - Unutilized wood resource: 32JPY/kWh
 - Other wood resource :24JPY/kWh



Source: Google map

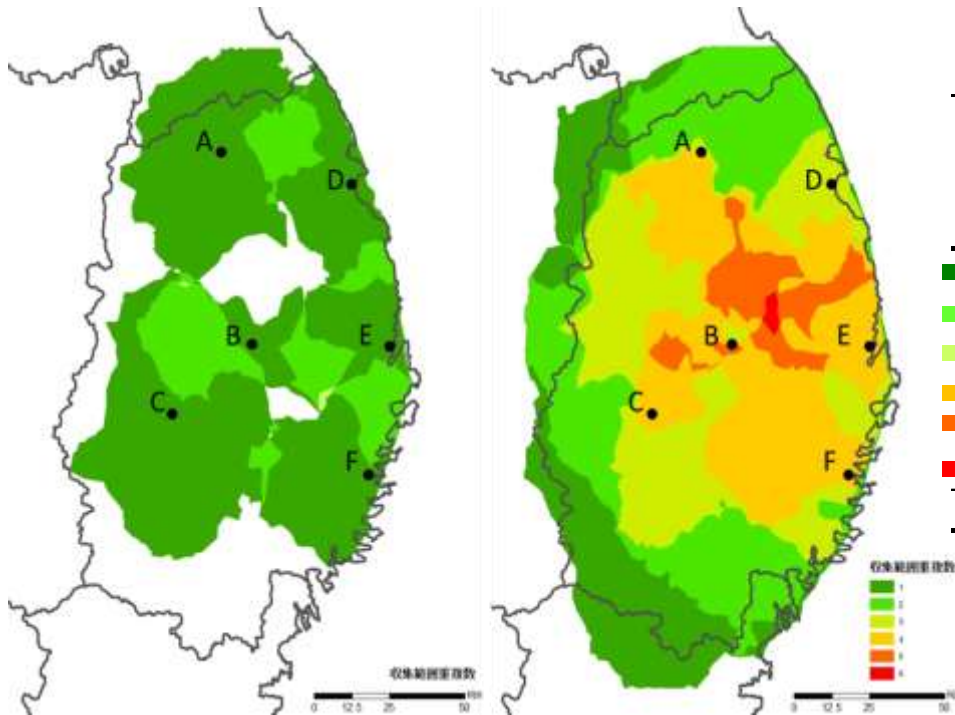


2. Assumptions

- Focus on 6 wood power plants (both in operation and under construction) in Iwate Pref.
- Only thinning residue of Japanese cedar is focused
 - Main wood resource in Japan
 - FIT price for power from thinning residue is higher than normal wood biomass
 - Other tree types, construction waste and sawmilling residue are not considered
- 30% of volume is thinned at the age of 25, 35 and 45 years
- 27% of felled trees are extracted, others are abandoned in forest due to lack of economic feasibility
- 40% of extracted trees is used for energy (the rest is for timber)
- 13895m³ of wood per 1000kW is needed according to a previous study

3. Results

- Degree of competition among 6 plants



Overwraps (Number of plants collecting biomass in the same forest)	Transportation distance 50km		Transportation distance 100km	
	Forest area (ha)	Share (%)	Forest area (ha)	Share (%)
1	12,541	79.4	5,506	4.5
2	3,225	20.4	20,343	16.7
3	21	0.1	33,116	27.2
4	0	0	50,961	41.8
5	0	0	11,588	9.5
6	0	0	432	0.4
Total	15,786	100	121,946	100

Transportation distance 50km

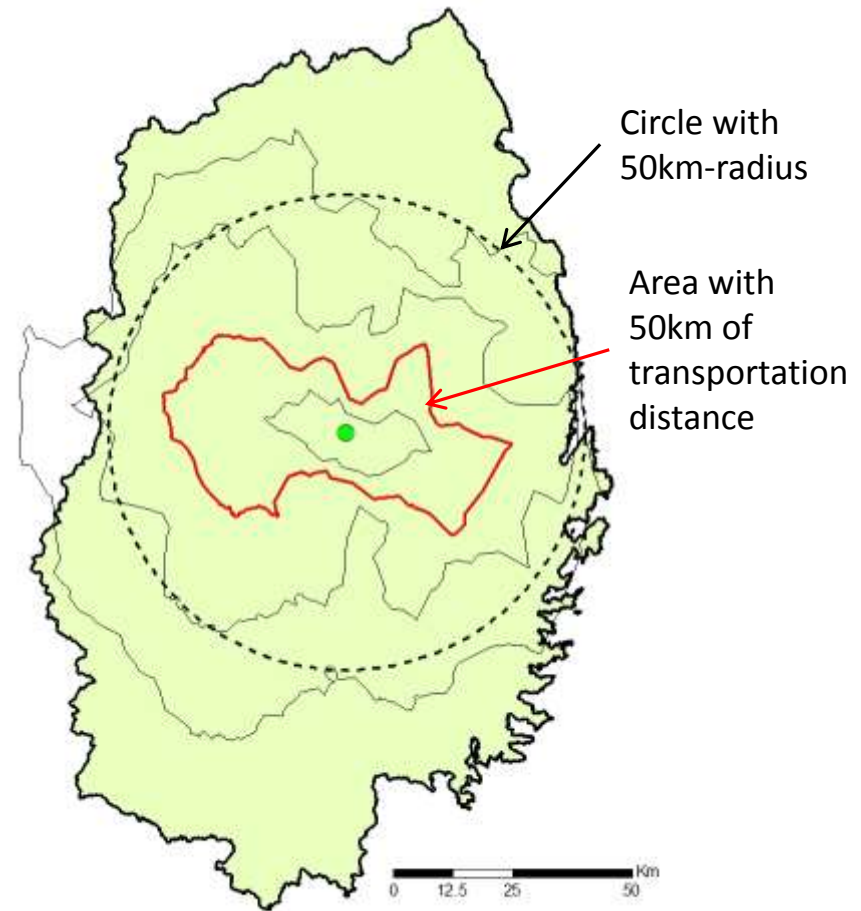
Transportation distance 100km

4. Considerations

- Why competitions occur?
 - Ambitious plans for resource procurement
 - Their plans are based on area a circle with 50 km of radius
 - Rough sketch of resource potential
 - Do not consider actual road network and availability based on tree type and age, slope in forest etc
 - They have to travel longer distance to collect biomass feedstock

4. Considerations

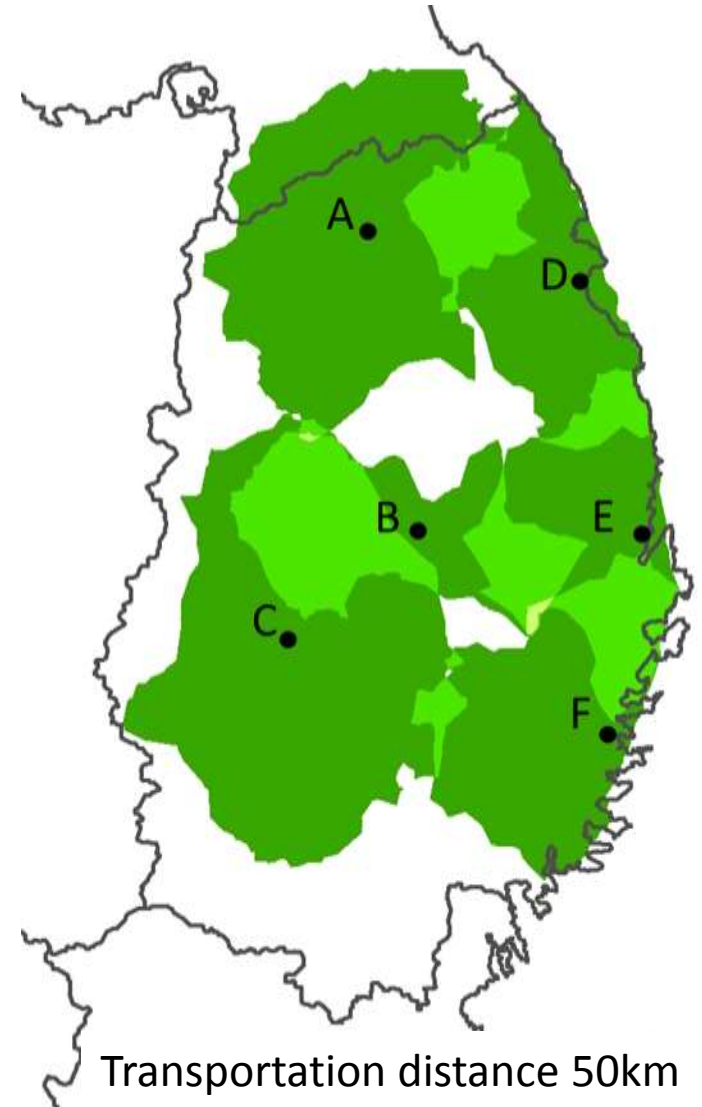
- When considering resource potential based on 50km-radius from a plant, 826km² of forest is included in the area, and 30.2 million m³ of thinned trees can be collected
- If transportation distance 50km is assumed, total volume of biomass reduces to 5.6 million m³ (18.5%)



	Forest area (km ²)	Total volume (million m ³)
Circle with 50km-radius	826	30.2
Transportation distance 50km	153	5.6
		18.5%

4. Considerations

- Plants elaborate their own plans for resource procurement individually
 - No coordination scheme is introduced at regional level



Plant ID	Biomass supply by transportation distance (m ³)				Biomass demand
	25km	50km	75km	100km	
A	7,456	20,065	29,211	42,372 →	86,087
B	1,738	9,369	38,157 ↔	94,360	79,889
C	8,478	44,600 ↔	91,090	129,382	86,087
D	2,345	7,899	17,920	29,383 →	192,835
E	4,386	12,719	27,808 ↔	63,901	41,322
F	← 9,857	39,097	68,883	91,706	6,600
Total					492,819

Note: Plant F is co-firing.

5. Concluding remarks

- Serious competition of biomass procurement could occur among 6 wood biomass power plants in Iwate pref.
- When considering actual road network, feasibility of extraction and thinning schedule of forest, available amount of biomass significantly reduces
 - Some plants cannot obtain even they travel 100km for collection
 - Actually, they are collecting feedstocks from biomass other than thinning residue or imported one but FIT prices from these feedstock are lower

5. Concluding remarks

- The reasons for the competition
 - Ambitious plans for resource procurement
 - No coordination scheme for multiple bioenergy plants at the planning stage is introduced at regional or national level
- To avoid the competition
 - Plant owners should make well-organized plans considering actual situation of biomass collection (road networks, forest and tree types, economic feasibility of resource extraction etc)
 - Coordination scheme should be introduced

Thank you very much
for your kind attention!



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Photo: Seiichiro Kanno