

Proposals for Industrial Recovery in the Tohoku Region

**— Developing new industrial clusters that lead the
Japanese economy to a new era —**

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In the three Tohoku prefectures of Iwate, Miyagi and Fukushima, fisheries, agriculture and their related industries are major contributors to the local economy. The Great East Japan Earthquake has had a major impact on the economy of the region. Moreover, the manufacturing industry in this region faces the risk of losing its foothold in the network of the international division of labor in manufacturing.

To put a stop to problems of unemployment in the stricken areas and to promote the recovery of the region's industries, we should aim to set up industrial clusters that are capable of leading the industrial restructuring of Japan. Specific moves would include restoring and advancing traditional industries and creating new industries that rely on new systems and schemes.

To create new industries, we believe it is desirable to establish industrial clusters in seven priority fields, namely (1) seafood, (2) agri-food, (3) super-manufacturing, (4) environment-related, (5) new resources, (6) health and medical and (7) urban-type industries by drawing on resources available in the Tohoku region as well as on its strengths built thus far.

Among these clusters, for the seafood industry cluster, efforts should be made to promote the agglomeration and sophistication of functions such as fisheries processing and logistics operations and to facilitate tie-ups between medical institutions, food manufacturers and fisheries whereby fisheries resources are used to produce health foods and supplements. The super-manufacturing industry cluster should aim to further promote labor-saving and automation in manufacturing operations such as developing leading-edge, fully automated, unmanned factories, and to develop the technology and expertise needed to be competitive with other Asian countries.

In rebuilding the industry in the stricken areas, the needs of affected companies and residents must be considered. Any efforts for reconstruction should be led by communities to the greatest extent possible. As one of the first steps towards a rapid recovery, a "special reconstruction zone" should be established, where tax breaks are provided and any regulations impeding reconstruction efforts are eased.

I Characteristics of Industries in the Stricken Areas

The Great East Japan Earthquake struck on March 11, 2011, with massive tremors shaking extensive regions from Tohoku to Kanto, which were followed by tsunami that devastated the coastal regions. Particularly hard hit were the three Tohoku prefectures of Iwate, Miyagi and Fukushima, with the economy of the region decimated. This paper discusses an industrial rebuilding plan for the three Tohoku prefectures.

1 Industrial structure in the stricken areas

When we look at the “Annual Report on Prefectural Accounts for FY 2008,” published by the Cabinet Office, Government of Japan, to see the industrial structure of the three Tohoku prefectures in terms of gross prefectural domestic product, we find that agriculture, forestry and fisheries constitute 2.6 percent of the total, well in excess of the national average of 1.2 percent. Manufacturing, on the other hand, accounts for 20.6 percent, which is almost the same as the national average of 21.2 percent.

The total output of the three Tohoku prefectures in fiscal 2008 decreased by 1.8 percent (in nominal terms) over the preceding five years since fiscal 2003, which is higher than the nationwide decrease (total for all 47 prefectures) of 1.1 percent.

When we look at the contribution of each industry to growth in the overall prefectural output, we see that the decline in secondary industries has had a major influence. For the three Tohoku prefectures, the contributions of mining and construction both fell by 1.5 percent (Figure 1). On the other hand, the contribution of tertiary industries increased by 1.3 percent.

2 Primary industries were the core of the regional economy

In the stricken areas, the fishing industry itself in the coastal areas that were overcome by tsunami was never a major contributor to the regional economy. However, when we consider other related industries such as marine product processing, wholesaling, warehousing, ship repairs and cooperatives, we find that they employed almost half of the workforce in the coastal cities, and were crucial to the regional economy.

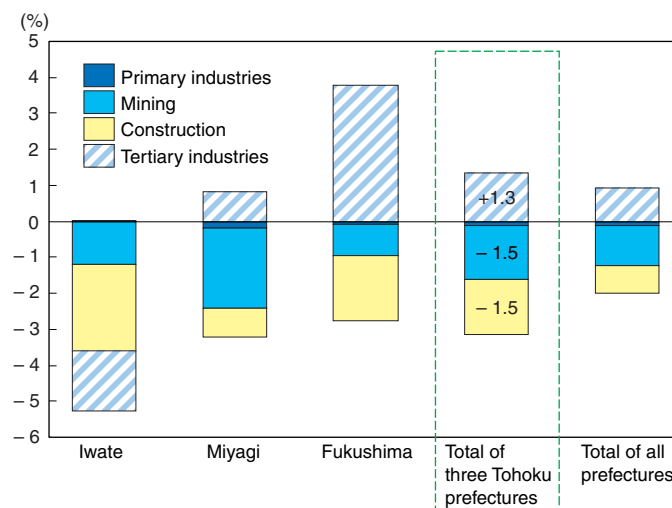
The Great East Japan Earthquake devastated fishing ports and related facilities as well as aquaculture facilities such as oyster farms. Add to this the pollution caused by leaks from the damage to Tokyo Electric Power Company’s Fukushima Daiichi Nuclear Power Station (Fukushima nuclear accident), and it becomes clear that the fishing industry has been very severely affected.

Furthermore, costal areas such as the Sendai Plain were dedicated to rice production. However, tsunami either washed away the topsoil or left the area flooded with damaging salt water. These problems have been compounded by the release of radiation following the Fukushima nuclear accident.

3 Concerns over deindustrialization

Although Tohoku was relatively late in becoming industrialized relative to the rest of the country, the region took full advantage of the opening of the Tohoku Shinkansen line and the Tohoku Expressway in the 1980s, with many factories moving from the Tokyo metropolitan area, etc. In particular, many electronic component and semiconductor factories opened in the area such that, taking a cue from the naming of Kyushu as “Silicon Island,” the area of these factories came to be known as “Silicon Road.”

Figure 1. Contribution of each industry to change of total output in the three Tohoku prefectures of Iwate, Miyagi and Fukushima (FY 2003 – FY 2008)



Source: Compiled based on “Prefectural Economic Accounts,” published by the Cabinet Office, Government of Japan.

After the 1990s, however, with the rapid movement of electrical and electronic production to other Asian countries, manufacturing in the Tohoku region, which had been characterized by the assembly of mass-produced goods and general-purpose goods came under intense competition from other Asian countries. As a result, factories that had been producing electronic components and information devices were either downsized or closed one after another.

Taking the place of these industries, recent years have seen the growth of automobile-related industries. In 1993, Kanto Auto Works opened its Iwate factory and, in 1997, Toyota Motor Tohoku Corporation started operations, leading to the rapid building of automobile-related factories such as those producing automobile components. In January 2011, Central Motor Co., Ltd. brought its Miyagi plant (new head factory) into full-scale production.

In addition to the manufacturing industry in the Tohoku region having to face competition from other Asian nations, the influence of the global financial crisis set off by the collapse of Lehman Brothers in 2008 was considerable. According to the Census of Manufacturers published by Japan's Ministry of Economy, Trade and Industry, the number of people engaged in the manufacturing industry in the three Tohoku prefectures fell by about 50,000 (12 percent) in two years between 2007 and 2009, with the value of product shipments falling by as much as about 2.7 trillion yen (22 percent) (Table 1). Exhibiting particularly large drops were three electrical industries, namely, "electronic parts, devices and electronic circuits," "electrical machinery, equipment and supplies" and "information and communications electronics equipment." In these fields, the number of personnel fell by around 23,000 (22 percent) over the two years, while their output dropped by about 1 trillion yen (29 percent).

Moreover, the number of people employed in the manufacture of transportation equipment, which mostly consists of automobiles, fell by around 2,400 (9 percent), with output down by about 300 billion yen (26 percent). As such, even though not directly hit by

tsunami, manufacturing in the inland areas was already facing a major crisis when the earthquake struck.

4 The Tohoku region faces the risk of dropping out of the worldwide manufacturing network

The earthquake not only destroyed facilities, equipment and factory buildings, but also severed power lines, sewers and water mains, and in the weeks following, led to a gasoline shortage, all of which dealt a massive blow to manufacturing in the Tohoku region. The effect has been prolonged with many enterprises still crippled four months after the earthquake, as of July 2011.

The earthquake revealed another problem in the shape of the failure of the supply chain. Even when located well inland, many workplaces had to suspend operations simply because they could not procure the necessary parts and materials.

A notable result of the Great East Japan Earthquake was that 4th- and 5th-tier subcontractors suffered damage, which paralyzed many manufacturing networks around the world—the automotive industry being a good example. The vulnerability of the supply chain became evident in that the lack of a single part could stop worldwide production. At the same time, the earthquake highlighted the large number of small- and mid-sized enterprises in the Tohoku region that hold a large share of specific parts and materials markets.

Because of the breakdown of the supply chain, some companies have begun sourcing from other areas in Japan as well as from overseas companies such as those in other Asian countries. However, once these other areas establish themselves as reliable suppliers, there is a danger that those in the Tohoku region, which had always been part of the supply chain, will find themselves remaining excluded from the pool of suppliers.

Furthermore, regarding goods that are exported from Japan, some countries are requiring proof of radiation testing or certification of any dosage detected. For manufacturers in the Tohoku region, the constraints being

Table 1. Change in the value of product shipments in the three Tohoku prefectures

	Number of employees (2007 – 2009)			Value of product shipments (2007 – 2009)		
	Change (persons)	Change (%)	Nationwide change (%)	Change (million yen)	Change (%)	Nationwide change (%)
Total manufacturers	- 49,380	- 12	- 9	- 2,686,798	- 22	-21
Food	- 70	0	- 1	30,170	2	1
Fabricated metal products	- 3,713	- 13	-12	- 134,202	- 22	- 18
Three electrical industries	- 23,294	- 22	- 14	- 1,011,352	- 29	- 28
Transportation equipment	- 2,385	- 9	- 10	- 299,243	- 26	- 26

Note: Figures for "three electrical industries" indicate the total of "electronic parts, devices and electronic circuits," "electrical machinery, equipment and supplies" and "information and communications electronics equipment."

Source: Compiled based on the "Census of Manufacturers," published by Japan's Ministry of Economy, Trade and Industry.

imposed by overseas customers are becoming increasingly restrictive.

In the East Asian area surrounding Japan, border-transcending “division of labor” networks for manufacturing parts, materials and finished products have been established. If the current situation remains as is, manufacturing in the Tohoku region is likely to be dropped from these networks that stretch over the East Asian area. Revitalization measures that enable manufacturing in the Tohoku region to show its strengths in the international division of labor manufacturing network are needed.

II Direction of Rebuilding Tohoku’s Industry

1 Industrial recovery that leads the restructuring of Japanese industry

Industrial recovery of the stricken areas does not simply consist of restoring the situation existing immediately before the earthquake struck. Actually, many companies and workplaces suffered such extreme damage from the earthquake that they will never be able to recover, thus reducing employment opportunities in the areas even further.

To compensate for the reduced number of people in the local workforce and to increase employment opportunities, it is necessary to take a two-pronged approach involving the revival of traditional industries and the creation of new ones. When aiming to revive traditional industries, rather than simply regenerating them as they were, we should aim to make them more competitive and adopt a new approach to achieving growth. In addition, new industries that are capable of absorbing employment seekers should be created in the stricken areas.

Industries in the stricken areas have had their share of issues. However, this phenomenon is not unique to the Tohoku region. Primary industries have been slow to modernize, and manufacturing has been facing declining competitiveness due to high cost structures. These issues affect all of Japan. In our efforts at reconstruction, we should aim to develop industrial clusters¹ that are capable of leading Japan’s overall industrial restructuring by actively incorporating new systems and schemes.

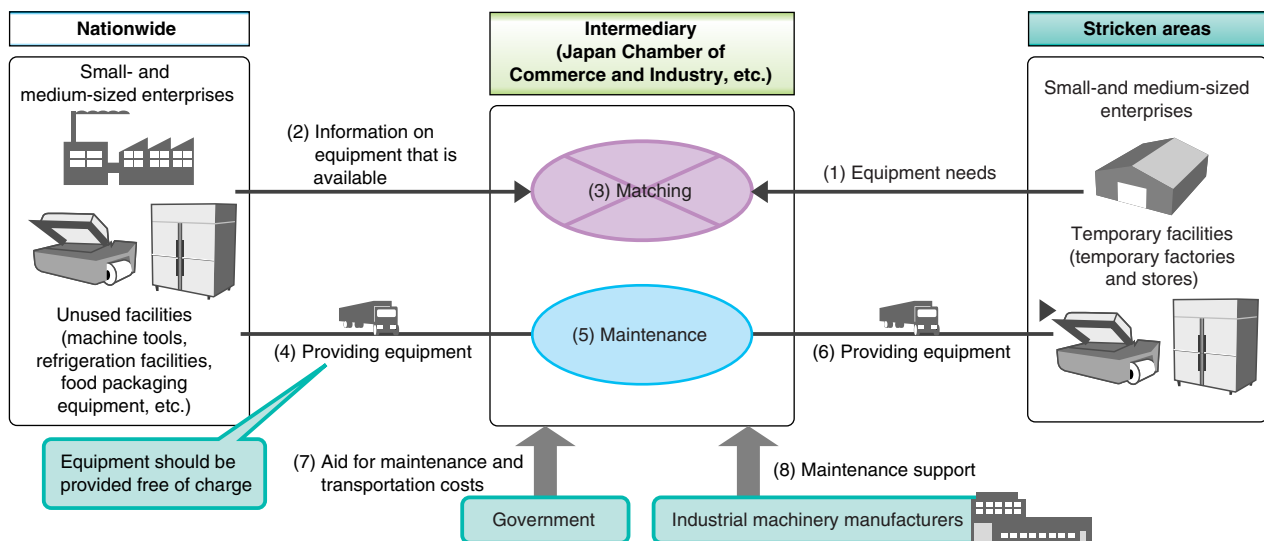
2 Realizing rapid recovery and strategic rehabilitation

Because many companies have yet to recover from the disaster, it is essential that we resolve the issues facing their speedy recovery, not only to safeguard the lifestyles of their employees, but also to restore the supply chain that is essential to industrial activity. For these purposes, a reconstruction strategy should be decided at an early stage, and the associated measures implemented.

When faced with the financial burden of resuming operations, many affected companies are concerned that the capital investment needed for their rehabilitation and reconstruction efforts will incur further debt in addition to that which they had on their books prior to the disaster, thus putting them in a “debt spiral” situation. How best to prevent this “debt spiral” issue is important. As one way of achieving this, in addition to providing temporary facilities and rental factories, we propose a “used industrial machinery matching project” in which companies in other, unaffected areas of the country provide affected companies with used machinery that they have in their possession (Figure 2).

The purpose of this used industrial machinery matching project is to match the industrial equipment needed by affected companies in the stricken areas with that which companies elsewhere in the country possess and

Figure 2. Overview of used industrial machinery matching project



Source: Compiled based on materials published by the Sendai Chamber of Commerce and Industry.

which is surplus to their needs, through support groups that have nationwide networks such as the Japan Chamber of Commerce and Industry functioning as intermediaries.

Affected companies would be able to take on this surplus industrial machinery free of charge to use for their immediate recovery efforts. While the recipient company would receive the machinery for free, it would, however, be liable for the costs of transportation and installation. In addition, the process of matching the available equipment with an appropriate recipient will require expert knowledge about the machinery's performance specifications, etc. If the government were willing to provide the necessary aid and funding, this project could proceed successfully.

3 Proposal for seven new industrial clusters

In the Tohoku region, existing industries will have to become more competitive in the international market in order for them to continue to drive the regional economy. In addition, from mid-and long-term perspectives, new industries must be created that can compensate for the lack of employment opportunities resulting from the earthquake and can be central to future regional economy.

As part of the rebuilding effort after the Great Hanshin Earthquake, the City of Kobe launched the Kobe Medical Industry Development Project. Since then, the city has been working to create an international research and development center in the field of regenerative medicine. As a result, the industry established in Kobe's Port Island now employs over 4,000 people.

Similarly, in the Tohoku region, it will be important to make full use of a variety of resources of the region and to enhance the efforts that have, to date, been made to create industries. At the same time, resources available both inside and outside the country should be fully utilized with the aim of forming new industry clusters. In this paper, in consideration of the strengths of the Tohoku region and the efforts that have already been made to promote industrial agglomeration, we propose the formation of new industry clusters in the following seven fields.

(1) Seafood industry cluster

Along the coast, many types of fisheries have been operating and have formed the nucleus of many other industries, which have contributed to the local economy. As part of the reconstruction of the tsunami-ravaged areas, it is essential that the fishing industry be rebuilt and that the industry cluster centered on fisheries be reconstructed.

As we undertake such reconstruction, rather than merely creating a facsimile of the industry as it was, it is important for us to rebuild the towns with a high degree of disaster resilience and create a new industry cluster

that can act as a model for future fisheries throughout Japan. This new industry cluster should take on the role of providing a driving force for the local economy.

(2) Agri-food industry cluster

Together with fisheries, agriculture has also played an important role in the economy of the affected areas. The coastal areas that were set aside for rice and vegetable production will be difficult to cultivate again in the near future because the soil was saturated with salt water from the devastating tsunami.

When rebuilding the agriculture of the areas, we need to correct the inefficiencies that have resulted from small-scale farming and set out to create a new agricultural model on which we can base future farming in Japan.

(3) Super-manufacturing industry cluster

Factories producing auto parts and electrical/electronic components such as semiconductors are mostly located along the Tohoku Expressway that runs through the inland regions. We must increase the international competitiveness of this industrial cluster, which is still required to play an important role as part of the international division of labor manufacturing network that extends across East Asia.

To this end, labor saving and automation in manufacturing must be further promoted to enable competition with low-cost manufacturing in other Asian countries. Creating such manufacturing expertise in Tohoku and spreading such expertise throughout Japan will be immensely useful in restructuring Japanese manufacturing in the future.

(4) Environment-related industry cluster

We have been urged to rethink our current energy policy that depends heavily on nuclear power. Therefore, we will have to promote the use of environmentally friendly energy such as renewables, while making further efforts to cut our CO₂ (carbon dioxide) emissions. To achieve these goals, we should promote industrial development in the fields of a variety of devices and systems that are related to renewable energy, including geothermal energy that is available throughout Tohoku, biomass² generated in a tie-up with agriculture, forestry and fisheries industries, and solar panels that can make use of the agglomeration of components industries.

(5) New resources industry cluster

For the electronic device and automotive industries, resources such as rare metals and rare earths are becoming increasingly important. Because Japan is dependent on overseas sources for these resources, we should promote new resources industries located in coastal regions such as refineries that are linked with port and harbor transportation.

In the future, we should also aim to establish industries that make use of deep-sea resources such as

seafloor hydrothermal deposits and methane hydrate³. Such industries could provide employment for that part of the workforce that might otherwise have sought work in the decimated coastal fisheries industry.

(6) Health and medical industry cluster

The Tohoku region has been working together with local universities and related organizations to create industries in the medical, welfare and health care fields. The proportion of the aged population in the Tohoku region is greater than that of the rest of the country, which results in high needs for a health and medical industry. In addition, those fields in which the region is traditionally strong such as agriculture and fisheries could bring about a tie-up between medical institutions, food manufacturers, farmers and fisheries such as producing supplements and so on. Similarly, the machinery manufacturing industry that is clustered in Tohoku could move into a tie-up between medical institutions and manufacturers. These efforts to fully leverage the poten-

tial of the Tohoku region to create industries should be promoted.

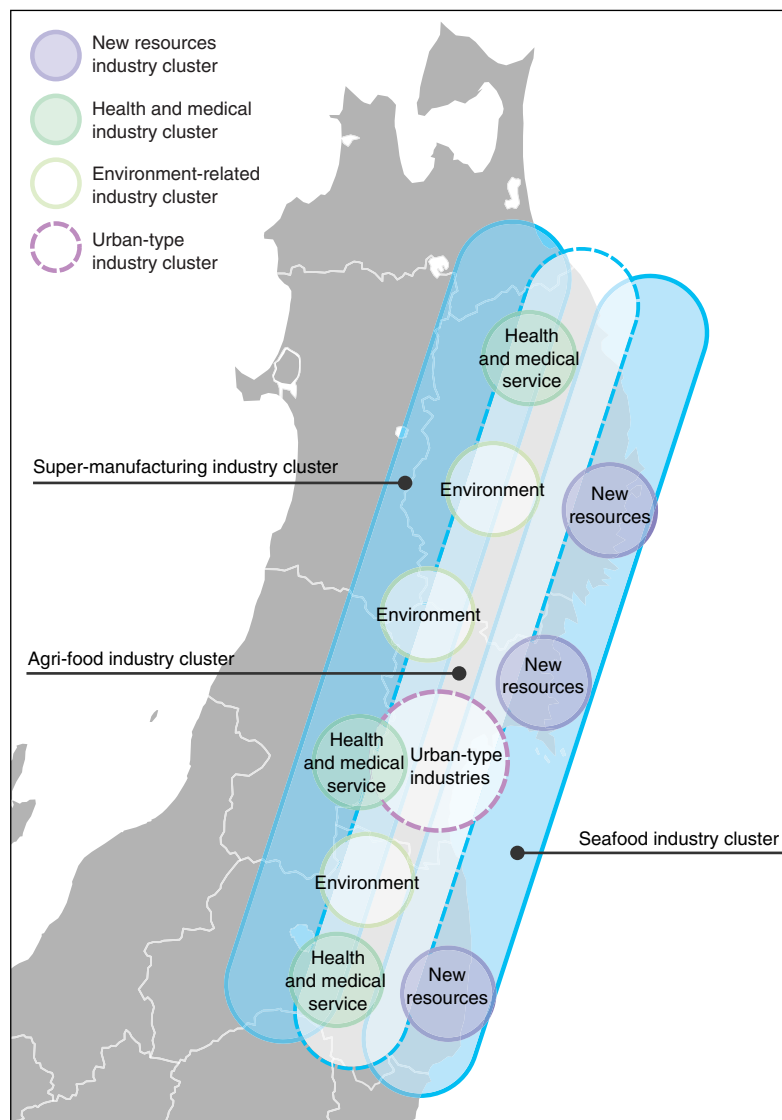
(7) Urban-type industry cluster

Sendai, the hub of the Tohoku region, is a large city having a population of more than one million. The city fulfills central functions in the Tohoku region in terms of administration, business and commercial activities and logistics. With the presence of Tohoku University and other schools, the city is traditionally known as the “university town.”

Given these characteristics of the city, the agglomeration of urban-type industries such as the research and development industry and information and culture industries such as software content should be further promoted. The city should strengthen ties with other areas within the region by functioning as a center for the entire Tohoku economy.

Figure 3 shows a conceptual geographical distribution of these new industry clusters in seven fields. The

Figure 3. Conceptual geographical distribution of new industry clusters



Note: This figure simply illustrates the concept of geographical distribution and is not intended to indicate specific locations.

seafood industry cluster would be widely spread along the coastal areas of the Tohoku region, while the agri-food industry cluster would be spread over the inland areas. The super-manufacturing industry cluster would physically correspond to the route of the Tohoku Expressway. Environment-related industries and health and medical industries would cluster mainly around the inland cities, while those related to new resources would cluster around the coastal cities. The urban-type industry cluster would center on Sendai, the hub city of the Tohoku region.

III Strategies to Promote Priority Fields

Among the seven new industry clusters introduced in Chapter II, strategies for forming the seafood industry cluster and the super-manufacturing industry cluster are described below because these industries will cover wide areas as target areas and they are expected to have large ripple effects on the local economy.

1 Strategy for promoting the creation of a seafood industry cluster

(1) The need to create an industry cluster

The three Tohoku prefectures have a total of 263 fishing ports, which accounts for a 9.0 percent share of the nationwide total. If we calculate the average distance between ports using the length of the coastline⁴, we find that the value for Miyagi is 5.8 km while that for Iwate is 6.4 km. This means that fishing ports are located in Tohoku at intervals of about half the national average of 12.1 km.

When these fishing ports are rebuilt, we should aim to create highly functional, integrated facilities where fishing boat/implement storage and repair facilities around the port, ice plants, cold storage facilities, wholesalers and fish processing factories having high processing capabilities are gathered together. In addition, to strengthen the management base, funding should only be allocated to certain selected ports, while fishermen, who have been sole proprietors in the past, should either organize themselves into groups or incorporate.

Moreover, what is important for the future development of fisheries is promotion of the clustering of related industries such as fish processing and logistics, which are positioned downstream of fisheries (the primary industry), so as to add further value to regional fisheries. Also important to the rebuilding of fisheries in the affected areas is the creation of new businesses (a sixth sector) that integrate the primary, secondary and tertiary sectors as well as tie-ups with different sectors.

Even before the disaster, the number of fishermen was on the decline, with many being quite elderly. To secure employment in the region and achieve regional

development, it is important to form an industry cluster under the theme of seafood through expanding the range of related industries such as fish processing and promoting industrial agglomeration. In Japan, one example is the Hakodate Marine Bio Cluster where efforts are being made to develop food products based on the functionality of *Gagome konbu* seaweed, a specialty of Hakodate.

In the following sections, we will introduce the Humber Seafood Processing Cluster of the UK, which provides an example that could be followed in the quake-hit areas in Japan. This cluster evidences the need for a seafood industry cluster to promote the integration of fishing infrastructure and the clustering of downstream industries, and illustrates how to form such a cluster.

(2) Case in the UK

The Humber region is located in the North East of England and is the center of the country's fishing industry, centering on Grimsby and Hull in North East Lincolnshire County⁵. Development of the area depended on the fishing industry. However, as of the 1990s, increased imports of frozen fishery products from developing countries led to the industry's decline, with fewer and fewer people working in the industry.

In response to this situation, in 2001, the Yorkshire Forward (Regional Development Agency) launched the Cluster Competitiveness Reinforcement Initiative (CRI) in cooperation with local authorities.

As a result, more than 500 food processing companies have now set up operations in the area, and together supply 70 percent of the seafood products consumed in the UK. Furthermore, efforts are being made to develop the means necessary to export to European countries such as France. This cluster has been recognized as being one of the UK's most successful industrial clusters⁶.

To make the Humber region more competitive, the situation facing the region was assessed, and numerous discussions were held among all stakeholders. These studies revealed the following:

- The fisheries and fish processing industries in the Humber region were facing intense competition including that from new entrants such as developing countries in Asia, resulting in being low-margin, high-turnover businesses.
- Future growth could be found in providing the British public with food products that satisfy their growing needs for foods that are fresh and healthy and are easy to cook.

As a result of this analysis, the Humber region set out to become Europe's most advanced source of "convenient food" (food that can be prepared quickly and easily) by applying the strategic steps of (1) improving the inbound logistics, (2) integrating and enhancing the markets and (3) developing new products and improving logistics.

To achieve “(1) improving the inbound logistics” in addition to the existing logistics base at Immingham port, perishable distribution centers were set up around Humberside airport. Although the Humber region has traditionally supplied more than 70 percent of the UK’s seafood processing, around 60 to 70 percent of the raw material came through London or Edinburgh airport⁷. To procure fresh materials at lower cost, efforts were put into improving logistics by developing the local infrastructure.

Regarding the challenge of (2), the biggest issue faced was integrating and enhancing the two markets situated in Grimsby and Hull. The market in Grimsby was large, but it was out of date, while Hull’s Fishgate market was modern, but relatively small. While both locations were adamant in fighting any change, the tireless efforts of Yorkshire Forward and a coordinator ultimately led to the successful integration of the two markets.

As for product development in Strategy (3), local municipalities received funding from Yorkshire Forward and the European Regional Development Fund (ERDF) allocated by the European Union, which was used to establish a joint facility for R&D activities related to food products in the shape of the Humber Seafood Institute (HSI) in pursuit of innovation.

Regarding the improvement of logistics, attention was paid to the Dutch refrigerated product distribution network. It was planned to set up a shuttle service between the Humber region and the Netherlands using either Schiphol airport or Ijmuiden port, from which goods are transported by either truck or TGV.

The main reason for the success of the above efforts was the establishment of the Humber Seafood Group (now Humber Seafood), which is a non-profit organization in which major seafood processing companies in the region extending over Grimsby and Hull participate,

with the backing of Yorkshire Forward and other entities. This organization played a central role in looking into ways of promoting sales as well as stimulating innovation by making full use of the advantages of the region’s seafood industry and logistics (Figure 4).

It is also thought that the establishment of a higher education institution in the region effectively reduced the outflow of skilled people. Also important to the success of the region has been the activities in which small- and medium-scale enterprises were included. While most of the added value created in the region originates from the deep-sea fishing fleet, the efforts to promote the formation of an industrial cluster owed much to the creation of a regional community in which small- and medium-scale coastal fishermen were included.

(3) Strategy for forming industrial clusters in disaster-hit areas

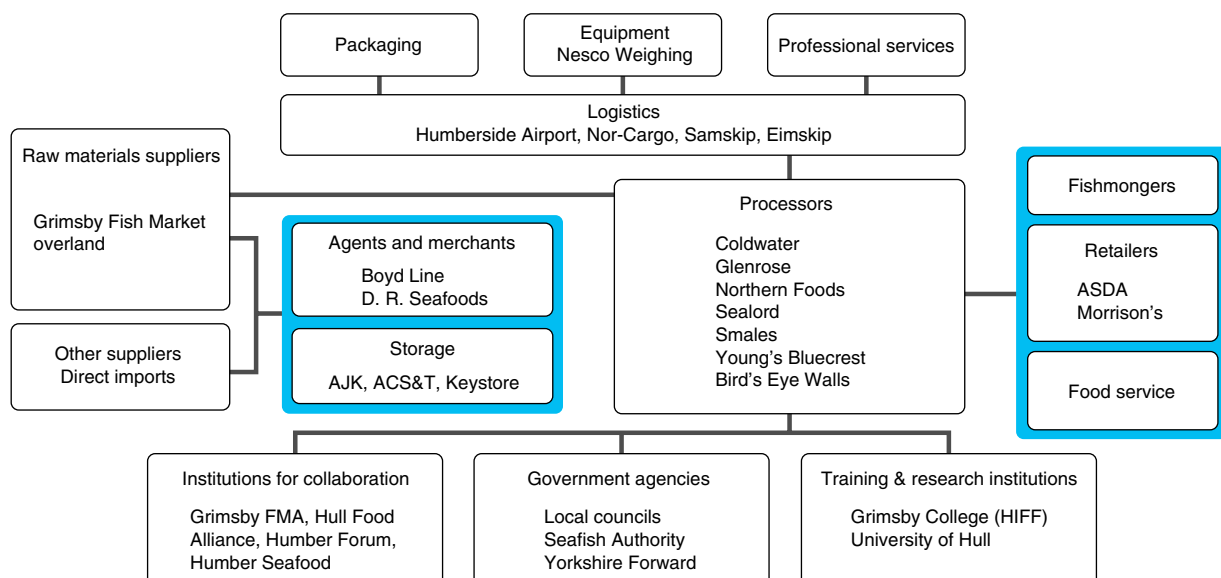
When we consider the current state of the fishing industry in the disaster-hit areas and how best to upgrade the industry, taking the Humber seafood cluster as a model, we feel that the following approaches should be applied.

① **Conceptual overview of seafood industry cluster**
As stated above, merely restoring the fishing industry to the state that existed before the disaster would provide the industry with very little capacity for growth.

To improve the agglomeration of the seafood industry and add further value, we should aim to integrate and upgrade the downstream industries with the fisheries situated upstream in the same way as was done in the Humber seafood cluster. We will have to invest in R&D and strive to achieve innovation that will add value.

In New Growth Strategy—Blueprint for Revitalizing Japan, which was decided upon by the Cabinet in June 2010, a tie-up between medical institutions, food

Figure 4. Humber seafood cluster



Source: Emiliano Duch, A case study of a successful cluster policy. Learnings for the Icelandic geothermal cluster, November 2010.

manufacturers and farmers was given as one of the directions in which the agricultural sector is to be developed. In the case of the seafood industry as well, it is also important to promote activities to develop a tie-up between medical institutions, food manufacturers and fisheries such as producing health foods and supplements by making use of fishery resources.

In the case of the Humber seafood cluster, the clustering was promoted with the goal of moving from simple processing of freezing seafood towards convenience foods that are easy for the consumer to prepare. The disaster-hit Tohoku region, however, has a more advanced level of expertise, such as the processing of shark fin. In addition, the necessary seeds are in place such as that major food manufacturers' factories are located in Tohoku and that efforts are being made to establish a tie-up with Tohoku University. By leveraging these seeds, it is hoped that a highly competitive seafood industry cluster that offers high added value can be created (Figure 5).

Furthermore, we need to increase brand value so that we can establish a sales channel for fishery products and seafood products that can be sold at high prices, while enhancing and strengthening cooperation with the tourism industry in fields such as recreational fishing, dining and souvenir sales. Currently, for example, while there are shopping spots that are popular with tourists, such as sushi in Shiogama, Miyagi, we could develop cuisine that has even greater brand power and establish facilities like Fisherman's Wharf where tourists can both dine and directly buy seafood products.

To promote structural reform and implement a business model that is based on a seafood industry cluster

where considerable value is added by incorporating fisheries, seafood processing and sales, it is necessary to create a venue where the opinions of the people concerned are coordinated. In addition, we will need both financial support and human resources. It will be particularly important to provide a venue where the drive of private-sector enterprises can be combined with the expertise of universities to create new businesses.

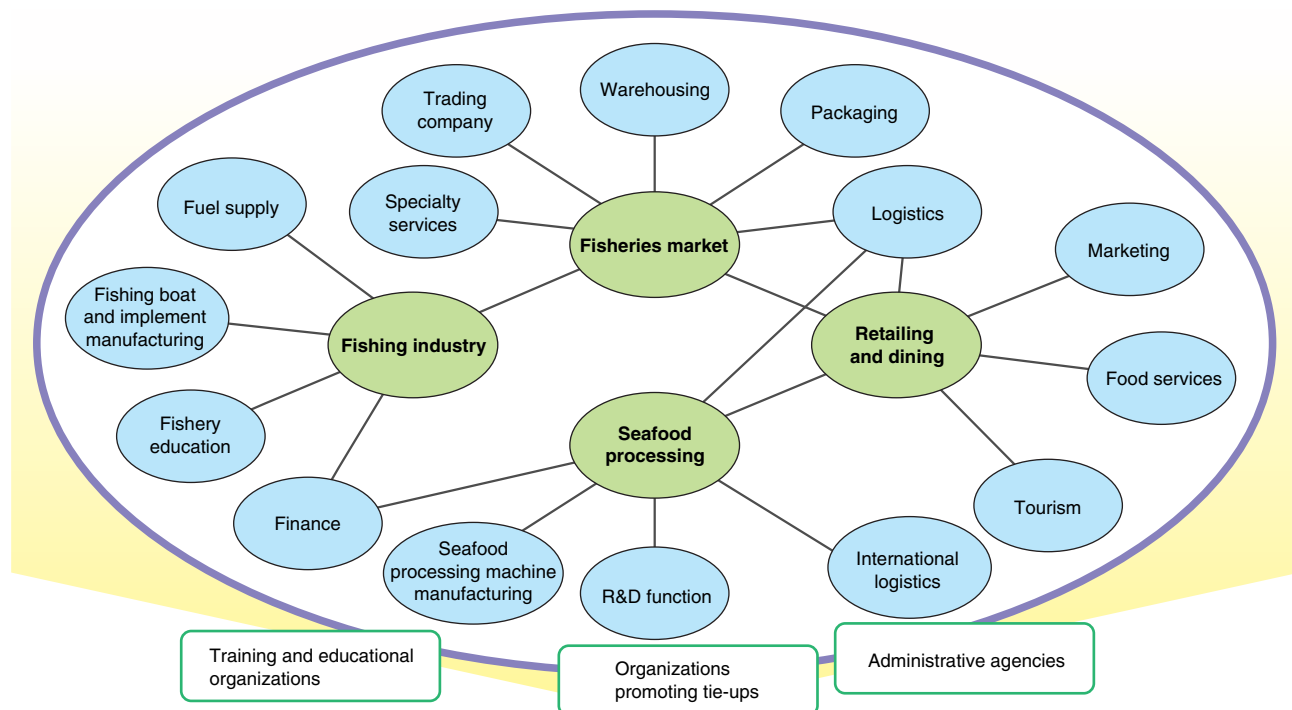
However, the people who are directly involved in the industry in the disaster-stricken areas are busy trying to restore what they had prior to the disaster. As such, it will be the role of national and local authorities to promote activities that offer prospects for the future by giving priority to model projects that contribute to the creation of high added value such as the creation of new businesses (a sixth sector) that integrate the primary, secondary and tertiary sectors as well as tie-ups between medical institutions, food manufacturers and fisheries.

② Integration and consolidation of fishing bases

The 2011 earthquake and tsunami struck the vast majority of Tohoku's fishing ports. Because there are simply not enough resources to rebuild them all, their integration and consolidation is inevitable. At the same time, the functional level of hub ports such as Hachinohe, Kesenuma, Ishinomaki and Shiogama, which are designated by government ordinances as important ports, should be enhanced.

The infrastructural facilities of these hub ports should be developed to support exports to other countries such as enabling acquisition of the HACCP (Hazard Analysis Critical Control Point) certification and

Figure 5. Conceptual overview of seafood industry cluster



Note: R&D = research and development.

the Halal attestation, which is required for foods imported by Muslim countries. For example, facilities processing products for export to Europe are required to have a roof over the conveyor between the dock at which the catch is landed and the plant where the catch is processed. Accordingly, these requirements must also be taken into consideration in developing functions.

③ Establishment of new management entities

To create a strong fishing industry that can be profitable in the face of global competition, especially from other Asian countries, it will be necessary to establish management entities that are capable of operational management and have sufficient funds to make investments. Along with the consolidation of the fishing bases, management should also be integrated and consolidated. In addition to the deep-sea and offshore fisheries that already are relatively highly incorporated, inshore fisheries and aquaculture should also be brought under the umbrella of a single organization or be incorporated.

With the exception of large-scale stationary net fisheries for which an organization such as a fishermen's cooperative association is a management entity, the majority of coastal fishery and marine aquaculture operations are managed by individual fishermen who own fishing boats. These entrepreneurs lost the vast majority of their assets such as their boats, farming rafts and so on in the earthquake and ensuing tsunami. Because many of them also lost their homes and their household goods, the proportion of fishermen who have funds available to resume fishery operations is limited. As such, the procurement of initial funds for reconstruction is a major issue. Possible solutions to this issue include nationalizing the fishing industry in the affected areas and encouraging the entry of private-sector enterprises.

In this case, however, it would be necessary to consider the diversity of the fishermen. There are varying degrees of involvement from fishermen who earn in excess of 10 million yen per year from multiple forms of aquaculture and coastal fishing to those who harvest abalone and sea urchins in season only.

It would not be realistic, therefore, to bring all such fishermen engaging in varying working formats under the control of a corporation and pay them a similar wage. For those fishermen for whom fishing is their main source of income and who have relatively large amounts of capital available, we should look at ways of reducing the burden of rebuilding such as by offering them no- or low-interest financing. For those fishermen who instead come under the umbrella of an enterprise, we would have to develop a system that takes their diversity into account by devising a flexible payment system such as one that incorporates commission payments.

While we need to examine the needs of these fishermen before we do anything else, we should consider various formats for the relationships between a corporation entering the fishing industry and fishermen such as con-

signment contracts and subcontractor agreements without limiting such relationships to those between employer and employees.

When attempting to integrate or incorporate the fishing and fish processing sectors in which there are many parties with vested interests, how best to gain a consensus from all the stakeholders is also a major issue. The first thing necessary is to share the same recognition of the current situation facing the industry among all stakeholders under the guidance of a coordinator who is conversant with the fisheries industry. Upon establishing the same recognition, a new business model should be designed by referring to preceding cases. To this end, a venue where the opinions of the stakeholders are coordinated should be established and financial and physical support should be provided. It is also hoped that priority will be given to model projects that contribute to innovation and the creation of high added value such as the creation of new businesses (a sixth sector) that integrate the primary, secondary and tertiary sectors and a tie-up between medical institutions, food manufacturers and fisheries.

④ Restructuring of resource management methods

As an overall trend of Japan's deep-sea fishing operations (naturally, not just in the Tohoku region), the depletion of fish stocks such as sardines has led to greatly reduced landings. In our efforts to promote reconstruction, we must improve productivity and should examine new sustainable ways of deep-sea fishing.

One possible approach that could be applied to deep-sea fishing is the introduction of the individual quota (IQ) resource management system adopted by Norway and some other countries.

Currently, Japan applies the total allowable catch (TAC) method of managing fishery resources, whereby an upper limit on the total catch of a specific fish is set for the year. This is seen as an Olympic method whereby fishermen are in free competition to catch as much as they can after the lifting of the ban and until the quota is reached.

To increase their catch over those of other fishermen within the limits of the TAC, fishermen will also take fish that have not yet reached adulthood. As a result, the unit price of fish falls, and a vicious circle is likely to arise in which the number of adult fish that is able to reproduce falls, ultimately leading to the depletion of fish stocks.

Furthermore, in their efforts to increase their catch over those of their competitors, many fishermen are apt to invest excessive amounts in capital equipment such as larger engines for their boats. These factors—"decreasing stocks," "falling prices" and "high capital investment"—all contribute to reducing the productivity of deep-sea fishing.

In the past, Norway's fishery productivity also suffered for the same reasons to the point where collapse of

the fisheries became an issue. As a solution to this issue, the above-mentioned IQ was introduced. With IQ, a limit is placed on the annual catch on a boat-by-boat basis. Consequently, there is no need for the fishermen to compete to catch as much as possible in the shortest time possible. Furthermore, during the fishing season, they do not have to catch low-value immature fish, instead waiting to ensure that they catch only high-value mature fish.

As a result of these measures, excessive capital investment has been suppressed and unit prices have increased, enabling the productivity of Norway's fishing industry to greatly improve. In addition, because juvenile fish are not taken and an environment in which the fish can mature is maintained, fish stocks are recovering. As such, Norway's fishing industry can now claim to be sustainable.

In Japan, the introduction of an IQ system has been discussed for many years. However, unlike Norway where only cod and herring make up the vast majority of the total catch, Japanese fishermen target a very wide variety of fish types. Because of such differences, there has been considerable opposition to the introduction of IQ and it has still not been adopted.

However, to revive the fishing industry off the coast of Sanriku, one of the world's three largest fishing grounds, while improving productivity and ensuring tenability, we will have to undertake serious discussions aimed at the introduction of IQ. If the productivity of the industry can be improved and fishermen's incomes can be increased, more people will want to enter the fishing industry (resolving the issue of the shortage of successors), leading to long-term job creation in the disaster-hit areas, with fisheries acting as a starting point for the creation of an industrial cluster.

2 Strategy for promoting the creation of a super-manufacturing industry cluster

(1) Background of development of a super-manufacturing industry

The Great East Japan Earthquake broke the Japanese supply chain—the development of which had always pursued greater efficiency, dealing a major blow to manufacturing around the world. In particular, the damage suffered by many parts, components and materials manufacturers in the Tohoku region had a particularly wide-ranging effect.

While disaster recovery efforts are being made to help restore the supply chain and revive manufacturing in the Tohoku region, some companies have gone to suppliers in China, Korea and other countries to procure parts and components to make up for the supply chain that was broken by the disaster. Ultimately, in some cases, manufacturers in the Tohoku region will no longer be part of the supply chain. This situation not only affects the Tohoku region, but may lead to all of Japan's manufac-

turing becoming somewhat removed from the global manufacturing supply chain.

By reviving and further strengthening “manufacturing in Tohoku,” which had established a firm foothold in global manufacturing, we have to set out to make Japan's manufacturing stronger than ever before, without limiting it just to that of the Tohoku region.

Tohoku University has been involved in world-class, top-level research in areas such as semiconductors, MEMS⁸ and metals. Other universities are also deeply involved in research and commercialization efforts related to the supporting industries. Examples include Iwate University's involvement in casting and molding and the University of Aizu's work on embedded software.

On the other hand, the Tohoku region is not particularly noted for its final assembly industries. Whereas, in the past, plants had been producing semiconductor manufacturing devices and various electronic products, in recent years, more and more automotive plants have been appearing. The parts and components manufacturers that have clustered in the Tohoku region have just started to become linked to the automobile industry.

(2) Strategy for forming a super-manufacturing industry cluster

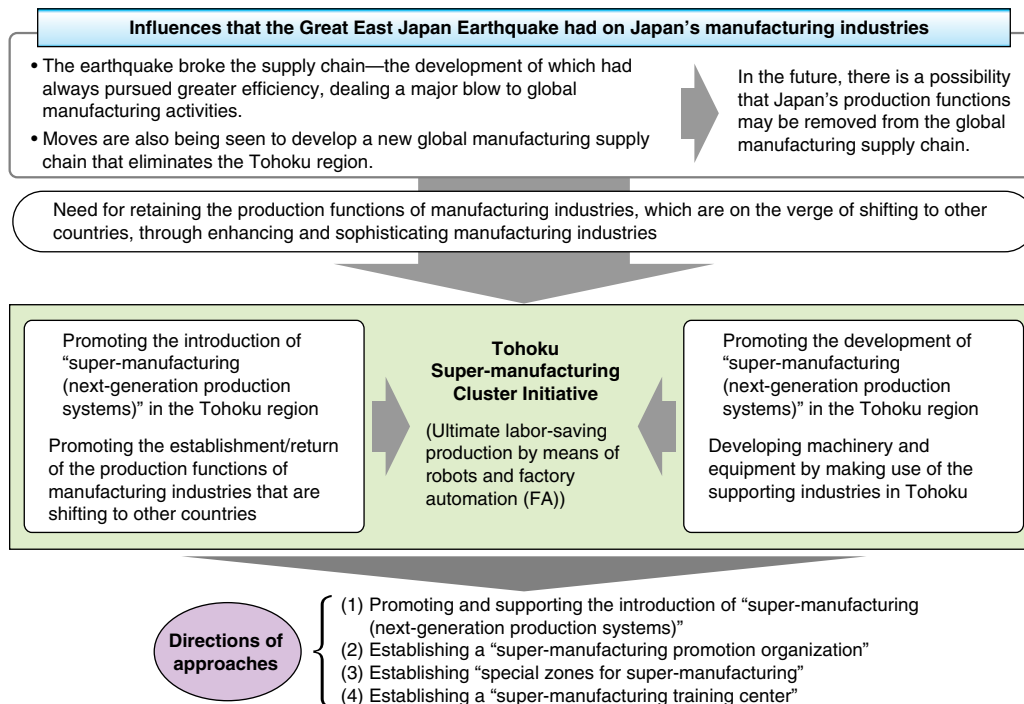
To enhance manufacturing functions in the Tohoku region, we need to create a super-manufacturing industry cluster in this area (Figure 6). Using Japan's strengths in supporting global manufacturing activities, we need to promote the rehabilitation of companies in the earthquake-hit areas as well as the agglomeration of industries that are related to next-generation production systems (= super-manufacturing) with the aim of providing a showcase for Japan's manufacturing industries after ten years.

(3) Promoting the introduction of next-generation production systems

For those affected companies that are situated inland, in addition to repairing their damaged equipment and machinery, such equipment that is beyond repair must be replaced, which requires investment. Because this investment was not in the budget, it is likely that companies would replace their equipment with similar or somewhat cheaper models. In that case, however, any recovery will remain at a low level, and it will be difficult to make up for losses caused by the stopping of operations due to the earthquake. Rather, with the aim of recovering lost orders and lost opportunities, we need to promote the development of ever more sophisticated production systems.

(4) Establishment of zones where new production functions are available (rental factories and high-value-added industrial complexes)

In Japan, there was already concern about the hollowing-out of the country's manufacturing industries. This

Figure 6. Conceptual overview of the Tohoku “Super-manufacturing Industry Cluster” Initiative

disaster may well accelerate the trend not only in Tohoku but also in Japan as a whole. To alleviate these concerns, we need to promote the establishment of production bases using next-generation production systems.

To this end, receiving facilities such as rental factories to which the production functions from all of the affected areas can be transferred should be provided. At the same time, in the areas where an excellent logistics environment is available, a symbolic industrial cluster should be created as the base of production functions. It is thought, for example, that electric vehicles (EV) and plug-in hybrid vehicles (PHV) would be a promising undertaking. While continuing the recent trend towards agglomeration in the automotive industry, we should combine the efforts of industry, academia and government with the aim of creating a cluster of the assembly operations that are relatively weak in Tohoku.

In addition to the establishment of a symbolic industrial cluster, it will also be necessary to create industrial parks consisting of rental factories in various locations along the coast.

(5) Promoting the development of next-generation production systems

Japan has supplied manufacturing equipment to the world market that contributes to the next-generation production systems such as semiconductor production equipment. For some time, Tohoku will bring in machinery and equipment that is manufactured outside the region. To strengthen Japan's manufacturing industries in the future, however, more advanced machinery and equipment will have to be developed. This development could be undertaken by fully utilizing the manufacturing

infrastructure in Tohoku. In these endeavors, it will be important to use the technological seeds available in the region such as those coming out of Tohoku University as the core, while also linking these seeds with other technological seeds that are available in other parts of Japan.

(6) Strengthening human resource development (both operations and development personnel)

Once next-generation production systems become stable, the required number of unskilled workers can be minimized. Instead, equipment operators and maintenance personnel will become indispensable. Also essential will be the personnel needed to develop advanced new manufacturing facilities.

3 Measures for creating super-manufacturing industry clusters

(1) Promoting and supporting the introduction of next-generation production systems

Funding for supporting the recovery has been incorporated into Japan's first 2011 supplementary budget. However, this support assumes the restoration of the situation existing before the disaster, and is not available for increasing future industrial competitiveness in the Tohoku region. To promote the introduction of advanced equipment, support such as financial aid, accelerated depreciation and low-interest loans would be desirable.

(2) Establishment of a “super-manufacturing promotion organization” (provisional name)

In our move towards realizing next-generation production systems, we should establish a super-manufacturing promotion organization (provisional name), the role of

which will be to show a direction and solve the problems encountered along the way. This organization would undertake research on next-generation manufacturing industries and propose the directions that should be pursued. It would also engage in activities to promote the development of standards to integrate related factory automation (FA) systems. Specific themes could include “research aimed at creating a common manufacturing infrastructure,” “drawing up FA-related technology strategies” and “building international standard systems.” The organization should be set up with the cooperation of industry, academia and government, while establishing tie-ups with existing related bodies.

(3) Establishing “special zones for super-manufacturing” (provisional name)

In establishing special zones for super-manufacturing, efforts should be made to promote the building of labor-saving and automated factories through the introduction of leading-edge FA and robots. In these areas, rental factories should be provided so that disaster-hit enterprises can quickly resume operations. The zone should also enable small- and medium-scale enterprises to easily set up their facilities.

Furthermore, in addition to minimizing the environmental load on this zone by introducing energy management systems such as FEMS⁹, the status of energy consumption should be monitored to achieve more efficient production management.

For example, a symbolic special zone for super-manufacturing could be built in the area that has excellent access to both Sendai Airport and Sendai Shiogama

Port. This zone could then become a production base offering fully automatic assembly lines for EVs and PHVs that are the next-generation products of the automotive industry, which has begun to cluster in the Tohoku region. Beside this zone, by making use of unused sites within existing industrial parks, we could provide rental factories throughout the Tohoku region (Figure 7).

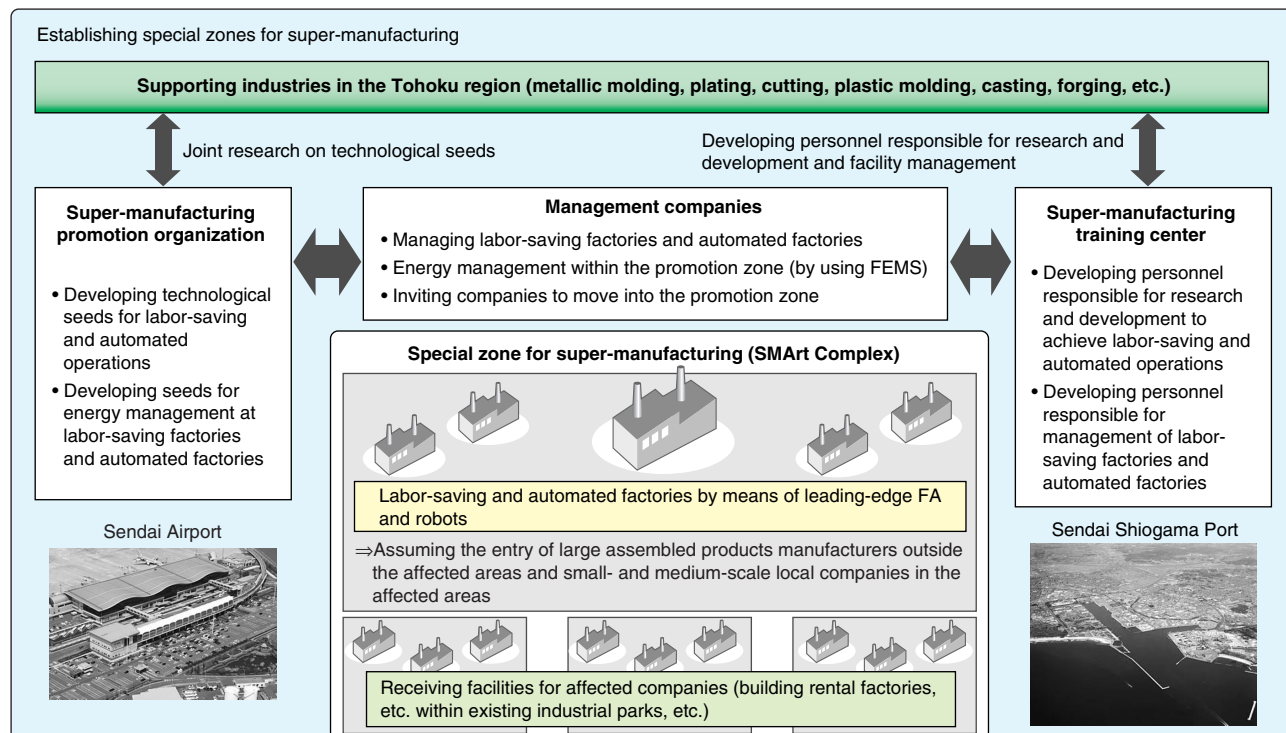
(4) Establishing a “super-manufacturing training center” (provisional name)

We will have to set up a super-manufacturing training center (provisional name) that will develop and train not only people who will operate next-generation production systems but also those who will be responsible for research and development. To promote the creation of a super-manufacturing industry cluster, the center would cooperate with the region’s universities such as Tohoku University as well as technical colleges. This center will develop and train people who would be responsible for research and development and those responsible for facility management, both of whom would bolster the supporting industries that have been developed in the Tohoku region in fields such as metallic molding, plating, cutting, plastic molding, casting and forging.

(5) Establishing “special zones for super-manufacturing”

To better promote the implementation of measures (1) to (4), we should aim to establish “special zones for super-manufacturing” in the affected areas, where existing regulations that might impede the achievement of the

Figure 7. Conceptual overview of a special zone for super-manufacturing



above-mentioned efforts are relaxed or excused. In these special zones, financial support such as tax breaks and subsidies should be provided for investments made by overseas companies (including the repatriation of those operations of Japanese manufacturers that have been set up overseas) and companies in the affected areas. At the same time, rapid investment should be enabled, for example, by easing land use regulations as stipulated in the Factory Location Act, the City Planning Act, the Agricultural Land Act, etc.

IV Issues to Address for Industrial Recovery in the Tohoku Region

Given the issues described in the previous chapters, to promote industrial recovery in the affected areas, the following points must be addressed.

1 Setting up a regional promotion system aimed at industrial revival

In rebuilding industry, it is important that these efforts be led by the communities in the region to the greatest extent possible by considering the local resources that are available in the affected areas as well as the needs of affected companies and residents. To do so, we need to quickly establish an entity that is able to make decisions promptly by working across the boundaries of national and local authorities.

As a project execution entity capable of flexibly and expeditiously tackling industrial revitalization in the wide-ranging stricken region, a Tohoku Regional Revitalization Organization (provisional name) should be established under a public-private partnership (PPP) framework, in which the national government, local governments and private-sector enterprises would invest. This organization would play the role of quickly reviving the entire Tohoku region by investing in reconstruction projects and industrial and corporate revitalization projects in the affected areas.

To smoothly promote reconstruction projects in each municipality, a public-private partnership is also essential. For example, in Miyako, Iwate Prefecture, which was severely damaged by the tsunami, starting on March 16 immediately after the disaster, the Chamber of Commerce and Industry, the local government and construction-related industry groups joined forces to discuss the recovery on an almost daily basis. As a result, debris removal in the city center progressed rapidly compared to that in other areas. The city was very quick to issue requests to the Self-Defense Force and other rescue organizations to bring in construction equipment and start recovery operations. We need to create a recovery PPP organization that is equally effective.

2 Use of a “special zone” system to comprehensively promote the support for reconstruction

To facilitate reconstruction efforts, it is important that in addition to providing public and private financial support, various regulations that might impede the recovery projects be eased. With the aim of quickly implementing projects to achieve early recovery, the schemes such as “special reconstruction zones” that were stipulated in the Basic Law for Reconstruction, which passed the Diet in June, should be applied to provide tax breaks and relax regulations.

In the special reconstruction zones, those companies that move into the zones should be provided with incentives such as reduction of or exemption from corporate tax so as to encourage company investments.

3 Strengthening industrial infrastructure in line with the growing sophistication of industry activity

In order to create leading-edge industrial systems in Tohoku that will lead Japan’s future industrial activities, an infrastructure that supports such activities must also be developed. For example, a new industrial infrastructure necessary for supporting greater sophistication of industrial activities would include airport and port facilities to facilitate the movement of people and goods within the country and overseas, joint research facilities where industry, academia and government collaborate to create new industries, business incubator facilities and organizations to develop human resources that would engage in high-level industrial activities.

The development of such infrastructure should not be limited to public works projects undertaken by the government. It should also draw on every means available including PPP arrangements so that private-sector funding can be fully utilized.

4 Relief for areas affected by the nuclear accident

Even though about four months have passed since the occurrence of the Great East Japan Earthquake (as of July 2011), the problem of radiation leakage from the nuclear accident remains serious. As a result, therefore, parts of the Hamadori area of Fukushima Prefecture have been designated as restricted areas, deliberate evacuation areas or evacuation prepared areas, causing major restrictions on industrial activity and preventing the prospect for recovery from being certain.

In addition, even though other Tohoku areas have not received any direct radioactive fallout, rumors have adversely affected not only agricultural products, processed foods and tourism but also general industrial products.

As such, while other stricken areas are moving towards reconstruction, Fukushima is hampered by the aftermath of the nuclear accident and cannot move ahead with its rebuilding efforts.

For Fukushima, therefore, the government must provide the maximum possible support for its reconstruction efforts including public relations activities for dispelling rumors, industrial recovery projects and the securing of employment opportunities for evacuees. At the same time, many different quarters including the business community should actively provide cooperation.

As mentioned above, eight months have already passed since the country was struck by the earthquake. However, reconstruction of the stricken areas still presents us with many challenges. We very much hope for the rapid recovery of the affected areas and that reconstruction of the areas will be based on the creation of new industrial clusters, which will serve as a model for Japan's future development.

Notes:

1. An industrial cluster refers to an industrial agglomeration that enables local companies to successively create competitive businesses by establishing tie-ups with universities and research organizations.
2. Renewable organic energy and resources derived from living organisms, except for fossil fuels.
3. Methane hydrate is a solid compound in which methane is trapped within a crystal structure of water. Because it emits less CO₂ than coal and petroleum when burned, it is expected to be an effective energy source in the efforts to deal with climate change. It is estimated that some of world's largest methane hydrate deposits are in Japanese waters.
4. The total coastline length is measured along the actual coastline. When we consider that the coastline in the

stricken areas is intricate and constitutes the Rias coast, the actual distance between fishing ports is considered shorter than the indicated figures. For reference purposes, the distance between Fukushima Station and Ninohe Station (Iwate Prefecture) on the JR Tohoku Honsen Line is 328 km.

5. Currently, Grimsby does not have its own town council, and is under the jurisdiction of the North East Lincolnshire Council.
6. In 2010, Humber Seafood Processing Cluster was named the Best Overall Cluster by the Secretary of State for Business, Innovation and Skills.
7. European Union, "Case studies of clustering efforts in Europe: Analysis of their potential for promoting innovation and competitiveness," 2008.
8. MEMS is an acronym for Micro Electro Mechanical Systems.
9. FEMS is an acronym for Factory Energy Management System, which is an automated energy control system for saving energy in factories.

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