Here Today.
Here Tomorrow.

Sustainable Revitalization for the Tohoku Region

Harvard University | Graduate School of Design

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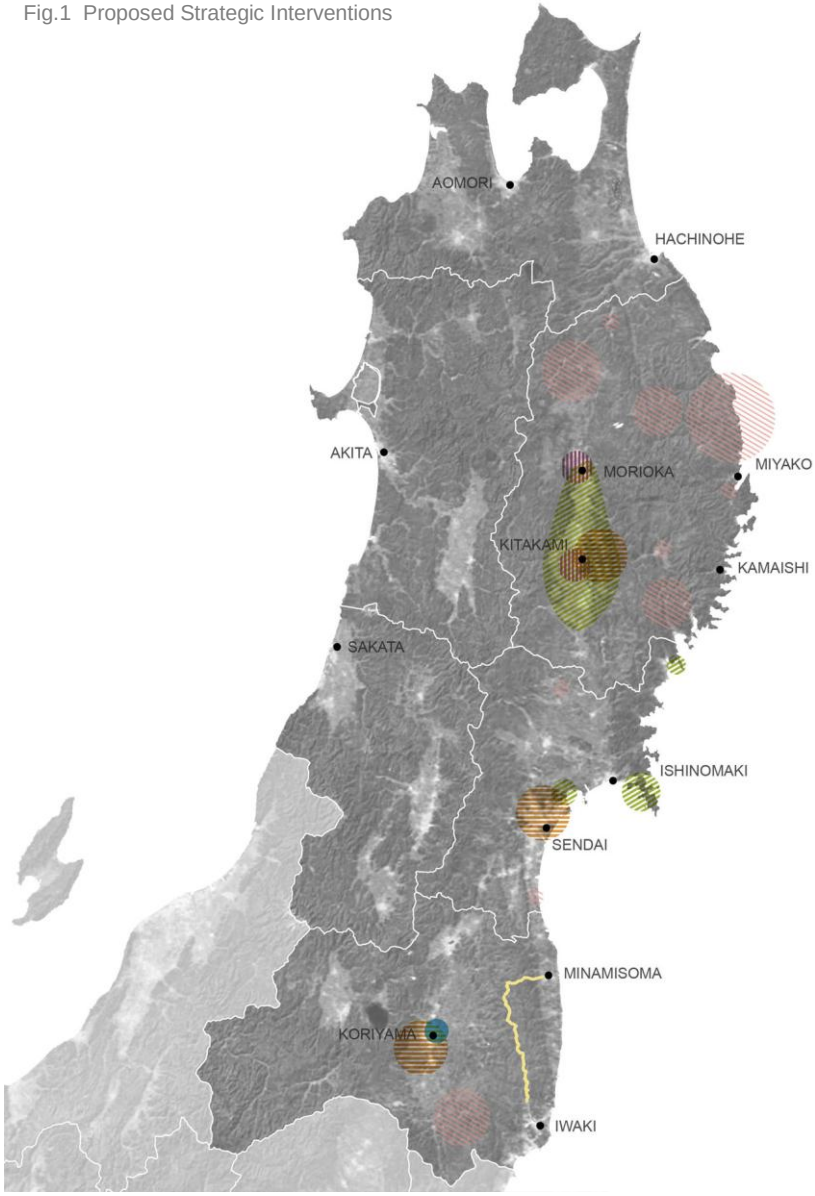

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Our Vision

For us, the sustainable recovery of the Tohoku region must integrate the rebuilding of social and economic, as well as physical, infrastructure. With this in mind, we propose strategic interventions that will make Tohoku a leader in health, medical education, the sustainable energy industry, and innovative fishing and agricultural techniques, while ensuring the well-being of its multi-generational population by providing new transit options, job training, and restored permanent housing options, and building the region's capacity to respond to and rapidly recover from future disasters.

Strategic Approach

The mental and physical toll of the 2011 Great East Japan Earthquake continues to haunt Tohoku's residents today, and surely will continue to do so for the foreseeable future. The immediate effects of the earthquake, tsunami, and partial nuclear meltdown were devastating and threw into bold relief a longstanding set of concerns, including an aging and shrinking population, sluggish economy, and crumbling infrastructure, all of which increased the region's overall vulnerability to the disaster. Those same attributes have also in certain ways inhibited the recovery, while simultaneously framing debates over how the region might best be rebuilt over the long-term. We believe the devastating losses of nearly three years ago, though not soon to be forgotten, also bring forth a rare opportunity to build a revived, stronger, and more dynamic society.

The reconstruction efforts currently being led by the National Ministries via the Reconstruction Agency primarily focus on large-scale physical infrastructure and construction projects. Of equal importance are the social and economic aspects of the Tohoku region, which must be developed alongside capital investments. The new Tohoku must be positioned not only to withstand future earthquakes and tsunamis, but also other, perhaps less dramatic, demographic, economic, and environmental challenges.

Recovery is not just about rebuilding a school, port, roadway, or home, although these types of physical investments are crucial. A fully integrated recovery also means ensuring that the new schools built will provide greater opportunities for their students and engage a broader, multi-generational community with the capacity to solve future challenges in the region. It means developing new ways of thinking about the maritime industry and its ports that maximize the comparative economic advantage of the region and create employment opportunities for a newly skilled workforce. It means creating transportation infrastructure that better aligns with the needs of an aging population and provides access to healthcare and good jobs. It means building homes that are located and erected to withstand future natural disasters, use less energy, and promote the maintenance of community.

As expressed in the report's title — Here Today. Here Tomorrow. — our goal is to achieve a sustainable recovery that stresses the importance of soft as well as hard infrastructure, and that while beginning today, continues to unfold into the future. In the following pages, we provide a twofold strategic approach for accomplishing a social and economic revitalization of the Tohoku region. The first approach focuses on social and economic infrastructure to ensure the long-term success and well-being of the region's residents, business owners, doctors, bus drivers, elders, and school children — in short, the people who inject life, community, and culture into Tohoku and have displayed unwavering resilience in the face of unfathomable adversity. The second approach proposes a new Regional Development Agency to guide and manage the implementation of this social and economic revitalization beyond the duration of the Reconstruction Agency's mandate.

Together, these strategic interventions strive to put Tohoku on a path toward a bright future by capitalizing on the potential of Tohoku's people to confront head on the myriad environmental, economic, social challenges facing the region today.

Report Structure

This report is broken into eight subject areas, each with a set of strategic interventions designed to promote the social and economic revitalization of the Tohoku region. These interventions were developed through in-depth analysis of the region's existing conditions, core challenges, and future goals.

The first section provides an overview of the opportunities for change we have identified in the region. Each of these opportunities, in turn, forms the basis of an individual chapter wherein strategic interventions are presented along with customized implementation approaches.

The areas we address, in order of appearance, are: health, medical education, energy and industry, fishing and agriculture, tourism and marketing, housing, and transportation. Throughout, we highlight synergies between the various sectors to enable better integration and to maximize efficiencies. The final section proposes the creation of a new Regional Development Agency, describing a framework for funding the revitalization through public-private partnerships and financial instruments.

Our strategic interventions were developed to accord closely with existing conditions in Tohoku and often draw on, or expand on, precedents from the Tohoku region or elsewhere in Japan. This decision was intended to ensure the proposals are rooted in Japan's specific social, political, and economic context and to increase potential for their quick implementation.

Although Tohoku comprises six prefectures, we focus primarily on serving the immediate needs of Iwate, Miyagi, and Fukushima Prefectures, those most severely impacted by the 2011 disaster. These areas are still in a state of recovery-in-progress and, as such, have the greatest opportunity to rebuild in ways that incorporate new ideas and approaches. Over the long term, however, many of the strategic interventions include components with the potential to be expanded beyond their initial footprints and be applied to regional revitalization programs more broadly.

Opportunities for Change

Tohoku comprises the prefectures of Akita, Aomori, Fukushima, Iwate, Miyagi, and Yamagata in the northern part of Japan's largest island, Honshu. Although each prefecture has its own characteristics, in general the region is known for its remoteness, predominately rural character, mountainous terrain, and oftentimes harsh, cold climate. Small towns in the Sanriku coastal region, the area most affected by the disaster, are the base of the region's proud fishing and maritime products industries. Further inland, population is concentrated in several cities. Sendai, Miyagi Prefecture, is the area's largest urban center, with a population of just over 1 million in 2010.

Health and Medical Education

Organization of medical care in Japan centers heavily on hospitals, many of which were impacted or destroyed by the disaster. Those that were not became overwhelmed by increased demand caused by reduced supply of healthcare options.

In addition to acute care centers, Japanese hospitals often serve as long-term care facilities, a function which is evidenced in the beds-to-patient ratio. In 2012 the number of hospital beds per 1,000 persons was 13.4, among the highest worldwide. Tohoku's average was even higher at 14.1 beds per thousand.[1]

Yet, at the same time, Tohoku is experiencing a decline in the number of trained medical professionals in practice. The dilemma this creates is even more alarming given the region's aging population, which has increased demand for elder care. Residents over age 65 comprise up to 35 percent of the coastal area population, and the proportion of senior citizens is expected to continue to increase in the future.[2]

Energy and Industry

In Fukushima, the Daiichi Nuclear Power Plant meltdown forced the long-term evacuation of 300,000 residents and resulted in a loss of jobs at the plant, on top of the significant and well-known environmental impacts which themselves may continue to unfold. Even before the disaster, though, the country aimed to expand the usage of renewable, green energy sources. On November 4, 2013, for example, Japan opened the world's largest offshore solar plant in Kagoshima Prefecture. In Fukushima, these goals have spurred plans to build a 1,000-megawatt wind farm off the coast. Two megawatts are already completed with seven more under construction.

The construction sector has been a major employer in Tohoku, a trend that is slated to grow. In 2013, 8% of Japan's national labor force was employed by the construction industry.[3] The dual pressures of reconstruction in the Tohoku region and preparations for the 2020 Tokyo Olympic Games will likely divert a greater proportion of the workforce into construction. In Tohoku, higher construction wages may entice younger workers to abandon jobs in the primary sectors of fishing and agriculture, and to pursue even-more lucrative incomes by relocating to the Kanto region. Not only would this diminish the employment base to resurrect regional industries and develop new enterprises, it would also result in the elderly constituting an even-larger proportion of the remaining population.

Fishing and Agriculture

Ten percent of Tohoku's population is employed in fishing, agriculture, or forestry; the rest work in a variety of manufacturing and service-based industries. As in other areas of Japan, an aging and declining population had muffled economic growth across the board, and especially in fishing and agriculture, even before the disaster. In the aftermath, this has presented a more acute problem as many business owners and laborers, have opted for retirement rather than reestablishing their businesses.[4]

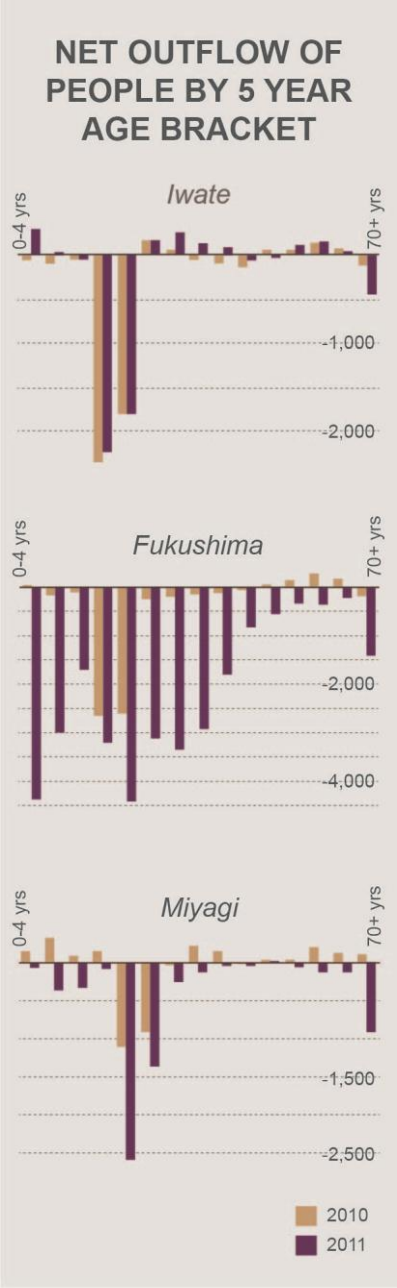


Fig. 2 Regional Outmigration by Age Cohort

Source: adapted from MLIT, "Report on Demographic Shift of the Basic Resident Register"

Recovery of the agriculture industry has been slow. The eastern coast of Tohoku, once known for its high-quality fruits and vegetables as well as rice production, must now grapple with widespread fears over radiation contamination, perceived and real, stemming from the nuclear disaster in Fukushima. Decreased demand for food products from the area could further impede Japan's goal of decreasing food imports through increased domestic production and consumption. This, on top of the salinization of vast agricultural areas, loss of essential equipment, small farming parcels, and an aging workforce, all present

[1] http://stats-japan.com.

[2] Rajib Shaw and Kenji Isayama ,eds., *Integrated Healthcare as the Future of Disaster Recovery Potential in Tohoku Region* (Tokyo: Springer Japan, 2014).

[3] Oguma Eiji, "Nobody Dies in a Ghost Town: Path Dependence in Japan's 3.11 Disaster and Recontruction,"*Asia-Pacific Journal* 11:44:1 (November 4, 2013).

[4] Michael Clark, "The Impacts of the 3-11 Tsunami on Regional Fisheries in Japan," Maureen and Mike Mansfield Foundation White Paper, May 2, 2011

significant challenges to be overcome.

Tourism and Marketing

Due to its varied and dramatic landscape, regional attractions, and identity as a bucolic agricultural and coastal area, the Japanese have long cherished Tohoku. However, the incident at Fukushima has prompted concerns over exposure to radiation and the accompanying reputational damage has led to decreased tourism, as well as reduced demand for consumer products from the region, especially fish, fruits, and vegetables. In addition to existing marketing efforts to dispel what are sometimes unwarranted fears, plans are also in place for the creation of a new Geopark in northeastern Tohoku as an attraction for recreation, learning, and hazard mitigation.[5]

Housing

Housing and land tenure issues continue to be major hurdles in the recovery. As of August 2013, more than 100,000 persons continue to live in temporary housing in the Sanriku coastal area.[6] In coastal areas where the rebuilding of tsunami-mitigation infrastructure is pending, land readjustment processes have come to a standstill, while prices for land at higher elevations are steadily increasing. Notwithstanding recent legislative reforms to enhance direct aid to disaster victims, Japanese national policy prohibits the use of reconstruction aid to rebuild private property. When insurance proceeds are insufficient to cover outstanding debt on a destroyed homestead, displaced owners can only construct a new residence if they can afford to continue making payments toward their existing mortgages and shoulder additional debt for a new home.

Transportation

Transportation infrastructure along the coast was significantly affected by the disaster. Rapid restoration of the region's ports, railways, roads, and bridges will encourage the long-term sustainability of the social and economic recovery. To date, major thoroughfares are mostly restored to service, but many minor roads are still in need of rebuilding. Railways are also being repaired, except in places such as Kensennuma and Ofunado, where tracks are being replaced with Bus Rapid Transit (BRT) service. Low ridership in these areas has made the restoration of rail service unnecessary and infeasible.

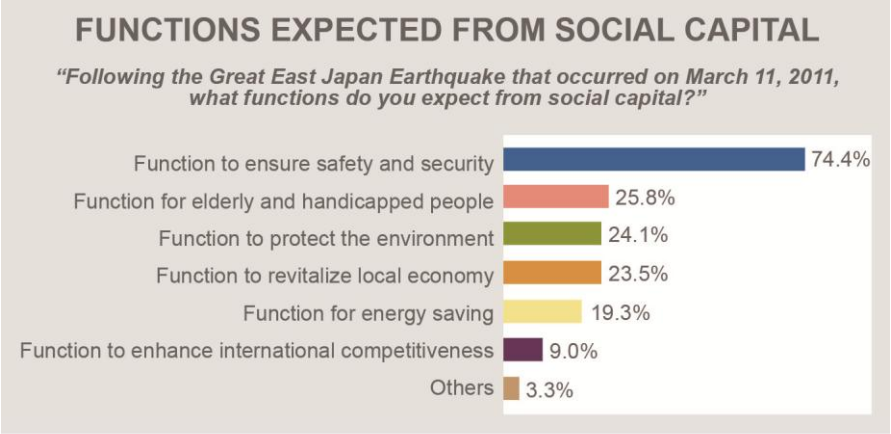


Fig. 3 MLIT "Public Awareness Survey"

Regional/Local Governance

Japan concentrates project planning and decision-making power at the municipal level with funds deriving from ministries at the national level. This sometimes leads to a lack of regional coordination and, because municipal governments often lack sufficient capacity, prolongs or inhibits the implementation of large-scale projects and programs.

Due to the housing uncertainties described above, municipalities are currently unable to determine what proportion of the prior tax base will be restored. As a result, municipal budgets will continue to be dependent on national grants for the foreseeable future. Further straining municipal budgets, maintenance costs associated with public capital projects funded by the central government through the Reconstruction Agency are the responsibility of local governments.

Public-Private Partnerships

The overwhelming financial costs associated with the rebuilding of Tohoku have sparked expanded interest in promoting private investment in the region, especially through public-private partnerships, but few private sector contractors or public sector officials have the necessary experience to spearhead the complex projects now permitted under law. From its enactment in 1999 until a comprehensive amendment in 2011, Japan's Private Finance Initiative (PFI) law limited private sector involvement in project planning, delivery of economic infrastructure, and the scope of services provided. Given the limited scale, complexity, and scope of first-generation PFI projects, contractors were unable to gain experience in assembling consortia, securing project finance, and managing the entire project lifecycle. The 4th Amendment to the PFI law in 2011 has enabled private sector participation in infrastructure projects from design through operations and maintenance, but only domestic contractors who have international PPP project experience or who can partner with firms that do will be qualified to undertake second-generation projects. Similarly, at the sub-national level, government officials generally are inexperienced in complex contract management, which entails significant time and resources from already-overburdened staff.

Moving Forward

The Tohoku region's recovery is ongoing and significant progress has been made. The people of the region continue to display their resilience in the face of adversity. However, much work remains and the task of long-term recovery will take decades. Yet, we believe this presents a rare opportunity for regenesis: the creation a new, stronger Tohoku that unifies its people's rich past with a vision for a brighter future.

[5] Japan Ministry of Environment, "Sanriku Reconstruction (Fukko) National Park," http://www.env.go.jp/en/nature/nps/sanriku-fukko/initiative.pdf.

[6] Oguma Eiji, *supra*.

STRATEGIC INTERVENTIONS

	Location	Scale	Timeframe	Partnering	Regional Development Agency Role	Sustainability	Disaster Preparedness	Synergies
HEALTH								
01. Mobile Clinics	All Prefectures	network	short-term	Concession	Contract Administrator	¥ social	Medium	housing, energy & industry, transportation
02. Community Life Support Centers	All Neighborhoods	network	short-term	Concession	Contract Administrator	¥ social	High	housing, energy & industry
MEDICAL EDUCATION								
03. Family Medicine Specialization at Tohoku University School of Medicine	Sendai, Miyagi	site	short-term	Diaspora Bonds	Coordination	¥ social	Medium	housing, healthcare
04. Graduate School of Public Health at Tohoku University School of Medicine	Sendai, Miyagi	site	short-term	Diaspora Bonds	Coordination	¥ social	High	housing, healthcare
ENERGY & INDUSTRY								
05. Battery Industry Hub	Koriyama, Fukushima	cluster	short-term	Development Fund	Coordination/ Promotion	environmental, ¥ economic, social	Low	housing, transportation
06. Global Market for Renewable Energy	Koriyama, Fukushima	cluster	long-term	Development Fund	Coordination/ Promotion	environmental, ¥ economic, social	Low	housing, transportation
FISHING & AGRICULTURE								
07. Special Economic Zones for Maritime and Agricultural Innovation	All Municipalities	cluster	short-term	Development Fund	Coordination/ Promotion/ Enforcement	¥ economic, social	Medium	housing, transportation, energy & industry
08. Workforce Development Apprenticeship Program	All Municipalities	site	short-term	Social Innovation Fund	Contract Administrator	¥ economic, social	Low	housing, energy & industry
09. Blue Tech Cluster	All Municipalities	cluster	long-term	Development Fund	Coordination/ Promotion	¥ economic, social	Low	housing, transportation, energy & industry
TOURISM & MARKETING								
10. Sanriku Coastal Trail	Sanriku Coast	network	long-term	Development Fund	Coordination/ Promotion	environmental, ¥ economic, social	High	housing, energy & industry
11. Agricultural Tourism	Kitakami, Iwate	network	long-term	Development Fund	Coordination/ Promotion	environmental, ¥ economic, social	Low	housing, energy & industry, fishing & agriculture
HOUSING								
12. Radiation Zone	Koriyama, Fukushima	site	short-term	Diaspora Bonds/ Development Fund	Coordination	¥ economic, social	Medium	transportation, energy & industry, healthcare
13. Inland Zone	Kitakami, Iwate	site	long-term	Diaspora Bonds/ Development Fund	Coordination	environmental, ¥ economic, social	Medium	transportation, fishing & agriculture, healthcare
14. Coastal Zone	Sendai, Miyagi	site	short-term	Diaspora Bonds/ Development Fund	Coordination	environmental, ¥ economic, social	High	transportation, healthcare
TRANSPORTATION								
15. Bus Rapid Transit (BRT) Network	Fukushima Prefecture	network	short-term	Concession	Contract Administrator	¥ economic, social	Medium	fishing & agriculture, energy & industry, housing, healthcare
16. Railway Upgrade	Fukushima Prefecture	network	long-term	Concession	Contract Administrator	¥ economic, social	Medium	fishing & agriculture, energy & industry, housing, healthcare

KEY

Scale	Timeframe	Sustainability	Synergies	
site		social	housing	energy & industry
cluster	short-term	economic	healthcare	transportation
network	long-term	environmental	education	fishing & agriculture

Fig. 4 Strategic Interventions Matrix

STRATEGIC INTERVENTIONS MAP

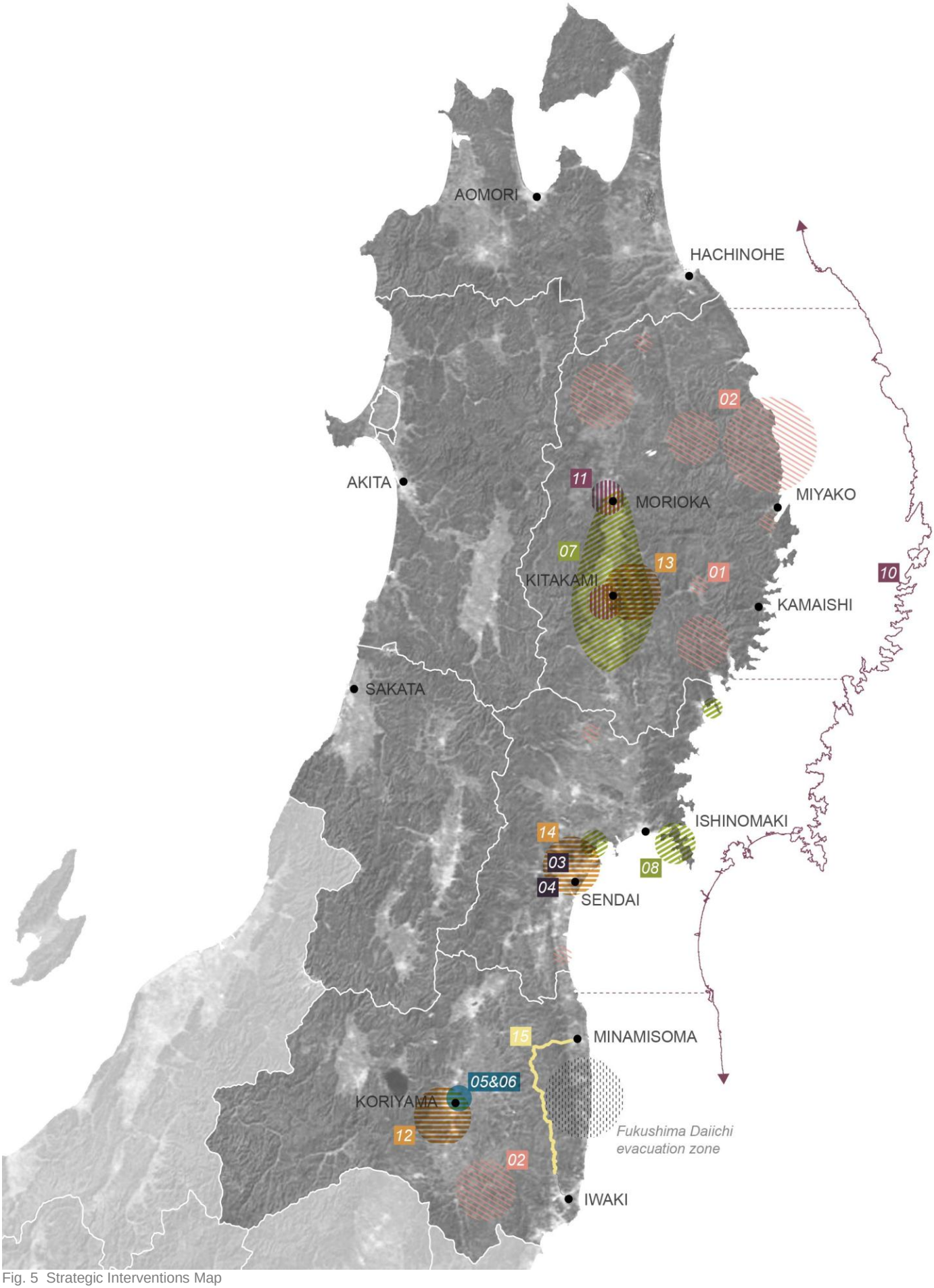


Fig. 5 Strategic Interventions Map

TOHOKU REGIONAL DEVELOPMENT AGENCY

AUTHORITY

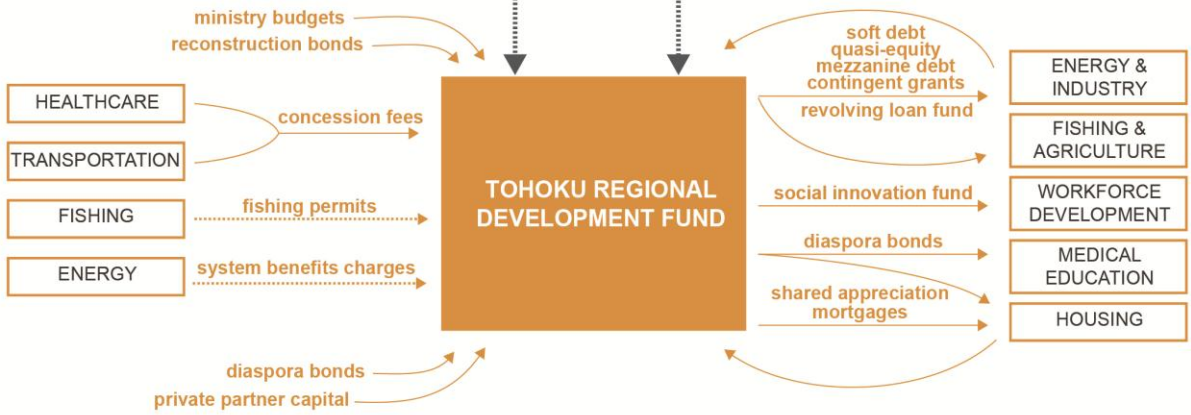
A quasi-public body, the RDA is a pilot iniative that will report to the prime minister. It will have the following powers:

(1) Make and execute contracts necessary to exercise functions
(2) Issues bonds and notes
(3) Engage services of consultants on contract basis

GOVERNANCE

Board of Directors (9 members)
3 from academic institutions
3 from leading regional industries
3 fom trade associations

The RDA will conduct activities with the support of private sector consultants and establish a mentorship program for Toyo University graduates.



GOALS

capacity building ***stakeholder engagement*** ***tourism & marketing*** ***enterprise support***


Presentation by director of METI Tohoku


Toyota Motor East Japan team


Tourism PR video in Kakunodate Samurai residence


Ground-breaking ceremony of Shin Shirakawa data center, Fukushima

Fig. 6 Regional Development Agency

HEALTH

Our Vision

The Tohoku region will offer exemplary healthcare for its aging population through a decentralized network that leverages the strengths of hospitals and increases the local communities' capacities to provide continuous and consistent medical care to residents. Community networks built through this revised healthcare model will play a vital role in the event of a future disaster.

Opportunities for Change

The organization of medical care in Japan is heavily concentrated around hospitals. On March 11, 2011, communities in Tohoku's coastal areas were hobbled in part because hospitals and medical facilities were destroyed by the tsunami, and others that withstood the disaster were overburdened trying to keep up with heightened demand for medical treatment. The disaster exposed vulnerabilities in the healthcare system and its providers, but rather than accept such shortfalls, we approach them as opportunities for innovation and improvement.

In Japan, in addition to providing acute care services, hospitals are viewed as recuperative centers and long-term care facilities. This is evident in the number of hospital beds, utilization rates, and prolonged average length of stays in Japan. In 2012, the number of hospital beds per 1,000 persons was 13.4, among the highest worldwide. Tohoku's average was even higher at 14.1 beds per thousand.[7] Hospitals are magnets for patients seeking medical care – once referred to a hospital, many patients do not return to a clinic – and their strong role in communities provides an opportunity for them to be centers of larger healthcare networks.

The ever-diminishing number of medical professionals practicing in the Tohoku region provides a clear rationale for the restructuring of healthcare delivery in the region. While Tohoku boasts a high ratio of hospitals and hospital beds relative to its population, the lack of physicians pushes the ratio of hospital beds per physician well above average. In addition, an aging population has increased demand for elder care services. Residents over age 65 comprise up to 35 percent of the population in the coastal area, and the proportion of senior citizens is expected to continue to increase.[8] The lack of physicians and capacity to provide medical care, coupled with an increasing demand for specialty care, offers Tohoku an opportunity to rethink medical care delivery by shifting primary and daily health services away from hospitals by establishing new networks and building community capacity.

Strategic Interventions

We propose that Tohoku promote a decentralized healthcare system that will transform the role of hospitals, introduce mobile clinics, integrate information technology platforms, and strengthen community capacity to provide for the daily health needs of its aging population.

[7] Total number of hospital beds includes general beds, beds for mental patients, and long-term care beds, http://stats-japan.com.

[8] Rajib Shaw and Kenji Isayama , eds., *Integrated Healthcare as the Future of Disaster Recovery Potential in Tohoku Region* (Tokyo: Springer Japan, 2014).

Hospitals

Health facilities, and hospitals in particular, play an important role in the socioeconomic and psychological health of the Tohoku region. Rather than continuing to provide a broad range of medical services that are increasingly inefficient and risk overextending staff capacity, hospitals should coordinate networks offering varied medical services.

In the near-term, prefectural governments should identify geographic areas lacking sufficient health care options and provide incentives for hospitals to extend their services by means of mobile clinics and community life support centers. As coordinators, hospitals would build IT capabilities to facilitate the sharing of patient information among networked providers and coordinate patient care. Surveys conducted by prefectural governments should identify varied medical needs and incentivize services to vary accordingly. It is imperative that hospitals and their staff remain central to service provision to assuage patients' perceptions of current inadequacies in the primary care sector and lack of trust in local providers.

In the long-run, promoting a decentralized healthcare network will allow hospitals to deliver more cost-effective, appropriately intensive services to a larger population, while building on their capacity to provide specialized medical treatments at the hospitals themselves.

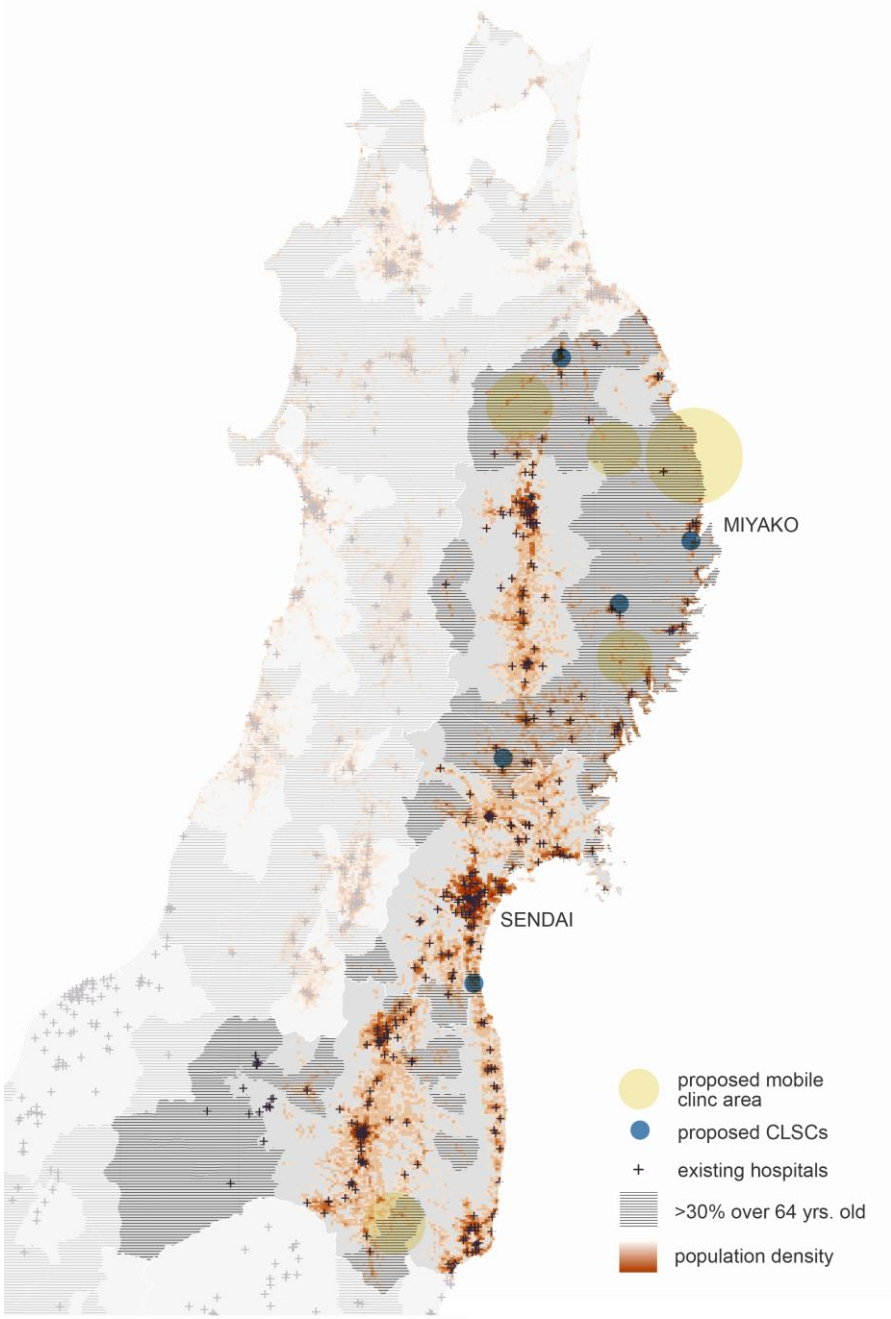


Fig. 7 Existing Population Distribution and Proposed Decentralized Network

Mobile Clinics

For survey-identified areas without a critical patient mass, hospitals should be encouraged to deploy mobile clinics to increase healthcare accessibility on an ongoing basis. Mobile clinics will be staffed by general practitioners and select specialists, and should be equipped to provide care on location or at nearby local public facilities.

Aligning with "Healthy Japan 21" goals for preventative care, Japan's national health insurance system should urge hospitals to have clinics administer annual health screenings, checkups, and preventative tests. In addition, mobile clinics should be equipped with basic laboratory facilities to provide physicians in the field with prompt results to guide diagnosis and treatment. Routine check-ups will curb the prevalence of self-diagnosis among patients, and allow clinic physicians, with networked IT support, to refer patients to hospital specialists as necessary.

Additionally, hospitals should capitalize on the increase of family medicine students in the region resulting from our proposed medical education plan (see MEDICAL EDUCATION, p. 11) and require that medical residents participate in semi-annual mobile clinic rotations.

Community Life Support Centers

Municipalities with a critical mass of medical and welfare needs should expand on the healthcare model established in Kamaishi City, and hospitals should structure operations so that physicians and nurses can serve such cities when needed. Hospital-affiliated Community Life Support Centers (CLSCs) should be established in select neighborhoods to function as both community and public health centers, providing medical care, welfare services, and educational programs for people of all generations.[9] We recommend that hospitals provide staffing and equipment to deliver on-site medical care and support services at existing CLSCs, incorporating them into their network areas to expand access to quality care throughout the region.

[9] Shaw and Isayama, *supra.* Pursuant to Shaw and Isayama's recommendations, we believe that CLSCs are a proven model that should be propagated in the Tohoku region.

CLSCs should strengthen surrounding communities and increase quality of life through collaboration with local residents, while contracting with hospitals to provide easily accessible medical treatment and care options. Such a proposal will need to be tailored to the concerns and needs of individual communities to provide adequate and appropriate services. Specifically for an aging population, hospital-affiliated CLSCs will support Tohoku's elderly to peacefully age in place, enabling them to continue living in their homes and communities safely, independently, and comfortably.

While CLSCs should focus on developing mutually supportive local communities and be staffed primarily by local residents and volunteers, contracted hospitals will provide physician and nursing services on a rotating basis, similar to the mobile clinics. Such rotations will be achievable though comprehensive IT support to facilitate secure sharing of patient information and coordination of care. Where medical demands are high, rotations will also alleviate the exhaustion experienced by overburdened healthcare providers.

In the long run, promoting hospital-affiliated CLSCs and a decentralized healthcare network will allow communities henceforth to better respond to various issues themselves without having to rely solely on the government or experts. These capacity-building strategies and robust community networks will play an important role in the event of a future disaster.

Implementation

Public-private partnerships will be integral to the restructuring of healthcare service delivery in the Tohoku region. At both public and private hospitals, Japan's national health insurance covers 70% of medical expenses, while the patient pays the remaining balance. National health insurance service authorization and customary fee mandates govern even private hospitals' ability to provide off-site care or ancillary services. The public sector can encourage proliferation of decentralized networks by granting such rights through concessions. Assuming identical services command the same reimbursement

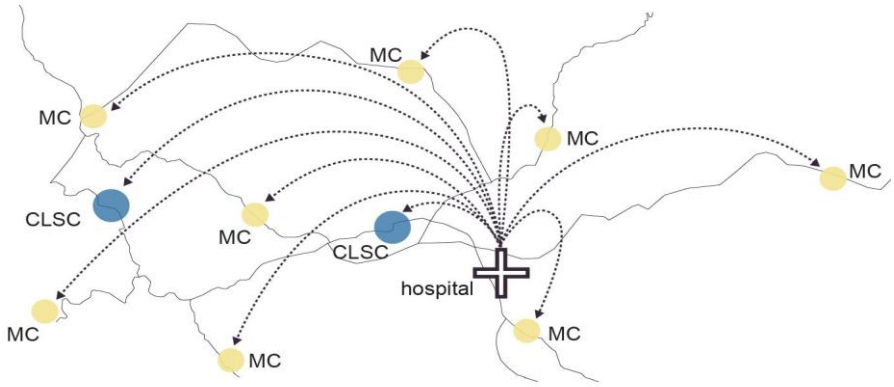


Fig. 8 Proposed Decentralized Healthcare Network

regardless of whether they are rendered in a hospital, mobile clinic, or CLSC, it is in Tohoku hospitals' interest to institute the proposed service networks. Decentralized networks will expand hospitals' catchment areas, enabling them to serve more patients at lower average costs. Those producer surpluses can be reinvested in elsewhere as hospitals become more specialized.

The Tohoku Regional Development Authority will award 20-year concessions to qualified consortia structured to deliver off-site care and develop IT solutions to consolidate patient records and physician communication. The Tohoku RDA will encourage partnering among neighboring hospitals to produce efficient-scale networks (See REGIONAL DEVELOPMENT AGENCY, p. 29).

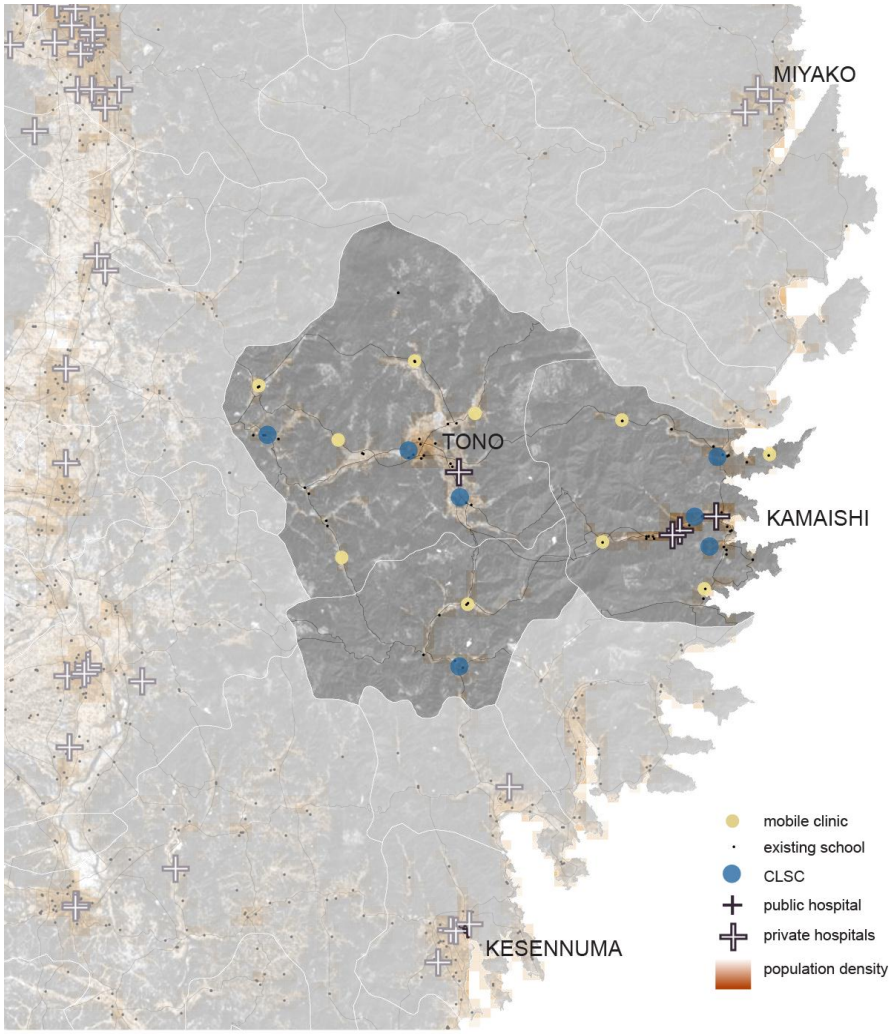


Fig. 9 Proposed Decentralized Healthcare Network at Tono, Iwate prefecture

MEDICAL EDUCATION

Our Vision

The Tohoku region will become a leader in medical education and practice by establishing a School of Public Health and a new Family Medicine specialization at Tohoku University School of Medicine. Through an innovative integration of these two fields, Tohoku University will build physician capacity in the region and become a worldwide magnet for experts interested in dealing with mental health and long-term trauma experienced by disaster victims.

Opportunities for Change

Japan's maldistribution of physicians is highly evident in the remote Tohoku region, especially problematic given the aging population and increasing medical care needs. Compounding the problem, the triple disaster in March 2011 left local physicians and medical staff overextended and has exposed long-standing discord between medical and public health needs in the aftermath of disasters. Rather than view such complicated circumstances as impediments to providing adequate and appropriate medical care to Tohoku residents, we approach them as opportunities for change.

In recent years there has been a severe decline in the number of medical professionals in the Tohoku region, resulting in areas that cannot meet the community's basic healthcare needs. Additionally, primary care is not recognized as an academic discipline in Japan.[10] With no restrictions on the number of specialists in a given region, surveys reveal that nearly 70% of medical school graduates in medically underserved prefectures obtain positions in other prefectures following graduation.[11]

Even as a region that is among the most medically underserved, with a growing need for care, Tohoku nonetheless boasts some of the best medical institutions in Japan. Expanding these institutions to include a new specialization in Family Medicine will enable Tohoku to attract a new breed of medical practitioner and prevent outmigration in the future. Additionally, a burgeoning primary care field will be able to address the varied and mounting daily needs of an aging population and curb patient self-diagnosis to increase hospital efficiency.

Tohoku has another opportunity to be on the forefront of medical education and practice. The 2011 triple disaster left many municipalities devastated, and while immediate acute medical needs were being addressed, residents with chronic conditions were left without access to government-supplied medication and services. The lack of attention to basic health needs during the immediate response and the mounting physical and psychological repercussions following the disaster have reinforced the fundamental need to properly link medicine and Tohoku region institutions to incorporate a new School of Public Health, with a concentration in

[10] In *Japan: Health System Review,* Kozo Tatara and Etsuiji Okamoto mention that Japanese medical schools have established departments of general comprehensive care to train medical students about diagnostics and referrals, but they have not established primary care departments.

[11] M. Matsumoto, K. Inoue and E. Kajii describe the maldistribution of physicians in "Long-term Effect of the Home Prefecture Recruiting Scheme of Jichi Medical University, Japan," *Rural and Remote Health* 8:930 (2008).

recovery planning and post-disaster mental care, would position Tohoku as an innovative leader and allow the region to share lessons learned with a worldwide audience.

Strategic Interventions

Our strategies entail establishing Family Medicine as a recognized medical specialization within Tohoku University School of Medicine and the founding a new School of Public Health within Tohoku University School of Medicine. Rather than create a new school, existing institutional capacities will be augmented. Tohoku University is the largest university in the region, and its School of Medicine ranks among the top in the country. The University has the capacity to build on its own initiatives and relationships in the region and to become an innovator in the field of medicine and public health.

Family Medicine

In the short run, Tohoku University School of Medicine should introduce Family Medicine as a field of specialization by developing a new curriculum using existing school facilities and faculty. The new specialization will be devoted to comprehensive healthcare for people of all ages, equipping graduates with the breadth of knowledge required to provide primary care to both Tohoku's aging population and its children.

A new corps of generalists will be vital to continuous and comprehensive medical services in the Tohoku region. Treatment will be based on knowledge of the patient in the context of family and community, emphasizing disease prevention and the promotion of health – both of paramount importance considering the ongoing fallout of the triple disaster and increase in elderly residents. The curriculum should include a strong base in geriatrics and disaster medicine, but also provide excellent training in internal medicine, pediatrics, obstetrics-gynecology, women's health, human behavior, and psychiatry. Additionally, rotations devoted to mobile clinics and Community Life Support Centers in underserved areas of Tohoku should be included in the two-year clinical education typically required in the latter half of degree programs.

In the near term, Tohoku University School of Medicine should also expand on the model developed by Jichi Medical University to produce rural family physicians and distribute them region-wide. Funded by Tohoku Regional Development Agency-issued Diaspora Bonds, Tohoku University should adopt a contract-based recruiting program to encourage students from Tohoku and other areas of Japan to specialize in Family Practice at the School of Medicine.

The recruiting scheme will require students to work in a medically underserved prefecture for a suggested nine years after graduation in exchange for tuition waivers. Post-graduate appointments will be determined by the University, in cooperation with the Tohoku Regional Development Agency, on the basis of needs-based assessments by prefectural governments and local municipalities. After completing their nine-year contracts, physicians will be free to choose where they practice.

In the long run, the increased number of primary care physicians will ensure the sustainability of Tohoku's healthcare system as a whole by reducing healthcare disparities and lowering spending on avoidable hospital care. Additionally, as service needs mount and networks proliferate, Tohoku University's model will be a replicable prototype that can be adopted at other medical schools in the region.

School of Public Health

The Tohoku region has an opportunity to leverage its complicated and unprecedented situation to establish new standards for public health response during and after disasters and to share them with a global audience. In the near term, Tohoku University School of Medicine should build on its existing International Post-Graduate Program in Human Security to establish a

Jichi Medical University's contract-based 'home prefecture recruiting scheme' recruits students evenly from all 47 prefectures of Japan and requires them to work in their home prefectures for 9 years (including 6 years of rural service) after graduation in exchange for having their 6 years of undergraduate medical education tuition fees waived. A recent study on the effectiveness of this program to evenly distribute physicians across Japan revealed that nearly 70% of graduates settled in their home prefectures after graduation. Settlement rates tended to be higher in prefectures with a lower population density or physician to population ratio, and primary care specializations were positively associated with settlement. In conclusion, such a recruiting scheme appears to be very successful for distributing physicians to medically underserved regions.

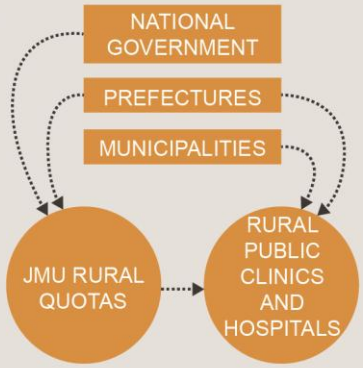


Fig.10 Jichi Medical School case study. Source: Matsumoto et al., *supra.*

Graduate School of Public Health within existing facilities and utilizing current faculty. Recognizing the interplay between mental health and physical health, the School of Public Health shall be devoted to synchronizing traditional medical education and practice with the science and art of promoting health, with the aim of integrating mental and behavioral health considerations into all aspects of public health and medical disaster management.

As such, the School will be devoted to the study of mental health and long-term trauma experienced by disaster victims to develop culturally appropriate public health resources as part of Tohoku's long-term recovery plan. To develop fully capable professionals, curricula will include education both in fundamental subjects and hands-on training through a two-year professional master's degree program, or a three-year doctoral program. Additionally, curricula should reflect a holistic approach and consider the long-term impact of disasters on service providers.

Also in the near term, Tohoku University School of Medicine should avail itself of Tohoku Regional Development Fund grants (see REGIONAL DEVELOPMENT AGENCY, p. 29) to establish a Center for Community Health within the School of Public Health and build on existing service to include all prefectures affected by the triple disaster. Graduate students enrolled in the School of Public Health will be required to complete a pre-determined number of hours of service in the Center to fulfill a portion of their hands-on training requirement. Additionally, the School of Public Health will offer partial scholarships or housing benefits using Tohoku Regional Development Agency-issued Diaspora Bond proceeds to attract talented students.

In the long run, the School of Public Health could utilize Tohoku Regional Development Fund revenues to establish satellite Centers for Community Health to address specific public health needs throughout the region, and better disseminate knowledge and expertise gained within the school.

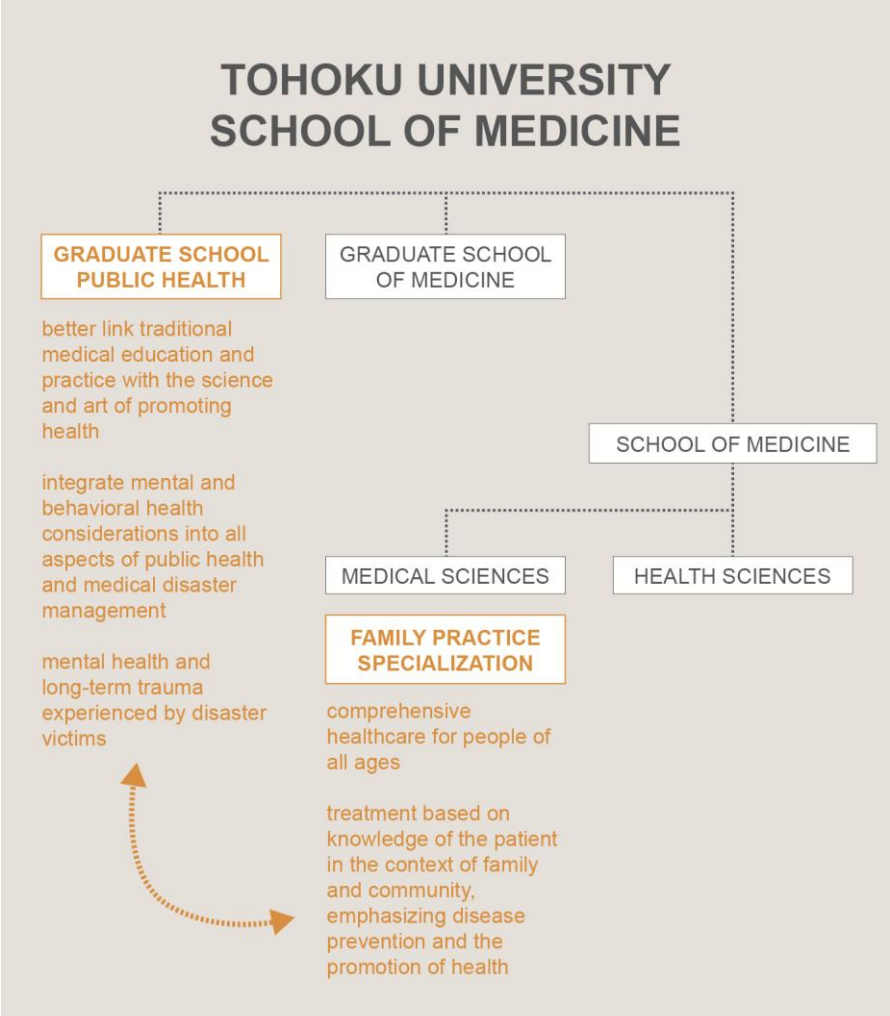


Fig. 11 Organizational Chart of Proposed Tohoku University Medical School

ENERGY & INDUSTRY

Our Vision

Tohoku will become a technology center for renewable energy by establishing an industry hub focused on research, development, and manufacturing of batteries for efficient energy storage. This hub will enhance and promote Japan's developing renewable energy program and renewable energy worldwide.

Opportunities for Change

The Fukushima Daiichi Nuclear Power Plant suffered great damage during the 9.0 earthquake and tsunami, forcing 300,000 people to evacuate. Closure of the plant was announced, causing many to lose their jobs. In an effort to switch to a new energy source, Japan is making progress in its plan to build a 1,000-megawatt (MW) floating wind farm off the coast of Fukushima. It will set a new page in the history of offshore wind farms, being the world's largest and utilizing new technology. Currently, windmills producing 2 MW of energy have been built, and an additional 7 MW of capacity is under construction. Developing the wind farm will be a large step towards supporting Fukushima Prefecture's goal of being completely reliant on renewable energy within 25 years.

In addition to wind energy, Japan has expanded its sources of renewable energy by recently opening its largest offshore solar energy plant, the 70-megawatt Kagoshima Nanatsujima Mega Solar Power Plant in Kagoshima Prefecture, on November 4, 2013. Other sources of renewable energy in Japan include geothermal heating, solar, hydro, and an additional 45 megawatts of wind farms throughout Japan.

In order for renewable energy to become a reliable source of energy, batteries must be integrated into the system to supply power when production is down and store energy when production exceeds consumption. Technology for large-scale, renewable-energy-storing batteries is still in its infancy. Research and development and manufacturing of batteries are vital for a successful renewable energy program not only for Japan, but also for the world as more countries turn towards cleaner and less risky energy.

Strategic Interventions

Our long-term goal is to establish Fukushima Prefecture as a global hub for renewable energy battery storage. In order to build to this level, our proposal is to encourage businesses involved in research and development and manufacturing of batteries to set up offices in Fukushima Prefecture.

The Tohoku region can become the center of efficient storage battery technology, specifically in Fukushima Prefecture, due to its close proximity to the Fukushima offshore wind farm. Research and development of innovative batteries can be conveniently tested and monitored. Batteries that are manufactured will be an economic driver for the region due to an increased need for energy storage throughout Japan. The industry can also be expanded globally through exports to countries starting and expanding renewable energy infrastructure.

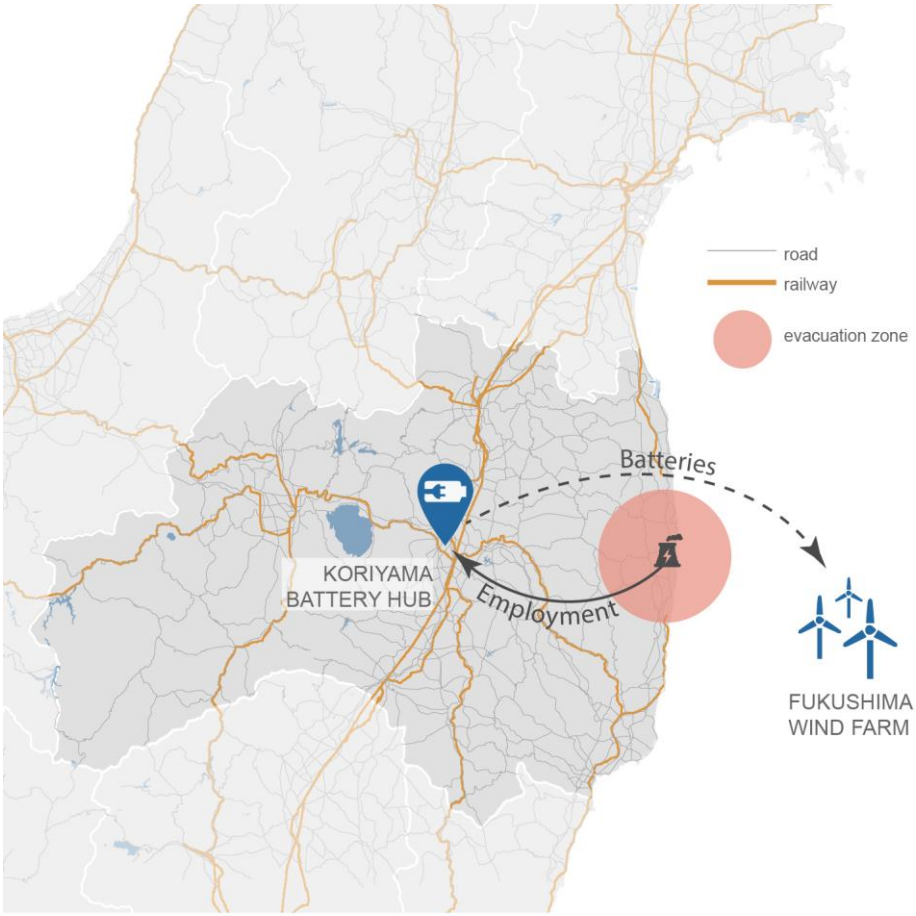


Fig. 12 Proposed Koriyama Battery Industry Hub Location

Global Outreach

The battery industry hub in Fukushima can become a global leader, drawing in scientists and engineers from around the world. Along with local Mistubishi Heavy Industries, Inc., leading foreign companies invested in battery development, including MegaWatt Storage Farms in the United States and Fraunhofer Institute in Germany, can expand their business and build a location in Fukushima. The University of Tokyo can set up an extension location for training and educating the next generation of technological engineers and encourage a younger generation to settle in the Tohoku region.

Employment

The Fukushima location aligns with the need to create employment for Fukushima's displaced residents and workers at the power plant. We propose to locate the battery storage industry hub in an inland city near the Fukushima power plant that currently has a large stock of temporary housing, possibly Koriyama. It will not be possible for families who lived near the power plant to return to their homes anytime soon. Developing the battery industry hub will provide residents with stable employment in a safe location. This provides security for families, allowing them to establish roots in a new community, building on bonds that have already been formed in temporary housing establishments. This will provide the economic and social base needed to facilitate conversion of temporary shelter to permanent housing (see HOUSING, p. 22). By including research, development, and manufacturing in the battery hub, all job skill levels will be employable, covering a wide range of people. The proposed bus rapid transit system for Koriyama will connect current residents as well as residents of proposed permanent housing to the industry hub.

Implementation

Small businesses in the renewable energy and manufacturing sectors will be eligible to finance equipment replacement or upgrades through the Tohoku Regional Development Fund's Revolving Loan program. Industrial and clean energy enterprises, as well as their suppliers, will also be eligible for contingent grants and soft debt to defray the costs of innovative technology development. The contingent grant and soft debt both are repaid when the nascent technology reaches the commercialization stage.

The Tohoku Regional Development Fund will also invest in commercial-stage technologies and energy sector ventures as a mezzanine lender or quasi-equity provider to induce private sector financiers to issue senior debt by reducing perceived credit risk. As a result, credit will be available on more favorable terms than otherwise would be possible. Funding will be awarded on the basis of a competitive scoring system that accords preferences to firms headquartered in the region, consortia and partnerships involving regional enterprises, and for manufacturing and energy sector jobs that employ Tohoku residents.

To ensure the region has a sufficiently well-trained labor force to staff newly created jobs in the industrial and energy sectors, the Tohoku Regional Development Agency, utilizing Social Innovation Funds (see REGIONAL DEVELOPMENT AGENCY, p. 28), will contract with private sector intermediaries to identify integrated solutions to workforce development program delivery.

Unlike most public sector-sponsored job training programs, Social Innovation Fund contracts will guarantee that participants cultivate competitive skill-sets and secure meaningful employment upon program completion. A central goal of this workforce development program will also be to nurture burgeoning entrepreneurs capable of envisioning next-generation industry frontiers and establishing Tohoku's place in the global economy.

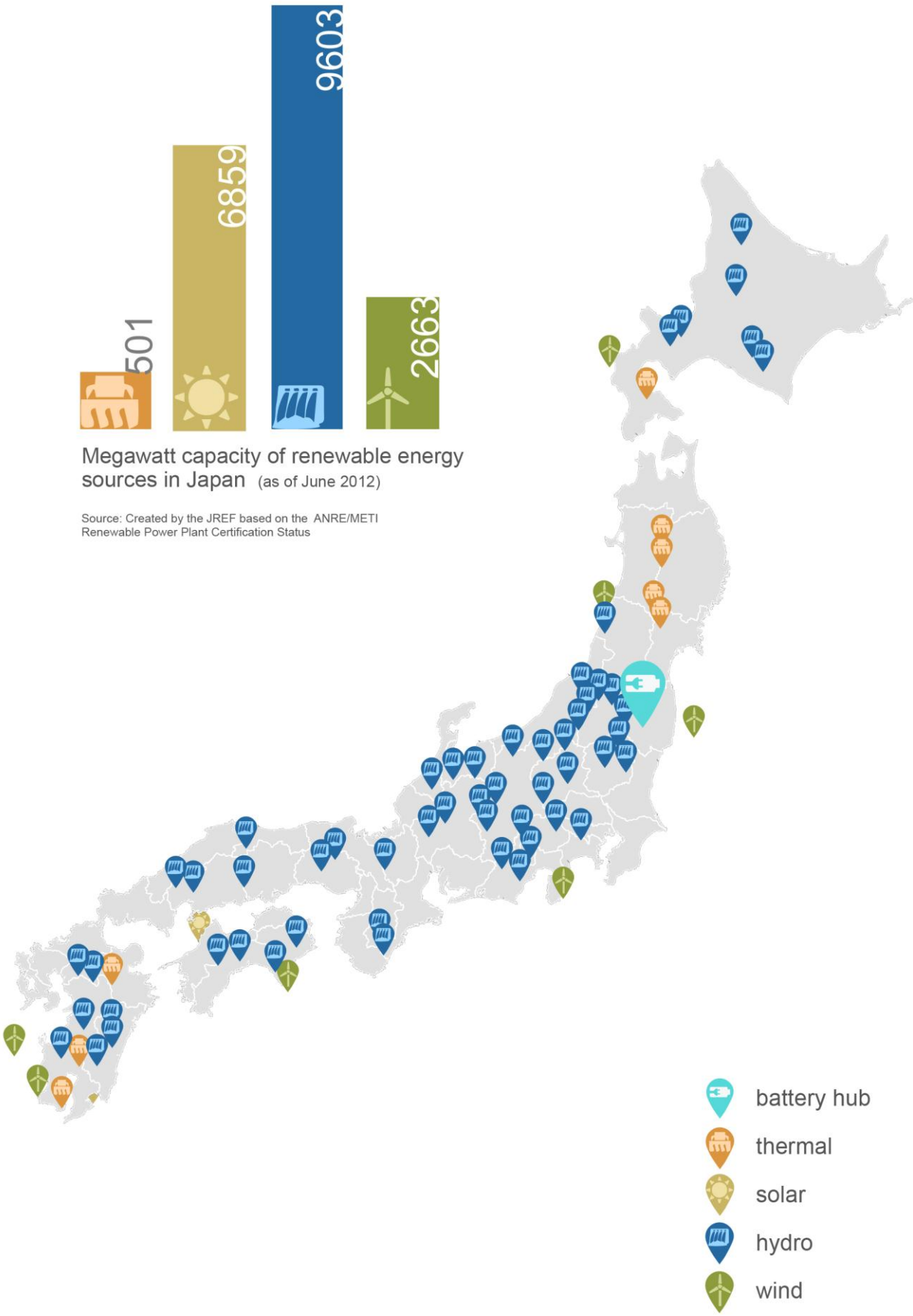


Fig. 13 Renewable Energy Sources

FISHING & AGRICULTURE

Our Vision

Tohoku will become a 21st-century leader in innovative approaches to fishing and agriculture by creating opportunities and incentives for private investment and export-driven technological research and development that leverage existing regional assets, rich aquatic and land-based resources, and a low cost of doing business.

Opportunities for Change

Tohoku's fishing and agriculture industries are vital to the region's social and economic identity. They are also two of the industries most affected by the triple disaster. [12] Not only were the immediate effects, such as the destruction of equipment and salinization of land, devastating, but also the disasters exposed structural, long-standing issues in both industries. Rather than view these hurdles as roadblocks to rebuilding, we approach them as opportunities for change and rejuvenation.

Population decline and an aging workforce, coupled with the remoteness of much of the region, have created ongoing labor shortages, with many family-owned farms and fishing companies left with no one to lead operations as elder family members opt for retirement instead of rebuilding.[13] Revitalizing these industries provides an opportunity to attract and retain a new, younger, and more skilled workforce to lead a 21st-century fishing and farming industry. Furthermore, the loss of equipment and, in the case of agriculture, salinization of crop land, left many fishing and farming businesses without the tools necessary to reestablish their businesses. Supports to help farmers and fishermen acquire new equipment is an opportunity to adopt new technologies and promote the adoption of innovative techniques and processes. The nuclear disaster at Fukushima tarnished the reputation of products stemming from both the sea and land due to fears of contamination, decreasing demand for produce and marine products both domestically and internationally.[14] Tohoku now has an opportunity to shift production centers and distribution networks to propagate the economic impacts of these industries throughout the region and increase the nation's food self-sufficiency.

Strategic Interventions

Short-term strategies and long-term goals for revitalizing the fishing and farming industries in the Tohoku region are based on the ideal of promoting private investment in innovative, sustainable, and replicable techniques leading to increased production, internal efficiencies, and exportable expertise and technologies.

[12] Hillel Wright, "Tohoku Fisheries Fight Back from 3/11," *Japan Times*, September 9, 2012.

[13] Michael Clark, "The Impacts of the 3-11 Tsunami on Regional Fisheries in Japan," Maureen and Mike Mansfield Foundation White Paper, May 2, 2011

[14] S.V.R.K. Prabhakar, "Fitting the Radiation Safety Piece into the Jigsaw Puzzle: Restoring Agriculture and Food Sector Aftermath the Great Tohoku and Fukushima Disasters." Presented to the Disaster Management Project Team, August 25, 2011, Hayama, Japan.

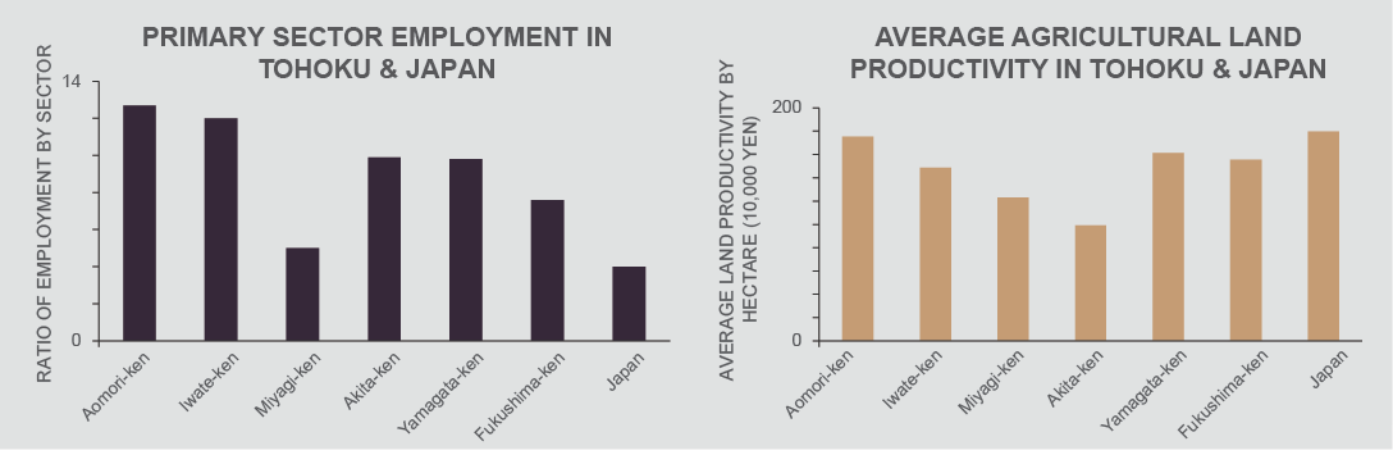


Fig. 14 Primary Sector Employment and Productivity. Source: Official Statistics of Japan, Regional Statistics Portal

Fishing

In the near-term, Tohoku prefectural governments should expand on the model applied in Momonoura, Miyagi Prefecture that increases access to fishing permits and reduces barriers to entry for private firms within Special Economic Zones (SEZ) for maritime innovation in both fishing and aquaculture.[15] The SEZs should provide reduced taxes, land subsidies, and infrastructure to promote investment. SEZs will need to accommodate the interests of local fishing cooperatives, increase the industy's resilience against future coastal hazards, and most important, protect the health of fisheries. Incentives should also be extended to cooperatives to support their integration of new technologies.

Prefectural governments must work together to establish a formal process for reviewing proposals for participation in the SEZ program and for reviewing business plans of participating companies. The number of permits available within the SEZs should be capped and could be traded over time within a marketplace. Promoting innovation by allowing and incentivizing private investment in the fishing industry will help establish Tohoku as an industry leader, attract new, younger talent to the region, and over time, create exportable technological innovations and expertise. The SEZs should be located near the region's larger cities to ensure access to labor markets and distribution networks, including Sendai, Ishinomaki, and Kesennuma.

Also in the near term, prefectural governments and the Tohoku Regional Development Agency must support workforce development programs to train, re-train, and retain a workforce to support growth in the maritime industry. Incentives, such as housing and educational and training opportunities, should be used to lure unemployed and underemployed workers from other areas of Japan to Tohoku. Apprenticeship and internship programs should be created in alliance with area universities near SEZs. For example, a pilot could be created in collaboration with Tohoku University's schools in Engineering and other sciences. The participants in the workforce development apprenticeship programs would be both university students who might pursue opportunities in corporate enterprise, research and development, or fisheries management, and also workers looking to gain new skills to fill jobs in the fishing industry.

In the long-term, SEZs could lead or co-evolve into "Blue Tech" clusters, supporting the growth of an innovation economy built around the research and development of new marine-based technologies and products, including cosmetics, biofuels, and other maritime and environmental technologies. This would again require private investment incentives, at least initially, but could have long-term positive impacts for the regional economy, attracting a new skilled workforce and establishing Tohoku as a leader in the maritime products industry.

Agriculture

Beyond the immediate needs of restoring farm land and aiding existing farmers, similar strategies to those proposed for the fishing industry should be undertaken to promote agricultural recovery.

Agricultural Innovation Zones, similar to the Agricultural and Food Frontier Zone (AFFZ) near Sendai, should be established to promote innovation and leverage private investment in agricultural revitalization.[16] AFFZs encourage collaboration between agricultural enterprises and secondary and tertiary industries, ideally for innovation and coordinated management practices. As in Sendai, for coastal cities the agricultural zones can also be used as buffers between sea-based hazards and settlement areas.

Similar zones should be created in agricultural areas in Iwate prefecture in proximity to markets in towns and cities. Prefectural governments must remediate soil contaminants wherever needed. In areas where small parcel size inhibits efficiencies of scale, governments should undertake land readjustment to form larger tracts of agricultural land conducive to large-scale farming. Tax incentives should be extended within AFFZs to private firms maximizing production (production in the region was below the national average before the disaster) through innovative farming techniques such as hydroponics or mechanized harvesting.

Workforce development will also be an issue, so collaborations with academic institutions must be created to establish apprenticeship and worker training programs. For higher-level employees, the Graduate School of Agricultural Science at Tohoku University is a likely candidate, with opportunities for basic training also provided.

[15] "Miyagi Special Fishery Zone Ok'd," *Japan Times*, April 24, 2013.

[16] Sendai City Post-Disaster Reconstruction Division, "Sendai City Earthquake Disaster Reconstruction Plan," December 2011.

Despite significant marketing efforts undertaken to alter public perceptions, concerns over the radioactive contamination of produce from Fukushima and surrounding territories likely will linger for years, depressing the revitalization of the industry in these areas. Thus, supply chains and distribution networks, as well as incentivized private investment, could be shifted northward in the region to Iwate Prefecture, near Morioka. This newly invigorated agricultural production area could become the chief supplier of produce to the Tokyo market, with support from smaller suburban farms near urbanized hubs, such as Sendai, Hiraizumi, and Kitakami.

Taken together, these strategies will expand agricultural production through innovation led by private firms, enabling Japan to reduce overall food imports and realize its goal of increased self-sufficiency.

Implementation

The formidable task of revitalizing the fishing and farming industries in Tohoku will require a multi-year effort, beginning with pilot projects and leading to wider adoption. Workforce development programs and industry growth and innovation will need to happen concurrently, though initially businesses should incorporate existing labor and import talent from outside the region where necessary. The Tohoku Regional Development Agency, utilizing Social Innovation Funds (see REGIONAL DEVELOPMENT AGENCY, p. 28), will contract with private sector intermediaries to identify integrated solutions to workforce development program delivery. Unlike most public sector-sponsored job training programs, Social Innovation Fund contracts will guarantee that participants cultivate competitive skill-sets and secure meaningful employment upon program completion. A more accomplished labor force not only will increase tax revenues and induce consumer spending, but may also facilitate new business formation in the long run.

Alliances are fundamental to realization of these strategies: between prefectural agencies, between these agencies and the private enterprises leading the revitalization of industries, and among the agencies, private sector players, and educational institutions, primarily Tohoku University.

Small businesses in the fishing and agriculture sectors can finance equipment replacement or upgrades through the Tohoku Regional Development Fund's Revolving Loan program. Fishing and agricultural enterprises, as well as their suppliers, will also be eligible for contingent grants and soft debt to defray the costs of innovative technology development. The contingent grant and soft debt both are repaid when the nascent technology reaches the commercialization stage. The Tohoku Regional Development Fund (see REGIONAL DEVELOPMENT AGENCY, p. 29) may also invest in commercial-stage technologies and primary sector ventures as a mezzanine lender or quasi-equity provider to induce private sector financiers to provide senior debt by reducing perceived credit risk. As a result, the fishing and agriculture sectors will be able to obtain credit on more favorable terms than otherwise would be possible.

The Tohoku Regional Development Agency will need to coordinate efforts to promote the incentives offered and the standards to which participants will be held, including agreements for preventing abandonment or relocation if profits decline over time.

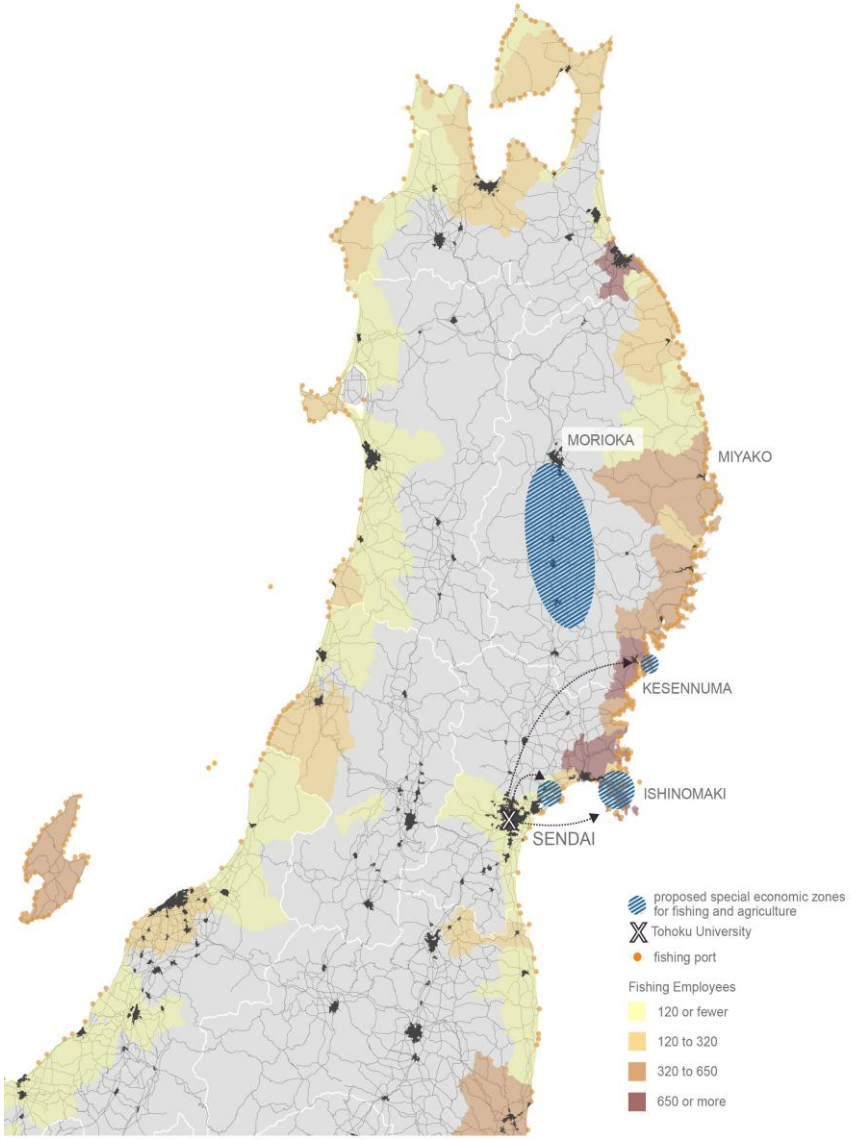


Fig. 15 Location of Special Economic Zones

TOURISM & MARKETING

Our Vision

The Tohoku region will offer a distinctive form of tourism, one that aligns with regional economic and social recovery goals by providing employment opportunities for local residents, incorporating disaster mitigation measures, and promoting the region's cultural heritage. Marketing efforts to restore consumer confidence in Tohoku's produce and promotion of artisanal goods will undergird this approach and contribute to the long-term revitalization of the region.

Opportunities for Change

Although the Tohoku tourism industry is struggling to recover from the ripple effects of the disaster, prefectures and locally-based organizations, such as the Tohoku Tourism Promotion Organization, have demonstrated tremendous acumen in formulating tourism and marketing strategies.

Amidst the rebuilding efforts, plans for the Sanriku Geopark — Tohoku's first regional project — have re-emerged. Recognized for their geological value, Geoparks present a three-fold model of sustainable development that promotes conservation, environmental education, and geotourism. The Sanriku Geopark will combine the existing Rikuchu Kaigan National Park with several smaller natural parks along the Sanriku coast. It is expected that the Sanriku Geopark will preserve some of the scars carved onto the landscape by the tsunami and earthquake as sites for disaster education. This regional effort exemplifies the sort of inter-prefectural collaboration we believe is vital to Tohoku's revitalization.

The Tohoku Tourism Promotion Organization, created in June 2007, has led tourism recovery efforts by collaborating with, among others, the Tohoku District Transport Bureau and the East Japan Railway Company to invite overseas travel agencies and media representatives to Tohoku in order to showcase the region's natural and cultural attractions. These initiatives, however, have mainly focused on dispelling rumors that arouse fear of heightened radiation levels and, as such, have emphasized promoting Tohoku's nuclear safety in the wake of the triple disaster.

Finally, many of Tohoku's prefectures have spearheaded tourism recovery efforts at a more local scale. For example, although the Akita prefecture incurred little damage from the March 2011 incidents, its economy was severely impacted by the reduced number of visitors to the region. Consequently, local officials mounted a public relations campaign entitled "Akita Vision" to encourage foreign and Japanese tourists to return to Tohoku's western coast.

Expanding on these independent efforts to revive the tourism sector, we believe Tohoku can offer an innovative, comprehensive tourism strategy that will buttress long-term social and economic recovery efforts.

Strategic Interventions

Building on these opportunities for change, our proposed strategies follow a two-pronged approach. First, the Tohoku Regional Development Agency (Tohoku RDA) will expand existing marketing endeavors to support the economic recovery of the region. As a coordinator, the Agency will

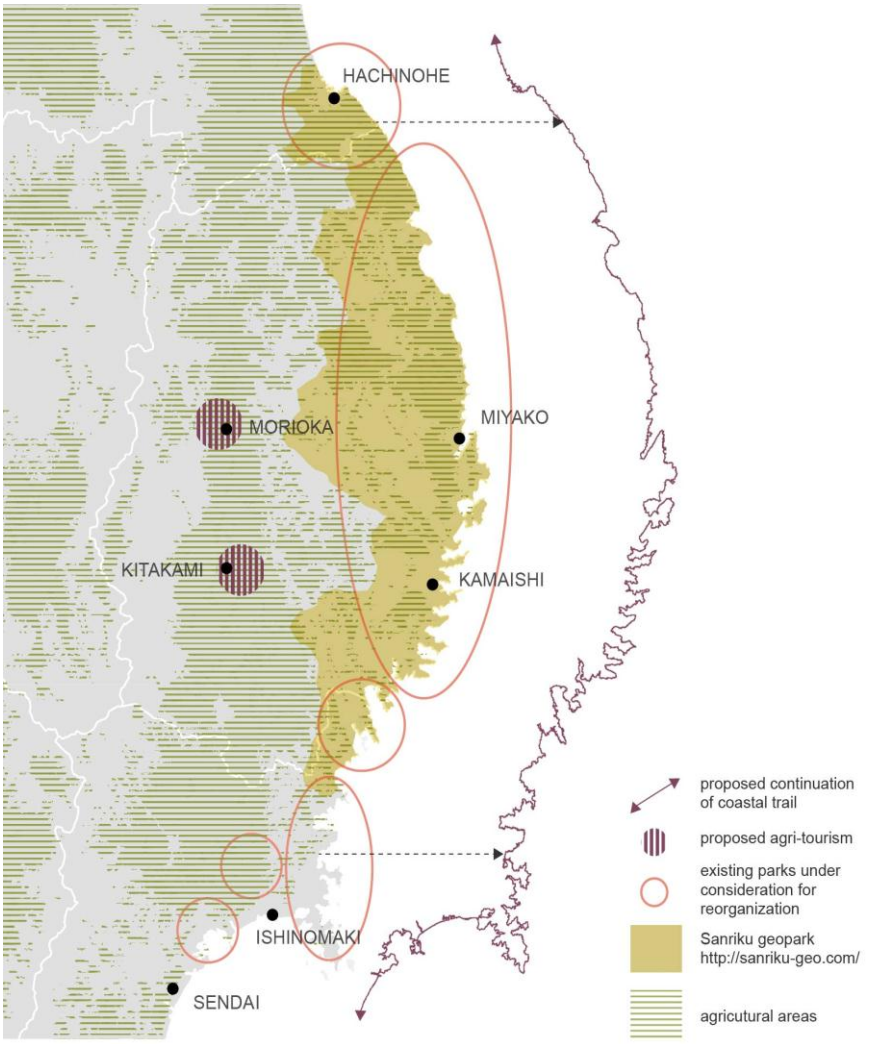


Fig. 16 Proposed Expansion of the Sanriku Coastal Trail and Agri-tourism Locations

focus on reversing the reputational damage experienced in the aftermath of March 2011 by restoring national and overseas consumers' confidence in local goods and produce. For example, the Tohoku RDA will replicate at a larger scale Aomori prefecture's website displaying the results of radiation tests on fruits and vegetables by expanding it to include produce from everywhere in the Tohoku region. In an attempt to streamline efforts, the Tohoku Tourist Promotion Organization would affiliate with the Tohoku RDA. Such an alliance will ensure that the goals of the Tohoku Promotion Organization align with the region's broader economic development goals.

Second, the Tohoku RDA should focus on leveraging regional projects as links to Tohoku's other cultural and natural attractions. Using the new Sanriku Geopark as a catalyst, the Tohoku RDA should incorporate each prefecture's tourism campaign into a larger region-wide tourism strategy. The Agency should augment the Geopark's unique educational and cultural features by creating a network of sites offering experiences that are emblematic of the Tohoku region. These itineraries will also reinforce the Geopark's sustainable development goals.

Sanriku Coastal Trail

In the long term, existing plans for the Sanriku Coastal Trail should be expanded beyond the Geopark's boundaries to include mitigation measures along the flood-prone coast.[17] The multi-faceted trail will create a regional-scale tourist experience spanning the Sanriku coastline. Beginning as a buffer area between the sea and urban settlements (see HOUSING, p. 22), the coastal trail can be developed incrementally to allow the corridor's width to vary across the region in accordance with local conditions, geography, and the presence of tsunami mitigation infrastructure. In certain areas, agricultural lands may be interspersed along the trail. As such, the Tohoku Coast Trail can intertwine disaster mitigation measures and local economies within the contours of a tourist attraction.

Agricultural Tourism

In line with the implementation of Agricultural Innovation Zones in the areas surrounding Morioka and Kitakami, agricultural tourism has the potential to further increase the region's appeal. Agri-tourism will allow Tohoku to capitalize on its agricultural heritage by showcasing Japanese farming technologies and promoting local produce and artisanal products. While agricultural tourism is at a nascent stage in Japan, it has been successful in Europe, both as a sustainable development education tool and as a source of supplemental income for farmers who offer guest accommodations. The Tohoku RDA should model regional agri-tourism initiatives on successful precedents, such as the Terra Citta Farm in Portugal.[18]

CASE STUDY: TERRA CITTA FARM, Naturtejo Geopark

In partnership with Portugal's Naturtejo Geopark, Terra Citta Farm was founded after the triple disaster as an act of Portugal's solidarity. The project included a Japanese village that encouraged farmers from Fukushima to take up their activities in Portugal. Additionally, the park used this opportunity to establish ecotourim and agritourism activities that highlight Japanese farming technologies and handicrafts and promote artisanal products made in Terra Citta.

[17] Ministry of the Environment, "Green Reconstruction: Creating a New National Park," 2012.

[18] Armindo Jacinto and Hiroko Kageyama, "TERRA CITTA: the Birth of a Japanese Bio-Diversity Farm in Naturtejo, a Symbol of Portuguese Solidarity in the Context of the Disaster of 3 March 2011 in Tohoku," *Abstracts Volume, the 5th International UNESCO Conference on Geoparks* (2012).

HOUSING

Our Vision

To achieve long-term social and economic recovery in disaster-stricken communities, it is essential to prioritize and promote immediate construction of permanent housing projects to which individuals currently living in temporary shelters in the coastal areas and the high-risk radiation zone can relocate.

Housing typologies should be tailored to geographic context and situated near centers of employment. Considering the disaster's magnitude and the vast number of destroyed buildings, the Tohoku Region requires a portfolio of approaches corresponding to the variety of topographic and economic conditions in affected areas. Three distinct housing solutions are proposed as pilot projects for Fukushima Prefecture, as well as prototypical coastal and inland locales.

Opportunities for Change

Radiation Zone

In Fukushima Prefecture, radiation exposure risk in certain areas continues to prevent thousands of families from safely returning to their former homes. Approximately 50,000 evacuees came from the four towns closest to the nuclear plant (Namie, Futaba, Okuma, Tomioka) and now are living in government-issued temporary housing or have dispersed elsewhere in the area. It is imperative to develop a holistic strategy to relocate the displaced population to housing near the jobs that will be generated by the economic development initiatives proposed.

Higher-density cities, such as Koriyama, a commercial and transportation hub in the heart of Fukushima Prefecture, could foster needed industrial development and accommodate new housing for its workforce.

Inland Zone

Food security concerns raised by radiation contamination risk in Fukushima Prefecture present an opportunity to promote agricultural production, as well as ecological and heritage tourism, in the central valleys of Iwate Prefecture and potentially can motivate construction of new inland residential developments to house evacuees from the radiation zones and coastal areas.

Kitakami City and its river offer a suitable redevelopment axis that can combine high-tech agricultural production methods with new mixed-income housing for families working in the area, in addition to possibly providing guest accommodations for tourists.

Coastal Zone

The unprecedented scale of the tsunami devastation in coastal areas has spawned a massive need for new residential developments to house displaced coastal populations. Confronting the dilemma of how to ensure safe habitation in environmentally-hazardous areas is fundamental to commencement of permanent housing construction. The need to rebuild disaster mitigation infrastructure should not be allowed to hinder residential construction in areas classified as low- and moderate-risk tsunami flood zones.

In response to the extensive damage sustained in Sendai, the city has proposed that reconstruction plans incorporate a multi-faceted approach to tsunami mitigation that can be

expanded upon to serve as a blueprint for the reconstruction of other coastal urban settlements. Tsunami mitigation should be complemented by fast-tracked construction of housing projects that integrate stricter building standards with special designs to enhance resiliency in lower-risk areas.

Strategic Interventions

The long-term goal of the housing recovery strategy is to foster regional recovery by promoting the immediate construction of housing projects adjacent to industrial hubs well served by public transportation. Our proposal mandates a combination of more disaster-resistant design standards with proven mitigation measures, and encourages densification to enable compact urban development.

To achieve this goal, in the near term, a different set of complementary strategies for housing recovery should be implemented that address land tenure issues and stimulate the construction of rental and ownership units at higher elevations and home rebuilding in place when there is no feasible alternative location.

Radiation Zone

The shift from reliance on nuclear energy to other renewable energy sources is an opportunity both for housing and economic development in Fukushima Prefecture.

To prevent urban expansion, redevelopment is a fitting alternative in moderate- to high-density land use urban areas with good access to multiple modes of transportation, such as regional railroads or highways. Housing or mixed-use projects situated in urban redevelopment districts attract and support private investment.

In Koriyama City, the creation of a renewable energy battery storage industry hub should be accompanied by development of eco-friendly workforce housing projects that can help the city to reinvent its identity.

Western Harbour, in Malmo, Sweden, succeeded economically by applying an ecological approach to planning and relying exclusively on local renewable energy to power the development. This large-scale

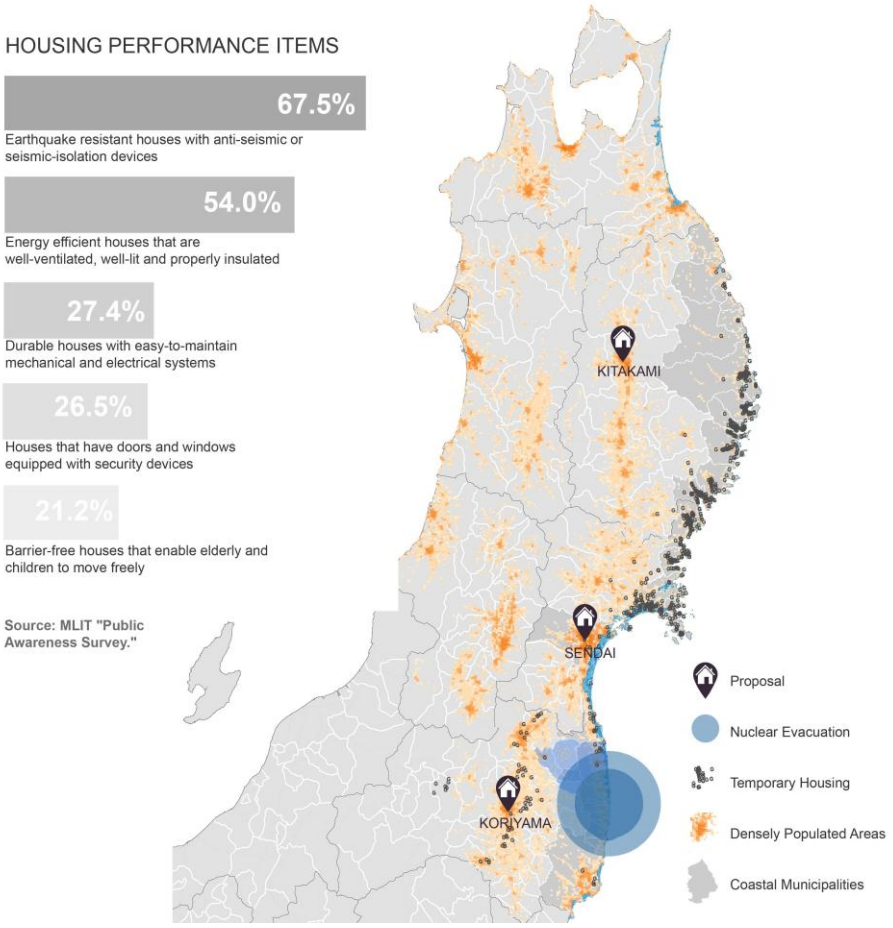


Fig.17 Radiation / Inland / Coastal Zone Housing

project exemplifies how environmental sustainability can be achieved in a densely built mixed-use urban setting.

Inland Zone

Since the beginning of the 20th century, land readjustment has been a key Japanese urban development tool to consolidate fragmented land ownership to pave the way for housing development projects that yield compact, sustainable cities.

Land readjustment has been used to assemble parcels in areas comparable to the fertile valley of northern Iwate Prefecture, where the city of Kitakami is located. The Kitakami area is well-suited to construction of ecologically sensitive housing developments that are interwoven with the surrounding pastoral landscape to promote agricultural cultivation and tourism in the region.

China's Wanzhuang eco-city, designed by ARUP, enabled conservation of vital productive land and agricultural heritage, by merging farmland with compact, mixed-use developments that respond to the surrounding villages.

Similarly, the Kitakami river corridor will preserve, utilize, and enhance local farming methods to attract new residents, developments, and tourism that perpetuate the region's agricultural legacy.

Coastal Zone

The strong historical, social, cultural, and economic forces that bind coastal communities to the sea makes it impossible to advocate coastal recovery solutions that categorically prohibit rebuilding in flood-prone areas. Rather than rebuild so as to avoid all potential environmental risks, in coastal areas social considerations demand strategies that balance prudent precautions with some degree of risk acceptance.

Multiple approaches can be used to make inhabitation of risk-prone areas feasible without compromising safety standards. The reconstruction plans for certain cities, such as Sendai, contain multi-layered approaches that integrate risk-based land use restrictions, mitigation infrastructure to protect urban areas, land restructuring to reassemble parcels in affected areas, housing relocation to higher ground, community participation, and evacuation routes and facilities, among other measures.

In coastal cities, public spaces could serve multiple purposes by accommodating evacuation routes and mitigation devices, as well as stimulating economic recovery and tourism if situated near centers of commerce or local attractions.

For example, in Sendai a network of micro green corridors can be created at a local scale to serve as evacuation routes that converge with coastal forest mitigation areas at a regional scale.

The challenge in the Tohoku region is to a establish a flexible set of criteria capable of jumpstarting recovery immediately in coastal zones by accelerating new housing construction to serve displaced populations and prevent future "ghost cities" that embody high safety standards, but are devoid of inhabitants.

To supplement existing local recovery plans and mitigation infrastructure projects, an additional strategies is proposed:

Construction of Resilient Housing in Low- and Moderate-Risk Areas

Residential buildings should be located above the flood line. Where this is not possible — due to geographic, economic, or cultural considerations — construction in low- and moderate-risk areas is permissible provided strict design regulations are enforced to diminish damage potential and buildings are sited so as to facilitate prompt escape route access.

Such building codes can ensure the serviceability of the structures built in low- and moderate-risk zones. In the event of a future tsunami, buildings so constructed will suffer minor damage but maintain their structural integrity, allowing faster recovery in the aftermath of another catastrophe. The success of such measures, however, will be contingent on prompt early warning and appropriate evacuation systems.

The city of Dichato, Chile, tested this approach as part of its 2010 reconstruction program. For families who did not want to move upland, a variety of specially designed public housing projects were built along evacuation routes in tsunami-prone areas.

Fig.18 Western Harbour
Housing & Energy

Fig.19 Wanzhuang
Housing & Nature

Fig. 20 Dichato
Housing & Resilience

Implementation

Because more than 60% of Iwate, Miyagi, and Fukushima Prefectures' residents own their own homes,[19] housing reconstruction efforts depend not only on Reconstruction Agency public housing funding, but will also necessitate financing instruments to permit debt-burdened homeowners to rebuild.

The Tohoku Regional Development Fund therefore will utilize Diaspora Bonds to assist homeowners in disaster-affected areas with down-payments on new residences and interest-rate buydowns on conventional mortgages. The Fund also will offer the most debt-burdened homeowners subordinated Shared Appreciation Mortgages to augment their borrowing capacity, enabling them to defer payment until such time as the home is sold, at which point the borrower either repays the loan principal plus accumulated interest, or a pre-determined percentage of the net sale proceeds, whichever is greater.

These programs will permit disaster victims to re-establish permanent homesteads, thereby restoring their well-being and livelihoods, while concurrently providing considerable short-term construction employment to reinvigorate the Tohoku region's economy.

[19] Official Statistics of Japan, Regional Statistics Portal, http://www.e-stat.go.jp/SG1/chiiki/Welcome.do.

TRANSPORTATION

Our Vision

Tohoku will reconnect its transportation grid through a series of bus rapid transit networks. When capacity increases and there is a need for a larger network, the bus rapid transit system can be upgraded to a railway system.

Opportunities for Change

The transportation network in the Tohoku region was severely compromised when the earthquake and tsunami struck. Destruction hit every transportation mode, including seaports, bridges, railways, and highways. Fortunately, Japan's exemplary emergency repair procedures had major thoroughfares up and running within days of the disaster, allowing relief efforts to reach everywhere within the Tohoku region. Damage evaluations and repairs have been ongoing since 2011 and many of the major roads and railway routes are operational.

Minor routes and stations are still in need of repairs, however. Due to lower population density, the viability of some of these smaller routes is uncertain and it may not be prudent or economical to rebuild them to the pre-disaster status.

The largest gap in the network lies near the Fukushima plant, where the radiation zone inhibits vehicle passage. The railway and highway route that runs along the coast stops just north and south of the Fukushima radiation zone, where it then extends back to the Tohoku Expressway (up to 70km).

With a high percentage of elderly in the Tohoku region, the demand for public transportation will increase as senior drivers become unfit to drive. In order to maintain independence, senior citizens will need reliable, accessible public transit. Even though some routes are not in high demand at the moment, within the next decade, the need for public transit will increase.

Strategic Interventions

The long-term goal for transportation is to meet the needs and demands of residents, tourists, and industries with an efficient and extended network connecting all prefectures of the Tohoku region with the rest of Japan and the world. The first step is to build a simple network that is quickly implementable and cost effective. A reliable transit system that connects to key destinations will encourage people to be less reliant on personal vehicles, thereby reducing pollution and road congestion.

Bus Rapid Transit

Bus rapid transit entails operation of buses on a dedicated bus lane. It functions much like a railroad system, with the same reliability and speed. The advantage of a bus rapid transit system is its lower capital investment compared to rail. The 20 million yen cost of a bus is much lower than that of a rail car, at roughly 140 million yen. Rail tracks inspections every six years can cost as much as 12 million yen, while interim three-year inspections cost six million yen.[20]

In regions where demand is insufficient to justify the costs of railway transit, a bus rapid transit system is a viable alternative. Even though passenger volume is much

[20] He Le, "Rethinking Mass Transit Post-tsunami: Buses Running like Trains for a Fraction of the Cost," *Japanese Business Press Co.*, November 12, 2012.

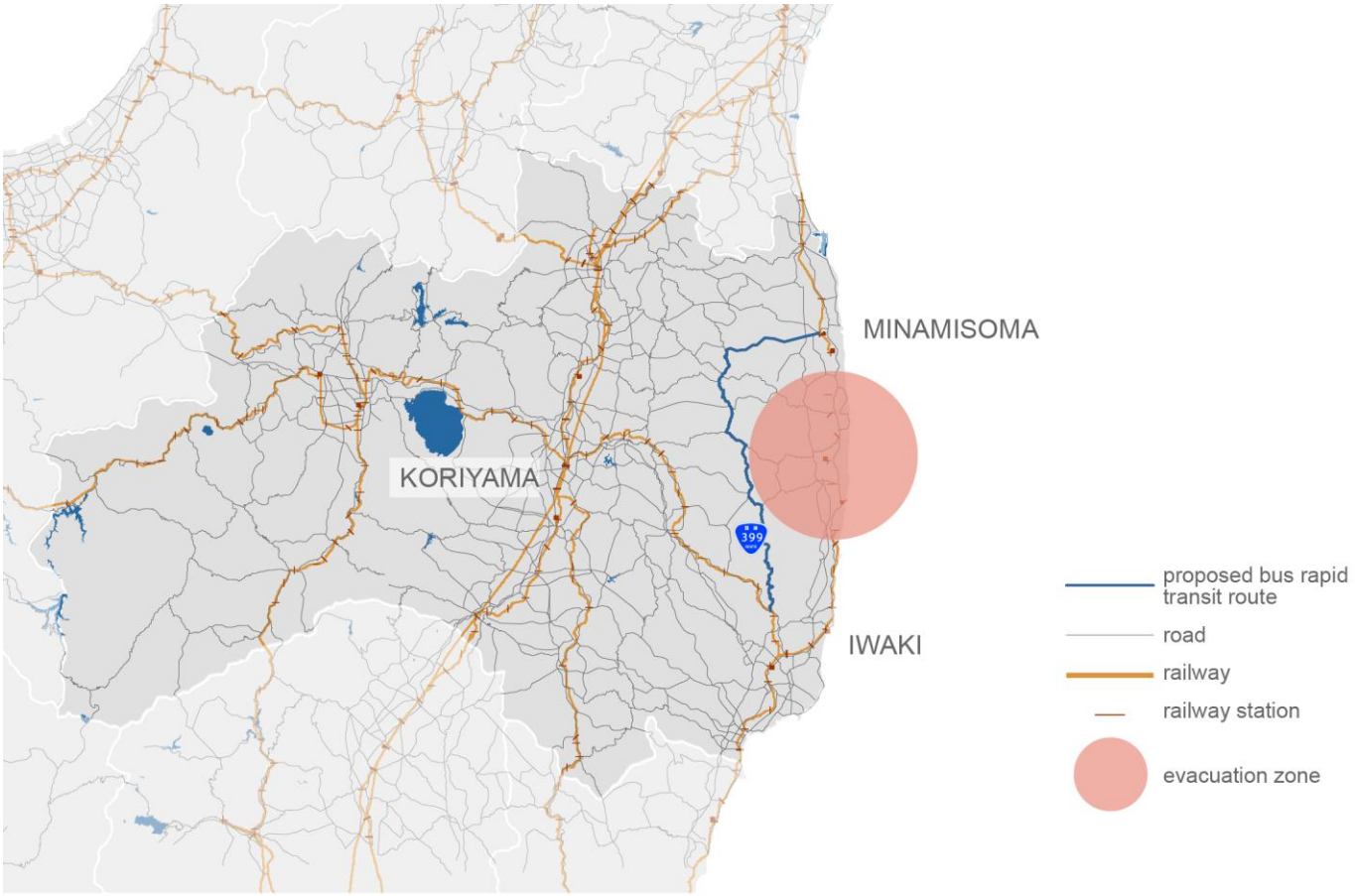


Fig. 21 Proposed Bus Rapid Transit Route in Fukushima Prefecture

lower for bus transit, the system is still sustainable because of the lower initial investment and reduced maintenance expenses.

A prime location for a bus rapid transit system is in the Fukushima nuclear plant region. It can be built to accomplish two goals: remove the division caused by the radiation zone and provide public transportation for the proposed renewable energy battery storage hub.

The first location for the bus rapid transit line should be built along National Route 399 outside of the radiation zone to provide a shorter connection between Minamisoma and Iwake. An additional line should be developed in Koriyama to connect residents to the newly developed energy hub. The route and stations can be determined once the precise location of energy hub location is established.

Stations should be situated in key neighborhoods, including areas where we propose temporary housing be converted to permanent communities. This will be pivotal to connecting new communities to the city of Koriyama. As ridership and revenues increase, the system can be converted to a light rail system to accommodate the higher demand.

A bus rapid transit system can be repaired quickly and at a lower cost than railway. In the event of a disaster, a damaged system can swiftly be restored to operational status.

Conversion to Rail

When demand increases on the bus rapid transit system, it can be converted to a railway system. To take full advantage of the initial investment, several bus stations should be strategically placed where they can be aligned with a potential rail line. These stations should be capable of expansion to service rail commuters.

Bus rapid transit routes that are developed should be fully integrated with rail services. Fares and ticket prices should be structured to facilitate smooth intermodal transfers, and bus routes should be printed on maps along with rail lines.

Implementation

To incentivize the creation of the proposed bus rapid transit system, the Tohoku Regional Development Agency (see REGIONAL DEVELOPMENT AGENCY, p. 28) will award 20-year concessions to qualified private consortia. The concessionaires will bid to acquire operating rights, but may pay the concession fee in installments pending operational stabilization.

Given the uncertainty of demand forecasts, it is imperative that the concession contract include a clause permitting the Tohoku Regional Development Agency, or its successors or assigns, to re-bid the concession if and when ridership increases to a pre-determined threshold that would make conversion to a light rail system feasible.

REGIONAL DEVELOPMENT AGENCY

Our Vision

Capitalizing on the expanded public-private partnership (PPP) scope afforded by the 2011 amendment to the Private Finance Initiative (PFI) law, our proposed Tohoku Regional Development Agency (Tohoku RDA) will foster increased private sector competition and innovation with regard to project delivery and financial instruments. Utilizing public funds to de-risk infrastructure and economic development opportunities, the Tohoku RDA will stimulate private investment in the region, particularly from institutional and overseas investors. Revenues accruing to the public sector will be retained by the Tohoku RDA to facilitate reinvestment in additional regional projects and enterprise development.

Opportunities for Change

Despite national government efforts to facilitate the coordination of reconstruction measures, the rebuilding process has imposed significant burdens on local governments in disaster-stricken areas of the Tohoku region. Local governments' administrative capacities have been weakened by extensive physical damage and loss of life, especially in smaller municipalities where human and financial resources were constrained prior to the disaster. Although an unprecedented influx of public money earmarked for reconstruction projects has inflated yearly municipal budgets, shortages of expert advice, local leadership, and regional perspective have hindered recovery efforts.

Overwhelmed local governments struggling to restore residents' livelihoods and well-being concurrently face the daunting prospect of implementing revitalization projects structured as public-private partnerships. In the first 10 years following the enactment of Japan's PFI law, local governments in Iwate, Miyagi, and Fukushima prefectures completed a total of 18 PFI projects.[21] Given the limited number and scope of projects undertaken prior to the March 11th disaster, few prefectural and municipal officials, or private contractors in the Tohoku region possess sufficient experience or skills to oversee the complex projects now permitted under the amended PFI law.

In Iwate, Miyagi, and Fukushima prefectures, municipalities are vying to outdo their neighbors in securing Reconstruction Agency project funding instead of collaborating to strategically allocate public resources. Each municipality offers competitive subsidies in order to prevent a population exodus. Intra-regional competition not only likely will result in sub-optimal resource deployment, but it also may thwart recovery initiatives that span multiple jurisdictions.

The national Reconstruction Agency has funded recovery efforts through a combination of annual appropriations and Reconstruction Bonds, which are disbursed as grants to local governments for approved initiatives. Grants have enabled projects to proceed more quickly, but are an inefficient long-term funding mechanism. Categorical grants should be reserved for public sector-sponsored projects, whereas projects involving the private sector should be required to repay grants upon closing of construction or permanent financing so that limited

[21] Government of Japan, PFI Promotion Office: http://www8.cao.go.jp/pfi/e/home.html, accessed October 1, 2013.

public resources can be reinvested. This is an especially critical issue in the Tohoku region, where crucial projects may be harder to finance due to the Japanese legal doctrine of nationwide uniformity, inherent project risks, and market risks attendant on deteriorating regional economic fundamentals.

Revenues derived from PPP projects typically are used to augment government operating and capital budgets, enabling the public sector to provide an enhanced range and level of services. In the context of a regional revitalization program, however, diverting PPP project revenues into general services would eliminate a vital source of funding for cross-prefectural initiatives and economic development related to the region's recovery.

Instituting Special Zones for Reconstruction that link incentives to a circumscribed area will not be sufficient to induce the extensive renewal of the region's economy that is needed to halt resident outmigration and retain businesses. The Reconstruction Agency has been configured primarily to expedite restoration of essential physical infrastructure, a necessary but insufficient foundation for economic transformation. To complement the Reconstruction Agency, a regional agency is needed to pioneer new entrepreneurial government initiatives and sustain restructuring beyond the Reconstruction Agency's 10-year mandate.

Proposed Agency Functions

Capacity Building

Initially, the Tohoku RDA will focus on alleviating the pressures imposed on overwhelmed local governments by establishing a fixed-term system that allocates expert staff from private companies to aid these burdened municipalities by augmenting their remaining staff with expert human resources.

Stakeholder Engagement

During the initial years of the reconstruction process, cooperation among the region's key stakeholders should focus on inter-prefectural collaboration at the local government level. Acting as a platform for information sharing, the Tohoku RDA will allow municipal officials to inquire about model projects in other prefectures and will identify opportunities for cooperative projects through resource pooling.

Monitoring and Enforcement

The Tohoku RDA will issue special fishing permits in designated Special Economic Zones (see FISHING & AGRICULTURE, p. 18). The Agency will also monitor permit-holders' compliance with territorial and volume regulations to prevent natural resource depletion.

Economic Development

In contrast to Reconstruction Agency-funded, large-scale infrastructure projects, the Tohoku RDA will engage private sector partners to provide essential resident services, and will co-invest in enterprise and workforce development. By establishing a distinct contracting authority for cross-prefectural projects and a sustainable source of investment capital dedicated to the region, the Tohoku RDA in time can extend its platform to promote the entire Tohoku region's competitiveness.

For example, the Tohoku RDA will develop an online repository of prefectures' economic development strategies, providing a one-stop resource for investors and potential partners. Building on Miyagi Prefecture's "Invest Miyagi" website, this platform will detail existing location incentives, outline legal procedures to set up a business, and provide case studies of successful alliances with local universities, firms, and municipalities.

Funding

The Tohoku RDA will award contracts and funding on the basis of a competitive scoring system according preferences to Tohoku-based firms, consortia and partnerships involving regional enterprises, and to projects that employ Tohoku residents.

To reduce the transaction costs associated with innovative project delivery methods and financing, the Tohoku RDA will draft model contracts for each project type, bundle projects when feasible, and provide technical assistance to project sponsors and investors.

Concessions

In the healthcare and transit sectors, the Tohoku RDA shall award 20-year concessions to qualified consortia organized as Special Purpose Corporations. The Tohoku RDA may issue Requests for Proposals to solicit bids or, pursuant to the 2011 PFI law amendment, entertain privately initiated proposals.

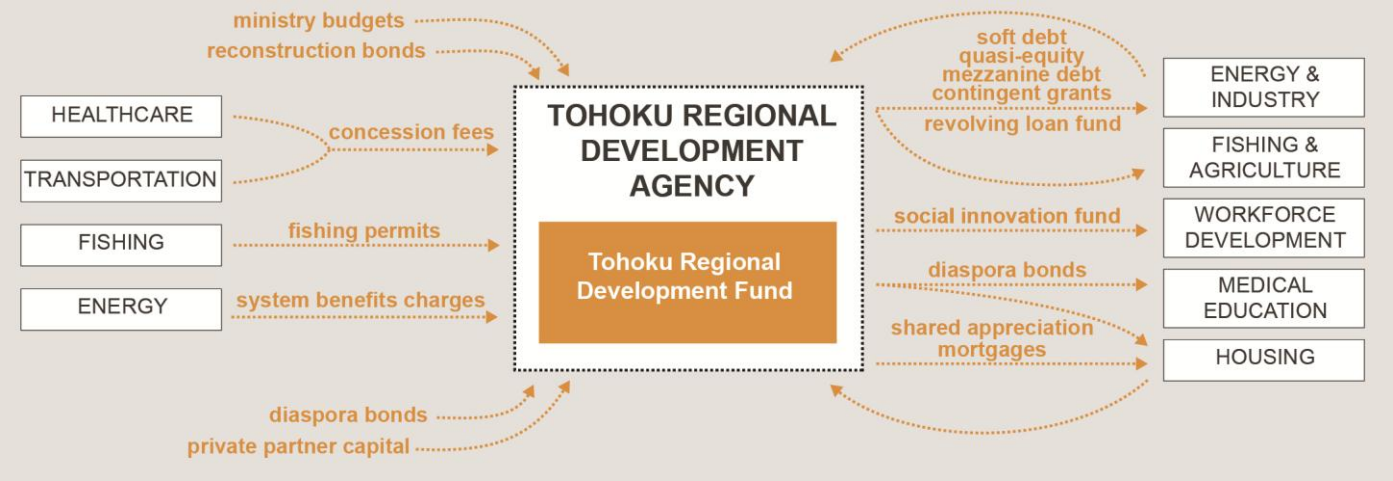
To encourage ingenuity, the Tohoku RDA will delineate performance specifications, allowing bidders to recommend suitable approaches to system design and service delivery. In exchange for concession rights, designated sponsors will pay an up-front fee to the Tohoku RDA, a portion of which may be deferred until the close of permanent financing. The Tohoku RDA will pool concession fees with other revenues to fund economic development initiatives.

Social Innovation Funds

Social Innovation Funds, also known as Social Impact Bonds, have emerged as a results-oriented contracting device for social service programs. They are well-suited to the provision of services the public sector has difficulty in coordinating across agencies and achieving desired outcomes.

Under the Social Innovation Fund model, a qualified intermediary identifies the program solution, raises operating funding from a combination of philanthropic and impact investors, and oversees service providers.[22] An evaluation advisor monitors program performance, recommending improvements as necessary. The public sector contracts with an independent assessor who determines whether performance targets have been met and calculates payments accordingly. The government is obligated to pay for services rendered by the intermediary only when and if performance metrics have been achieved or surpassed. If the intermediary does not meet those targets, no payment is due; however, superior performance is rewarded with payment increases up to a

[22] Laura Callanan and Jonathan Law, "Will Social Impact Bonds Work in the United States?" *McKinsey on Society*, March 2012.



pre-set maximum amount. Special enabling legislation is required to permit annual appropriations to be deposited in a sinking fund from which future Social Innovation Fund contract payments are made. The public sector benefits not only from performance-indexed payments, but also from deferred remittances pending program stabilization, cost savings across departments and levels of government,[23] and non-financial social impacts.

Since Social Innovation Funds are an emergent PPP technique, intermediaries may experience difficulty at the outset in raising operating funds entirely from private sources. To promote investor confidence, the Tohoku RDA may utilize Diaspora Bonds and Reconstruction Bonds to fund pilot projects. Upon stabilization, intermediaries can recapitalize pilot programs with non-government funds, permitting return of public capital; or, if unable to secure private funding, future payments can be pro-rated by the initial public investment amount.

Diaspora Bonds

The Japanese legal doctrine of nationwide uniformity proscribes use of public funds for purposes conferring advantage to particular jurisdictions, entities, or individuals. As such, government provision of financial assistance to displaced homeowners who cannot afford to rebuild their residences and tuition forgiveness programs for physicians who agree to serve in the Tohoku region are precluded. To circumvent this constraint, the Tohoku RDA will leverage its bonding capacity to raise private funds, which will be repaid from returns earned on the Agency's other investments.

Israel and India originated the Diaspora Bond model, wherein governments issue bonds to expatriates, who are motivated to invest by patriotism rather than financial interest. The Tohoku RDA will market Diaspora Bonds to ethnic Japanese living overseas, as well as Japanese nationals who have emigrated from Tohoku.

Diaspora bondholders subject to Japanese taxation will receive tax credits in lieu of interest payments.[24] Bondholders exempt from Japanese taxation will earn inflation-indexed returns. The Tohoku RDA will fund periodic interest and principal repayment using revenues generated by the Tohoku Regional Development Fund's investments.

Regional Development Fund

In addition to the Tohoku RDA's promotion and contracting functions, it will also oversee the formation and management of the Tohoku Regional Development Fund (the Fund), which shall aggregate capital for cross-prefectural initiatives and economic development in the Tohoku region.

The Fund initially will be capitalized through allocation of a portion of the national government's annual appropriations for the region and Reconstruction Bond proceeds. Consolidating some of the money earmarked by the national government for the region can diminish competition among prefectures and municipalities for project funding, permitting strategic capital deployment to those sectors and territories where it can yield the greatest overall benefit.

Revenues from fishing permits sold in Special Economic Zones will supplement national government funding. Fishing permit re-sales will trigger a value recapture provision entitling the Tohoku RDA to five percent of the sale price, which shall be reinvested in the Fund. System Benefits Charges levied on utility customers in the region also will be contributed to the Fund, along with PPP concession fees, Social Innovation Fund savings, and Diaspora Bond proceeds.

As the Fund amasses a successful track record, the Tohoku RDA can raise capital from institutional investors. In the meantime, the Fund will assume a variety of higher-risk capital structure positions in order to induce capital market participation as senior debt providers.

The Fund will utilize Diaspora Bonds to assist homeowners in disaster-affected areas with down-payments and interest-rate buydowns on conventional mortgages. The Fund also will offer the most-debt-burdened homeowners subordinated Shared Appreciation Mortgages to augment borrowing capacity, enabling them to defer payment until the home is sold. The borrower then repays the loan principal plus accumulated interest, or a pre-determined share of the net sale proceeds, whichever is greater. The Fund will reinvest the interest and appreciation income.

Small businesses in the fishing, agriculture, and manufacturing sectors can finance equipment replacement or upgrades through the Fund's Revolving Loan program. Primary sector and renewable energy

[23] If savings accrue to different jurisdictions, an inter-governmental cost savings sharing agreement shall be executed to capture positive externalities.

[24] U.S. Clean Renewable Energy Bonds have set a precedent for compensating bondholders with tax credits instead of interest payments.

enterprises will be eligible for contingent grants and soft debt to defray the costs of innovative technology development. The contingent grant and soft debt both are repaid when the technology reaches the commercialization stage. The Fund may also invest in commercial-stage technologies and industrial ventures as a mezzanine lender or quasi-equity provider. Fund quasi-equity will earn a *pro rata* preferred return until the hurdle rate is achieved; thereafter, non-Fund equity will be entitled to a promoted interest. Income from these investments will recapitalize the Fund, providing a sustainable financing source for continued economic development.

Conclusion

The 2011 Great East Japan Earthquake is a tragedy that will not soon be forgotten. While the loss of life, property, and infrastructure wrought by the disaster has taken a great toll on the people of the Tohoku region, it is truly a testament to their strength and resilience that the region is making a steady comeback. Despite setbacks and significant hurdles, all of which are to be expected, real progress is being made toward recovery. Building on this progress, and on the notion that recovery presents a rare opportunity for rebirth, the preceding pages have proposed a set of strategic interventions that seek to bring about a revitalization of Tohoku's social and economic fabric to align with developments in the physical rebuilding of the region.

Our approach, focused on eight subject areas, has been firmly grounded in the realities of Tohoku, drawing on existing conditions and local initiatives to develop innovative, yet implementable solutions to complex problems. After outlining what we see as the primary areas of opportunity in the region, we offered a set of health- and medical education-related strategies designed to create a network of mobile clinics and community life support centers to increase the welfare of residents and reduce demand on hospitals. Similar goals framed strategic interventions in the establishment of a Family Medicine specialization and School of Public Health at Tohoku University.

To encourage economic growth and provide jobs, we proposed strategies that would create a battery industry hub to support Japan's ambitious renewable energy goals, special economic zones to promote private investment and innovation in maritime industries and agriculture, and workforce and enterprise development training programs to help attract new workers to the region and generate increased employment opportunities for existing residents.

Tourism and marketing strategies offered synergies with existing regional assets, such as agriculture, as well as the scenery along the Sanriku Coastal Trail, and proposed ways of using tourism to generate jobs and other economic opportunities.

Housing strategies, meanwhile, focused on constructing permanent housing for populations displaced by the disaster. Three typologies were recommended for different zones: inland, radiation, and coastal, the last incorporating measures to increase housing's resilience to coastal hazards.

For transportation, we suggested the adoption of bus rapid transit systems in Fukushima, intended to help residents reach work and health care options quickly and cheaply. Throughout, we highlighted synergies between the various sectors to facilitate better integration and maximize efficiencies.

Finally, we delivered a proposal for the creation of a new Regional Development Agency to build on the Reconstruction Agency's work. The RDA would fill the vital role of managing, coordinating, promoting, and financing the implementation of the social and economic revitalization outlined above.

Our theory of innovation in this plan has stressed not so much the ability of any one idea or strategy to overcome the myriad challenges at hand, but rather the idea that the right mixture of strategies applied at different scales and using diversified funding instruments will catalyze the type of locally-driven recovery we imagine. The way in which our interventions work together as an integrated system to bring about social and economic recovery may in fact be the most novel aspect of our plan.

This is not to downplay the significance of each strategic intervention on its own, however. Our plan can adapt to a variety of scenarios and priorities, such that regional officials could begin implementing some interventions before or without others. The idea is to give local decision-makers a set of solutions that can be put in place as needs and funds arise.

Across the board, our strategic interventions were developed to accord closely with existing conditions in Tohoku and often drew on regional or Japanese precedents. This basis in Japan's specific social, political, and economic contexts should increase potential for their swift implementation. In the long run, it is hoped that these interventions will have implications for regional development strategies that have lasting impact far beyond the boundaries of Iwate, Miyagi, and Fukushima Prefectures.