

Resilience and sustainable development following a nuclear accident: Lessons from the Fukushima Daiichi NPP accident

*Thierry Schneider (CEPN), Pascal Croüail (CEPN), Jacques Lochard (Nagasaki University),
Deborah Oughton (NMBU), Friedo Zölzer (University of South Bohemia)*

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- **Some lessons from the Fukushima Daiichi nuclear power plant accident:**
 - **Difficulties in restoring the socio-economic activities** in affected areas, including policy challenges of lifting evacuation orders
 - **Complexity** of the individual and collective decision-making process for **lifting evacuation orders**
 - **Radiological situation** in the affected territories only **one dimension** of the problem faced by individuals and communities
 - **Radiological issues for business activity managers**, particularly for the protection of employees, but also to secure production and consumers trust of products through radiological control
 - **Difficulties for municipalities to plan their future** and size their infrastructure to accommodate the potential number of residents
 - Decision to return or not: a question of **choice and preference of each individual** or family, that must be respected

- **Current projects in the affected territories in the Fukushima Prefecture:**
 - Municipalities are seeking to **modernize infrastructure and develop economic activities** with the objective to increase their attractiveness to their former residents but also to potential new residents
 - The recovery process is shifting towards the **economic revitalization** of the affected territories through the implementation of the **Fukushima Innovation Coast Framework** aimed at encouraging people to return and attracting newcomers

Modernisation of infrastructures

◆ Revitalization Public Housing



Iwaki City:
Iwasaki housing complex

◆ Shopping facilities



Namie Town:
Roadside-Station "Namie"

◆ Medical and caregiving services



Tomioka Town: Futaba Medical
Center-affiliated Hospital

◆ Educational facilities



Odaka Industrial Technology and
Commerce High School



Okuma Town:
Disaster public housing



Okuma Town: Okumart, Hot Okuma,
and Linkru Okuma complex facilities



Multi-purpose
medical helicopter



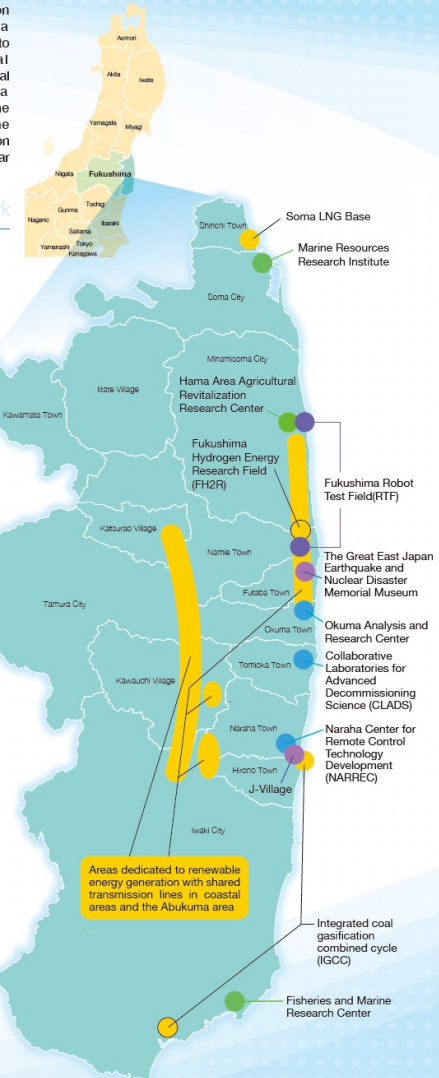
Futaba Future School
Junior and Senior High school

Promoting the creation of clusters of cutting-edge industries by utilizing research centers in various fields

Fukushima Innovation Coast Framework Major Projects

The Fukushima Innovation Coast Framework is a national project that aims to build a new industrial infrastructure of the coastal region of Fukushima Prefecture to recover the industries lost due to the earthquake and tsunami on March 11, 2011 and nuclear disaster.

Fukushima Innovation Coast Framework



Project 1 Technological development that brings together the expertise of Japanese and international professionals.

Decommissioning of nuclear reactors



The Naraha Center for Remote Control Technology Development (NARREC) conducts testing necessary for decommissioning.



The Okuma Analysis and Research Center conducts analytical research for the treatment and disposal of radioactive waste.

Project 2 Creating industrial clusters of robotics with the Fukushima Robot Test Field at the core

Robotics and Drones



The Fukushima Robot Test Field reproduces the operating environment of outdoor robots on land, at sea, and in the air.



World Robot Summit held in 2021 showcasing competing technologies and ideas in robotics.

Project 3 Toward the establishment of cutting-edge renewable energy and recycling technologies

Energy, Environment, and Recycling



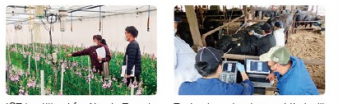
Promoting the systematic and smooth introduction of renewable energies in the entire coastal region and pushing the introduction of renewable energies by developing shared transmission lines for solar and wind power generation.



A hydrogen filling station that helps the proliferation of fuel cell vehicles by enhancing mobility of hydrogen powered cars.

Project 4 Revitalization of agriculture, forestry and fisheries industries through the use of ICT, robotics, and other technologies

Agriculture, Forestry and Fisheries



ICT is utilized for Namie Town's flower cultivation expansion initiatives.



FLAM is a manufacturer located in Namie Town that produces high-value-added laminated lumber. Their products help to increase the demand for prefectural timber, and they also help in revitalizing the forestry industry.

Project 5 Developing business opportunities through supporting technological development

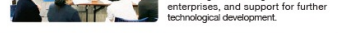
Medical industry



As a research center for the medical industry, The Translational Research Center supports the development of enterprises dealing with new therapeutic drugs for various diseases especially cancer.



The Fukushima Medical Device Development Support Centre is the first facility in Japan to provide integrated support from development to commercialization of medical devices.



Proactive support for commercialization and assisting the entry into the medical device field through business matching consulting services for enterprises, and support for further technological development.

Project 6 "Flying car" testing, and inviting new enterprises associated with flying cars

Aerospace



Robot & Aerospace Festa Fukushima is held for the purpose of technology exchange, business negotiations and raising public awareness of aerospace-related industries.



IHI Corporation, IHI Soma Office (Manufacturing base for parts for aero engines and space development related equipment)

Challenges for business activities facing the consequences of a nuclear accident

Preservation of economic activity and protection of personnel

- Need to evaluate the **capacity to maintain or not production** taking into account the radiological situation and the availability of personnel
 - Identify **sources of information**, means of **measurement**, access to **expertise**, effectiveness of **decontamination** actions, and planning for their implementation
 - Identification of **radiological criteria relevant** for making decisions
 - Articulation with the decisions of the authorities in relation to the territories and their **evolution over time**
 - Identify the **employer's responsibility** related to exposure to ionizing radiation
 - Implement actions to **maintain exposures as low as reasonably achievable**
 - Promote the development of **radiation protection culture**
 - Guarantee **working conditions** that contribute to the “**well-being**” of staff
 - **Involve staff** in evaluating and monitoring the radiological situation

Challenges for business activities facing the consequences of a nuclear accident

Guarantee the quality of production for consumers

- Organize the implementation of a **quality assurance process**
 - Processes that can range from the implementation of good practices to the intervention of a certified organization
 - Identify available technical resources and access to expertise
- Organize **dialogue and communication with consumers** and customers to restore trust
 - Promote transparent and pluralistic information on the radiological situation
 - Promote direct contacts and organize “open days”
- Develop **operational guides** for the implementation of quality processes for manufacturers
- Adopt **dynamic, scalable and flexible processes** to take into account the specific situation of each installation and its evolution
- Strengthen **cooperation between economic actors** to deal with the situation

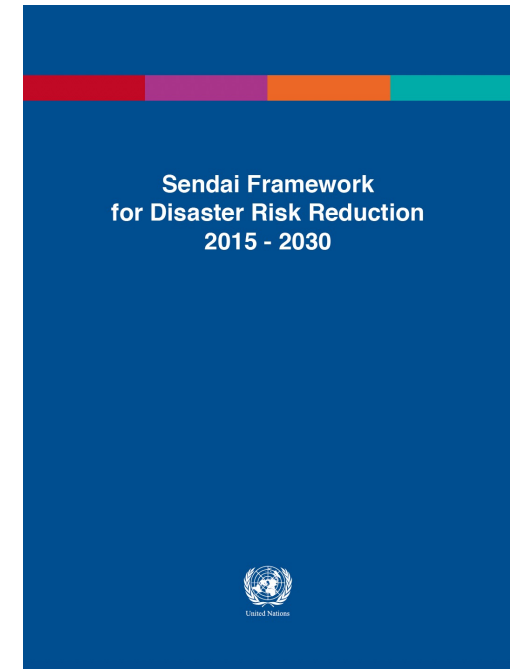
Organise socio-economic recovery

Restoring the socio-economic development of local communities

- **A priority** whenever the radiological situation allows it
- Importance of **local, regional and national cooperation** to identify the “**sustainable development**” project of the territory in the post-accident context
 - Example of the “Fukushima Innovation Coastal Framework”:
 - Targeted aid **for innovative activities** aimed at supporting the resumption of economic activity
 - Desire to **be attractive**: robots, hydrogen production, decontamination research center, etc.
- Objective aimed at **territorial resilience**
 - Chernobyl and Fukushima experience highlights the **inability to return to the previous situation**
 - Need for a **contract of objectives** shared between the different stakeholders in the territory to enable the development of decent living and working conditions
 - Importance of **maintaining the integrity of the local community** and having a monitoring process involving the different stakeholders

Sendai Framework for Disaster Risk Reduction 2015-2030

- **Priority 1: Understanding disaster**
 - In all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment.
- **Priority 2: Strengthening disaster risk governance to manage disaster risk**
 - At the national, regional and global levels for prevention, mitigation, preparedness, response, recovery, and rehabilitation, fostering collaboration and partnership.
- **Priority 3: Investing in disaster risk reduction for resilience**
 - Public and private investment through structural and non-structural measures to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment.
- **Priority 4: Preparedness for response and resilient recovery**
 - For effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction
 - Take action in anticipation of events, and ensure capacities are in place for effective response and recovery at all levels.



Coordinated by the United Nations Office for Disaster Risk Reduction and endorsed by the UN General Assembly in 2015

Sendai Framework for Disaster Risk Reduction 2015-2030

European Forum for Disaster Risk Reduction

Roadmap 2021-2030 - Priority 4

- Invest in **accessible multi-hazard** early-warning systems
- Strengthen **gender-responsive, age-sensitive and inclusive** preparedness for complex emergencies at all levels
- Apply **lessons identified from the Covid-19 pandemic** response for future preparedness and recovery planning and approaches
- Develop new **accessible and inclusive disaster-resilience tools** for building back better that address existing, emerging and future risks



Toward the resilience of affected territories

Radiological protection challenges and ethical considerations to promote the resilience:

- Organise the **vigilance regarding possible future health effects**
- Develop the **radiological protection culture**
- Promote the **approach in terms of well-being** and quality of life
- Develop an **inclusive approach with a central role for local stakeholders** by building a **vision for the future** of their life in the territories
- Promote **socio-economic sustainability** combining economic, social, environmental and health objectives and respecting ethical values



Conclusion: Some ways forward for preparedness

- Integration of **nuclear risk, alongside natural and technological risks**, in the development of business continuity plans for industrial activities
- Organization of a **dialogue between local socio-economic actors** as part of post-accident management preparedness
- Analysis of **vulnerabilities and challenges** to ensure radiological protection of people and the environment taking into account ethical considerations
- Analysis of the possible contribution of **support mechanisms** aimed at improving the well-being of affected people
- Implementation of an **expert training plan**, as well as **raising awareness** among local communities



Der Sarkissian, R.; Dabaj, A.; Diab, Y.; Vuillet, M. Evaluating the Implementation of the "Build-Back-Better" Concept for Critical Infrastructure Systems: Lessons from Saint-Martin's Island Following Hurricane Irma. *Sustainability* 2021, 13, 3133. <https://doi.org/10.3390/su13063133>

Thank you