

Restarting Japan

A First Assessment June 2011 on the Road to Recovery
after the Great East Japan Earthquake

The earthquake in Japan on March 11, 2011 is a tragedy in terms of loss of life, property and dreams of a normal life. It is in economic terms likely one of the most costly natural disaster in modern times. Growth Analysis gives an early situational report painted in broad strokes and describes some aspects of the crisis; crisis management in general, electricity shortages, disruption of industry supply chains and the disaster's economic implications.

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Foreword

The earthquake in Japan on March 11, 2011 is a tragedy in terms of loss of life, property, and dreams of a normal life. It is in economic terms most likely one of the most costly natural disaster in modern times.

The purpose of this report is to provide an early situational report and painted in broad strokes describe some aspects of the crisis; crisis management in general, electricity shortages, disruption of industry supply chains, and the disaster's economic implications. In-depth analysis will follow at a later stage.

The common thread in the report is how the modern knowledge society's vulnerability to major catastrophes can be handled. What has happened in Japan must be closely monitored because it allows us to in real-time create a deeper understanding and knowledge of crisis management organization and practical work in connection to major disasters. The main findings of the report can be summarized as:

- The reconstruction of Japan's east-north "Tohoku" region and the adaptation of society to the electricity shortage means a challenge, but also an opportunity for Japan to diversify its energy sources, modernize the electricity grid, and on a more general level to enhance competitiveness through structural reforms; many long overdue.
- In a crisis that unfolds on several levels: earthquake / tsunami / nuclear accident, it will require crisis management with clear leadership, coordinated action and clear communication to the public. How Japan handled the crisis will provide important policy lessons.
- The analysis also shows the increased vulnerability of global supply chains, security in energy infrastructure, and generally in crisis management.

The report was written in April and May 2011 by Niklas Z Kviselius, Anders Karlsson, Izumi Tanaka, Shigeyuki Naito and Miki Arai at the Tokyo Growth Analysis Office, everyone in Japan throughout the disaster. Dr. Karlsson and Dr. Kviselius were also part of the Embassy's and Foreign Ministry's local emergency team during the period March 11 to April 21, with specific responsibility to cover the development in Fukushima.

Stockholm, June, 2011

Enrico Deiacò, Head of Innovation and Global Meeting places

Förord

Jordbävningen i Japan den 11 mars, 2011 är en tragedi i form av förlust av liv, egendom, och drömmar om ett normalt liv. Den är i ekonomiska termer sannolikt en av de mest kostsamma naturkatastroferna i modern tid.

Syftet med denna rapport är att ge en tidig lägesrapport och i breda penseldrag beskriva några aspekter av krisen som speciellt diskuterats nämligen, krishantering generellt, elbrist, avbrott i industrins leveranskedjor, samt katastrofens ekonomiska implikationer. Fördjupade analyser får följa i ett senare skede.

Den röda tråden i rapporten är hur det moderna kunskapssamhällets sårbarhet vid stora katastrofer kan hanteras. Det som hänt i Japan måste följas noga eftersom det ger möjlighet att i realtid skapa en djupare förståelse och kunskap för krishanteringens organisation och praktiska arbete vid stora katastrofer

De viktigaste resultaten i rapporten kan sammanfattas som:

- Återuppbyggnaden av Japans öst-norra ”Tohoku” regionen och samhällets anpassning till el-bristen innebär en utmaning, men samtidigt en möjlighet för Japan att diversifiera sina energikällor, modernisera elnätet, och på en mer generell nivå att öka konkurrenskraften genom strukturella reformer, flera sedan länge nödvändiga.
- Med en kris som utspelas på flera nivåer; jordbävning/tsunami/ kärnkraftsolycka, kommer det att krävas krishantering med tydligt ledarskap, samordnade insatser och tydlig kommunikation till allmänheten. Hur Japan hanterat krisen kommer att ge viktiga policylärdomar.
- Analyserna visar även på den ökade sårbarheten i globala leveranskedjor, säkerhet inom energiinfrastruktur, och generellt inom krishantering.

Rapporten har skrivits under april och maj 2011 av Niklas Z Kviselius, Anders Karlsson, Izumi Tanaka, Shigeyuki Naito och Miki Arai vid Tillväxtanalys Tokyokontor, samtliga på plats under hela katastrofförloppet. Karlsson och Kviselius var också en del av ambassadens och utrikesdepartementets lokala kristeam under perioden 11 mars till 21 april, med särskilt ansvar att bevaka utvecklingen i Fukushima.

Stockholm, juni, 2011

Enrico Deiacco, Avdelningschef Innovation och Globala Mötesplatser

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Sammanfattning

Japan återhämtar sig från mars månads ”trippel-katastrof” i form av en kraftig jordbävning som ledde till en tsunami som i sin tur utlöste en allvarlig kärnkraftsolycka. Var och en av dessa tre händelser kan för sig klassificeras som några av de allvarligaste i modern tid i världen. Även om det japanska produktionsmaskineriet redan i stor utsträckning har återstartas, så är konsekvenserna för Japans ekonomi förmodligen mer långtgående än vad som ursprungligen rapporterats, inte minst vad gäller fortgående produktions- och leveransavbrott på grund av bristande elförsörjning. Omedelbart efter katastrofen förlorades cirka 30 procent av den totala kapaciteten för elproduktion som en följd av omfattande driftsstopp för kärnkraftsverk och kraftverk drivna av fossila bränslen. Regeringen har aviserat aggressiva mål för energibesparingar för både företag och hushåll - till exempel en 15 procentig generell minskning av strömförbrukningen inför sommaren för att förhindra massiva planerade strömavbrott. Mer långsiktiga åtgärder kommer att leda till ökande investeringar i förnybar energi. Katastrofen har också genom störningar i de globala leveranskedjorna påmint om Japans centrala roll som leverantör – speciellt inom bilindustrin. Nedan redovisas ett antal större policykonsekvenser som katastrofen gett upphov till.

- Sverige och Japan är bägge beroende av en stabil elförsörjning, inkluderande el från kärnkraft. Den unika kärnkraftsolyckan i Japan kommer att återverka på kärnkraftsindustrin globalt i årtionden. Det internationella samfundet har redan i ljuset av lärdomarna från Fukushima initierat åtgärder för att kontrollera säkerheten vid alla kärnkraftsverk. En riskanalys bör breddas, då i fallet Japan även en stor mängd kraftvärmeverk slogs ut på grund av otillräckligt skydd mot tsunami.
- De aggressiva inledande och förväntade långsiktiga förändringar av politiken kring energiplanering, särskilt energihushållning och förnybar energi val, bör följas i linje med Sveriges ambitioner på detta område.
- Förenkling av regelverk och kontinuerlig omprövning om vilka policies som skapar hållbar tillväxt är lika relevant för Sverige som för Japan. Om t.ex. policyinstrument som särskilda ekonomiska zoner nu används i Japan kan det vara av intresse att följa upp resultaten under de kommande åren. Ett annat område av intresse är nytänkande vad gäller finansiering av små och medelstora företag.
- Nationell krisplanering och hantering i efterdyningarna av katastrofen i Japan erbjuder många lärdomar, särskilt i resurshantering, mellan offentliga sektorns samarbete och kommunikation med allmänheten. Det är områden där Sverige aktivt har möjligheter att fånga in kunskap genom att öppna upp en dialog mellan svenska och japanska aktörer.

Summary

Japan is recovering from the March triple-catastrophe in the form of a massive earthquake causing a tsunami, which together triggered a nuclear plant accident. Each of these three events can individually be classified as some of the most serious ever recorded.

Although the Japanese production machine already has been re-started to a large extent, the consequences for Japan's economy following the earthquake could be more far-reaching than initially thought. Not least in terms of the production and supply line disruptions due to the electricity supply shortage. Immediately after the disaster, approximately 30 per cent of the total electricity generating capacity was lost due to halt of both nuclear and thermal power plants. The government has announced aggressive energy-saving targets for both industry and the public – for example a 15 per cent across-the-board reduction in the summer peak power consumption in an effort to prevent massive blackouts. More long-term measures will lead to more investments in renewable energy and the previous goal to increase nuclear power to 50 per cent of the electricity has been replaced with work on a new basic plan for energy focusing more on renewable energy.

The disaster has also pinpointed how important Japan is in the global supply chain of a whole variety of goods with the disaster causing remarkable disruptions in especially car manufacturing worldwide.

Below are some major consequences in terms of policy following from the disaster:

- Sweden and Japan share a dependence on nuclear energy. Measures, both technical but also regulatory, in order to make energy as safe as possible should be followed. The nuclear accident in Japan will have repercussions on the nuclear industry worldwide. A risk assessment should, however, go beyond nuclear power as also a number of thermal power plants were damaged.
- The aggressive initial and expected long-term policy changes on energy planning, especially energy conservation incentives and renewable energy choices, should be followed in line with Sweden's ambitions in this area.
- Simplification of regulation and continuous rethinking on what policy practices that creates sustainable growth is as relevant for Sweden as for Japan. If policy instruments such as special economic zones, materializes it could be of interest to follow up outcomes in the coming years. Another area of interest is financing of small and medium sized companies.
- National crisis planning and handling in the aftermath of the catastrophe in Japan pinpoints lessons especially in resource management, inter-government cooperation, and communication to the public. These are areas where Sweden actively should extract knowledge by opening up a dialogue between Swedish and Japanese actors.

1 Introduction

“We will see reconstruction not simply as returning to conditions the way they were, but as a starting point for new creation and a new future”, Japan’s Prime Minister Naoto Kan to the press visiting the earthquake and tsunami devastated city of Ishinomaki, Miyage Prefecture, April 10, 2011

This document is the first analysis from the Growth Analysis Tokyo Office on the short- and long-term effects from the Tohoku Earthquake, or as it is officially named, the Great East Japan Earthquake (Higashi Nihon Dai Shinsai - 東日本大震災), the ensuing tsunami, and nuclear plant accident. We only treat some aspects, such as crisis management, electricity shortage, disrupted supply chains, and economic consequences relevant to growth policy. In the restarting/reconstruction phase, Japan has become a testing ground for new policies and practices and there will be generic lessons on how Japan has been coping with the crisis as well as possibilities for policy and business exchange.

On March 11, 2011, at 14:46 local time, Japan was hit by a “mega-Earthquake” measuring magnitude 9.0. This magnitude places the earthquake as the fourth largest in the world since 1900 and the largest in Japan since modern recordings began 130 years ago. The earthquake triggered tsunami waves of up to 40 meters high that struck Japan, in some cases traveling up to 10 km inland. On top of this, the waves and flooding caused an INES (International Nuclear and Radiological Event Scale) level 7 (out of 7) nuclear accident around the Fukushima Daiichi nuclear plant. Normal life inside the evacuation zone around the accident is not possible for a long period to come. The statement of Japan’s prime minister Naoto Kan, 4:55 PM on March 11 is a statement for history, ref. 1.

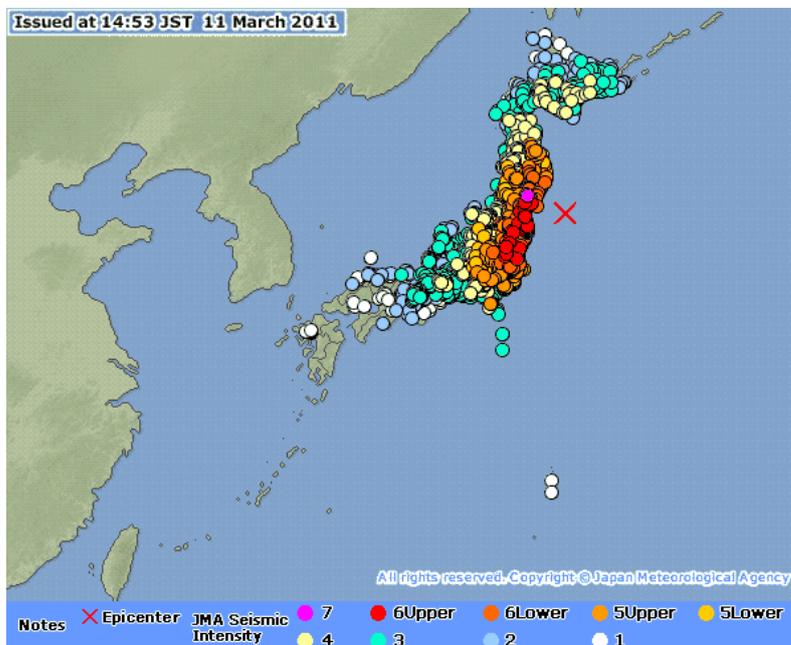


Figure 1. Snapshot of the earthquake, as seen from Japan Meteorological Agency website, 6 minutes after the earthquake. The scale is the Japanese seismic intensity scale measuring local vibrations (saturating at level 7 as maximum). As can easily be seen the earthquake was massive and the tsunamis generated devastating, see ref.2.

2 General Crisis Management

2.1 Introduction: A country prepared for natural disasters

Japan is prone to frequent seismic and volcanic activities. It is estimated that over 20 per cent of all major earthquakes over magnitude 6 during the time frame of 1996 to 2005 occurred in Japan, and the country is home to 7 per cent of the world’s active volcanoes. The geographical, topological and meteorological location also makes Japan subject to natural disasters such as typhoons, torrential rain and heavy snow.

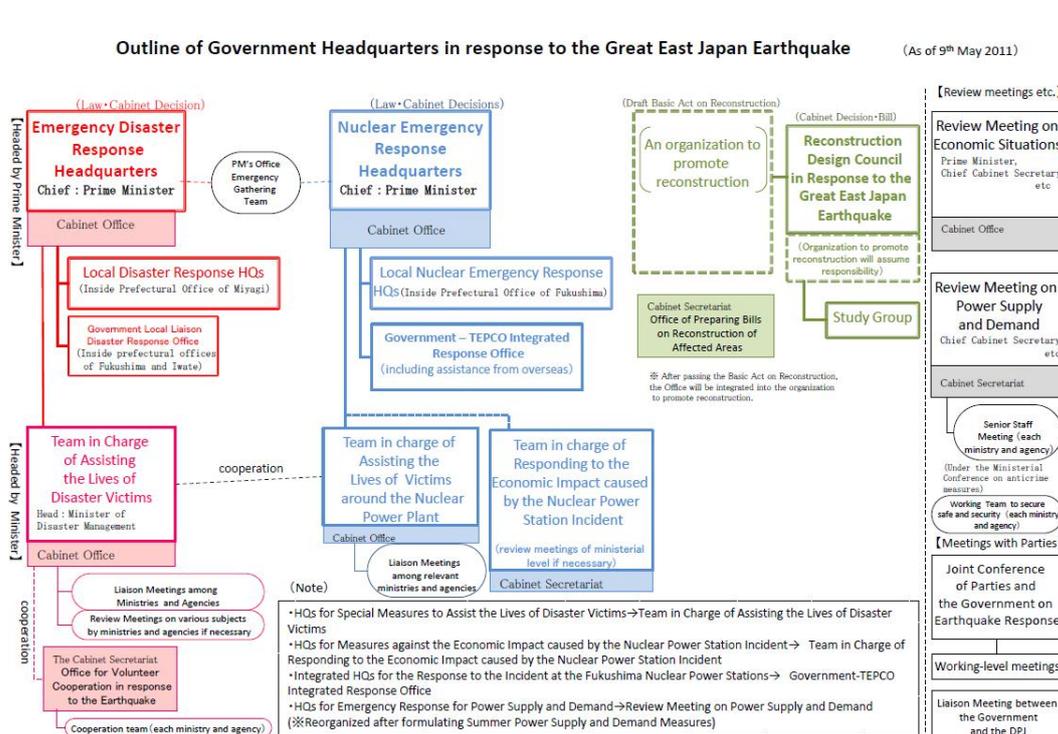


Figure 2: Formal governmental crisis management structure. Source: ref 3

Crisis and disaster management to minimize damage from natural disasters is a national priority. Japan has for instance spent over 1 billion US dollar on a system for earthquake and tsunami prediction. On March 11, 2011, this system actually worked well, warnings were issued about 10 to 30 seconds before the quake struck, some claim even a minute before. Likewise, tsunami warnings were issued, giving people in the hardest hit areas a 15 minute alert, in other areas more. Still, no one could predict the magnitude of the quake and the tsunamis that ensued. The first tsunami warnings in some places spoke about 3 meter tsunamis, then warnings were raised to 6 meter, then > 10 meter tsunamis. No one could predict the devastation to follow, the power disruption and the nuclear disaster at Fukushima.

The outline of the formal structure of the Government crisis management response to the Great East Japan earthquake is given in the figure 2 above. From the figure alone it can be anticipated that the crisis management has been complex, and as has been suggested has not been streamlined enough to be able to react promptly to the crisis evolving.

2.2 Short-term aspects of crisis management

Directly after the earthquake and the tsunami, the government of Japan (GoJ) established an emergency headquarters for disaster response. Japan immediately asked for international humanitarian assistance to deal with the disaster and to date (June 2011) has received offers of assistance from 146 countries and regions and 39 international organizations. (GoJ, April 20). A UN Disaster Assessment and Coordination (UNDAC) team supported the GoJ with information management, the deployment of USAR teams and international offers of assistance. Among national assistance, in particular the massive US military forces assistance “Operation Tomodachi” (tomodachi (jap) = friend) deserves to be mentioned. Early on in the rescue operations the Japanese government also ordered the Japanese self-defense forces to assist.

The scale of the disaster both in terms of lost lives, missing persons and buildings destroyed or damaged cannot be underestimated. As of June 1, 15 310 persons have been found dead, 8 404 are missing and 100 527 people are evacuated, living in shelters or temporary housing. Some 25 million tons of debris needs to be taken care of, an analogy would be to take care of 25 million wrecked small cars (i.e. the weight of a small car being about 1 ton). The road back to normal life is in many cases expected to be long. To move to the stage of reconstruction of the devastated areas, the Japanese Government launched a “Reconstruction Design Council” on April 11, 2011, see ref 4. The council is at the time of writing soliciting for suggestions for the long term reconstruction of the affected areas. Foreign stake-holders, i.e. industry consortia, government/industry consortia are also invited to submit proposals for the long term rebuilding.

2.2.1 Twitter and radio to the rescue

The mobile telephone system practically shut down due to demand after the March 11 earthquake also in Tokyo. Telecom operators limited the number of calls with 70-95 per cent to prevent from system shutdown by overflow, and to keep room for emergency calls. In the Tohoku region, power- lines and communication lines were cut by the earthquake and the tsunami. As a remedy for future, telecom operators will now invest more on in-house generators at base stations, mobile base stations, and long-range base stations for emergency. For instance NTT Docomo, announced to invest 1.6 billion SEK (20.5 billion JPY) for measures against disasters, ref 5 and 6, other operators are follow suit.

For the worst affected areas, radio became the main information source, an important lesson in the information age where internet access is taken for granted. Where internet, fixed and mobile was available, Twitter became the earliest information source, such as, availability of public transportation, after-quake, summary of news, etc. On Twitter, even people who needed help in Tohoku region wrote, and their messages were re-tweeted over and over again. The government have also extensively used social media, e.g. Twitter, Facebook as well as their regular home pages, see ref 7 as an example (the English site) of one ministry homepage. Social network services, many of them organized by non-governmental organizations, groups or individuals have also served a very important role, both in the rescue work as well with respect to the monitoring of the Fukushima accident.

Cloud computing services were also relatively robust on March 11. However, a number of internet companies have responded to the earthquake by spreading out their offices and data centers to improve their chances of staying in business after a disaster, and to cope with expected power shortages this summer.

2.2.2 A nuclear crisis of unprecedented scale

The nuclear accident in Fukushima became the first nuclear accident to unfold in world media in real-time. Whilst this has added to transparency, it has also put extra focus on timely crisis management. The loss of emergency cooling systems due to the tsunami at the Fukushima Daiichi plant caused three of the reactor cores to melt down (in units Fukushima Daiichi 1, 2 and 3), to what extent is yet not fully known. In the meltdown zirconium cladding surrounding the fuel elements melted and hydrogen gas was formed in large quantities causing explosions. The explosions caused a massive release of radioactivity in the air. The need to flood the reactors with seawater when all other cooling failed has caused also significant release of radioactivity into the sea, and with huge volumes of radioactive water, more than 100 000 tons, that needs to be de-contaminated.

The final verdict concerning why the situation in Fukushima went so wrong will need to await the analysis from the experts, Japanese and international such as IAEA, see ref 8 for the June 1 IAEA fact finding summary, as well as the Japanese government response, ref 9. However, let us here stress the following two aspects pointed out early on, ref 10 and 11. The main damage was caused by the tsunami of about 14 meter height hitting the plant while the plant was designed with barriers of 5.7 meters height only. However, tsunamis of 10 meters height or more have occurred by a frequency of about one per 30 years in Japan. In fact as late as 1993 a 10 meter Tsunami hit the northern Japan coast of the island of Hokkaido. Hence, the specific risk of large tsunamis was neglected by TEPCO (Tokyo Electric Power Company) and the regulator the Nuclear and Industrial Safety Agency (NISA). However, it should be pointed out that also a large number of thermal power plants were damaged by the tsunami. As shown by Prof. Kaneko, University of Tokyo, the tsunami protection at a number of thermal power plants has only been with 2-3 meter walls above sea level. Concerning infrastructure, not only the plant sites themselves were affected (and lost the grid-power), but also the nuclear plant off-site emergency centers were made unusable, in Fukushima due to increased radiation levels and the Onagawa nuclear plant off-site center was even destroyed by the tsunami.

On March 12, the Nuclear and Industrial Safety Agency (NISA) indicated that the severity of the Fukushima Daiichi incident was an INES 4 accident for reactor 1 (INES – the indicative International Nuclear Event Scale, used to illustrate for the public the severity of an accident). The INES scale indicate the estimated severity at the time, hence, if things turn to worse (or better) the rating can be revised. Indeed on March 18, it was raised to INES 5 for reactors 1-3, putting it on par with the Three Mile Island accident. On April 12, based on the estimated total emission of 0.37 to 0.63 millions of TeraBecquerel, NISA declared the Fukushima accident to be a INES7 accident, on the same severity level as Chernobyl. On June 6 NISA updated the estimate of emitted radiation to 0.77 Million TeraBecquerel. It should be stressed that in the case of Chernobyl 5.2 Million TeraBecquerel of radiation (Iodine 131 equivalent) was emitted, and the accident progression in Chernobyl was much more severe.

2.3 The long and winding road forward

Most important for the long term is, of course, what is done in the affected regions, and what will be the government support. Besides the work for the tsunami devastated regions, on May 17 the government presented a road-map for the compensation for the region around Fukushima. First and foremost, as nuclear power has been central to the

government energy policy, the government announced in the plan it must shoulder the responsibility. The plan is currently being implemented.

A major problem for the restoration and the work to distribute disaster relief funding and donations in the devastated regions is that in many cases is also the basic civic structures are gone, or that the municipal governments, are occupied working on reconstruction of the disaster-hit areas, do not have the manpower to distribute the disaster relief money to the large numbers of survivors. As of June 6, of the 250 billion yen donated to the Japanese Red Cross, only 37 billion yen has actually been handed out to the disaster victims.

Concerning Fukushima, besides power plant safety, the radiological contamination in air, land and sea will, together with the implication for energy management, be the major severe consequences of the accident. Radioactive nuclides have been discovered in a great number of fresh farm produce, as well as in some species of fish. This already has implications way beyond the physical zone of evacuation, both in terms of health aspects, the economical consequences for the farmers and fishermen concerned, as well as the long term damage caused to the image of Japanese products world-wide based on justified, or non-justified, fear of contamination.

2.4 Conclusion: Early Lessons on crisis management

“We have attached importance to thoroughly disclosing information on the nuclear accidents to the public without concealing, but regrettably, like this time, TEPCO has repeatedly failed to report information to us in a prompt manner. We take this as a serious situation for the entire nuclear power administration of Japan”. Quote from summary of Press Conference by Chief Cabinet Secretary Yukio Edano (May 27th, 2011)

The nuclear accident in Fukushima has put focus on the relationships between the operator TEPCO, the regulating body, the Nuclear and Industrial Safety Agency – NISA, and the Ministry of Enterprise, Trade and Industry – METI, to which NISA belongs. Basically, criticism is that there has been a too close relation between the operator and regulator, for instance, the “Amakudari” (descent from heaven) practices of government bureaucrats retiring to well-paid advisory positions in industry after their years as civil servants. Furthermore, the appropriateness of NISA, the regulator, being a part of METI, which has been actively promoting nuclear energy, has been questioned, up to the level of the prime minister and this will be changed. Many would also argue that society been lulled into a false sense of security of the Japanese nuclear power, and it is painstakingly clear that appropriate security measures against accidents were not put into place.

There has been a frustration in that the information to the public and outside experts as well as action from the government has been reactive rather than proactive, and that the crisis management have lacked preparedness and coordination. As an illustrative point, initially there were press briefings by TEPCO, NISA, as well as from the Cabinet Office, sometimes with contra-dictionary information. To unify the information flow, joint press conferences are held, which turns into long sessions with every organization just delivers their data. The authors have also, as part of the embassy emergency team been attended briefings organized by the Japanese ministry of foreign affairs. These briefings, albeit with an honest effort to inform, have at times lacked in pedagogics and presented lists of data without any interpretation, sometimes resulting in frustration from the diplomatic corps.

Concerning how the Swedish and international community locally handled the crisis, as for Sweden, following the earthquake and tsunami the Embassy directly established an emergency team under the coordination of UD, MSB and SSM. Two of the authors, as the embassy science office, joined the team from Saturday morning of March 12, the day after the earthquake. Many countries, including Denmark, Norway and Finland strengthened their embassies with experts on disaster management, including radiation experts. Besides staff replacements by UD, two of the authors – science counselor and technical attaché joining the team, the Swedish military attaché, and two radiation experts from FOI visiting for a week, no additional expertise were sent from Sweden. Initially the effort was mainly focused on consular matters of evacuating Swedes from the disaster regions. However, with the Fukushima accident unfolding, and the threat of radiation leaks with potential health effects, the emphasis in many ways shifted towards assessing potential risks. The embassy provided daily reports to UD & SSM in Sweden. An intense collaboration between embassies was also done, e.g. Sweden participating actively in Nordic and EU constellations, arranging meetings for instance with US and Japanese nuclear plant and radiation experts. The issue with safety zones, the handling of iodine tablets (where Sweden was the only country recommending a preventive intake), and how to locally assess the situation at times caused considerable stress for the staff. Few embassies, including Sweden, had included “nuclear accident” in their contingency plan, which we argue could be due to the (false) believed safety of Japanese nuclear plants, as portrayed by the Japanese authorities and plant operators.

The following lessons could be learned about crisis management

- Crisis management needs to be prepared to handle a “domino effect” of events unfolding, i.e. the combination of accidents; e.g. an earthquake and tsunami destroying infrastructure, including civic functions, combined with a nuclear crisis. The scale of the accident and civic structures gone causes delay for the citizens’ life to return normal. It is evident that Japan lacked preparation for a disaster of this magnitude.
- Nuclear plant operators and safety authorities need to consider how to handle multiple reactor failures occurring at the same site giving add-on complexities of high radiation levels due to more than one primary source, scarcity of rescue sources, e.g. fire trucks, diesel generators, personnel. For the first time in the history of nuclear power, there has been core meltdown, likely breaching the pressure vessels leading to a “melt-through”, in three reactors at the same site. The severity of this cannot be underestimated. The nuclear “stress tests” being undertaken in the European Union is a relevant response to these aspects.
- Nuclear safety authorities world-wide furthermore need to think creatively “outside the box” in terms of accident patterns that can cause a cooling loss. This need not only be due to tsunamis, but for instance due heavy storms, or ice storms.
- Information needs to be communicated correctly, timely and wisely. The information age means that the flow of information is fast, and that a large amount of data will be available. There is a fine line between interpretation and speculation. Still, society will demand not only raw data, but interpretation of data, i.e. discussions of cause and what are possible scenarios and how for the public to react. Furthermore, the communication of issues such as health issues concerning radiation is very delicate. How the Fukushima accident was handled should be studied by policy makers and experts in science and media communication.

3 Electricity Supply Crisis Management

3.1 Introduction: Power washed away by the tsunami

The primary energy supply mix in Japan is as follows: 44 per cent oil, 22 per cent coal, 16 per cent natural gas, 13 per cent nuclear and 5 per cent renewable sources. Of the country's total electric power generation year, 63 per cent came from conventional thermal sources, 27 per cent came from nuclear sources, 8 per cent from hydroelectric sources, and 2 per cent from other renewable sources, ref 12. Immediately after the disaster, approximately 27 GW or approximately 30 per cent of the total electricity generating capacity was lost due to halt of both nuclear and thermal power plants in the TEPCO and Tohoku EPCO areas, and approximately 16 GW and 35 per cent of its capacity for TEPCO alone, ref 13.

Tohoku EPCO		TEPCO		unit:GW
Onagawa Nuclear Power Plant	2,17	Fukushima-I Nuclear Power Plant	4,7	
Higashidori Nuclear Power Plant	1,1	Fukushima-II Nuclear Power Plant	4,4	
		Kashiwazakikariwa Nuclear Power	3,3	
Total Nuclear	3,27	Total Nuclear	12,4	
Sendai Thermal Power Plant	0,45	Hirono Thermal Power Plant	3,8	
Shin Sendai Thermal Power Plant	0,95			
Haramachi Thermal Power Plant	2			
Total Thermal Plant	3,4	Total Thermal Plant	3,8	
Total	6,67	Total	16,2	
Total 22.9 GW				<i>Date as of end of April 2011</i>

Table 1: Amount of Electricity Lost *after recovery. SOURCE: ref 14

With respect to Nuclear Power, from the magnitude 9.0 earthquake, eleven nuclear reactors underwent automatic emergency shut-down procedure as required once peak ground acceleration sensors detect vibrations above a set value. Nuclear power plants (some with more than one reactor block), Higashidori, Onagawa of Tohoku Electric Power Company (hereafter Tohoku EPCO) and Fukushima Daiichi and Fukushima Daini of Tokyo Electric Power Company - TEPCO), and Tokai-II of the Japan Atomic Power Co. were all stopped. Whilst the nuclear emergency that ensued, for obvious reason, has caused most of the world's attention, the tsunami actually initially damaged a substantial part of thermal power plants as well (initially more power than for the nuclear). The simple reason is that both nuclear power stations and thermal power stations are located close to the ocean (for purpose of access to cooling water and ease of access for loading of fuel/coal). Both for the thermal power stations and the nuclear power stations, as history of events proved, critical functions were not sufficiently protected against tsunamis.

3.2 Short term consequences due to loss of electricity supply

Following the initial crisis period the following measures were conducted to increase the supply capacity (Source: ref 15)

- restore operation of thermal power plants halted from the disaster
- restore operation of thermal power plants stopped for planned maintenance and for long-term planned shutdown
- purchase from Independent Power Producer
- power interchange from other electric utility companies

By the end of April, supply capacity for TEPCO had increased from approximately 31 GW immediate after the disaster to approximately 42GW. Japan has a two-part electricity grid system with 60 Hz in the western part of Japan and 50 Hz in the eastern part of Japan and with only three conversion points. This makes power interchange between western and eastern parts of Japan difficult.

3.2.1 Initial measures taken

Since the reduction in power capacity became evident, TEPCO asked its users to conserve energy, based on a clause listed in the Terms and Contract of electricity. On Saturday March 12, TEPCO announced the possibility of scheduled rolling black-outs starting the following day to avoid un-expected black-outs. The rolling black out continued until March 28. Information on, such as when, where and for how long, coming from both TEPCO and the government varied and caused much confusion to the society. After the rolling black-out announcement, due to swift efforts by all users in society, residential, industrial and governmental users, the demand significantly reduced, and hence the rolling black-outs needed not be implemented fully. The societal response with energy savings are now not only something the green minded are striving for, but a needed effort from everyone and would be of relevance to follow-up in detail, and will be reported elsewhere.

3.2.2 Outlook for the summer – Supply side

The Electricity Supply-Demand Emergency Response Headquarters (this Headquarter was restructured as a Review Meeting on Power Supply and Demand on May 16), and met for the first time in 25 March to consider short to long-term measures to handle supply shortage. In the report from the Headquarter on May 13, see ref 16 the predicted supply capacity for the summer is:

Unit: GW, unless noted	TEPCO	Tohoku EPCO
Forecasted Demand	60	14.8
Forecasted generation capacity	55.2	12.3
Amount to be supplied by TEPCO to Tohoku EPCO*	--	At maximum 1.4
Forecasted supply capacity	53.8	13.7
Deficiency against forecasted demand	10.3 %	7.4 %

Table 2: Capacity and Demand.

*TEPCO will supply at the maximum 1.4 GW of its electricity generated to Tohoku EPCO, where most of the disaster-stricken areas are located. Revised by the authors based on Electricity Supply-Demand Emergency Response Headquarters 2011 and press releases of TEPCO and Tohoku EPCO)

The predicted demand is based on the peak-demand measured in summer 2010, when the Japan experienced a hotter summer than on the average. The average increased demand for summer months are 5.5 GW and 1.3 GW for TEPCO and Tohoku TEPCO, respectively.

The following measures are continued and will be newly introduced to meet and decrease the shortage in the short-term, i.e. before the summer, from the supply perspective, ref 16.

- continue to restore thermal plants
- newly install emergency power supply, such as gas turbine
- newly contract private power generators to purchase pumped-storage power generation

3.2.3 Outlook for the summer – Demand-side

In both TEPCO and Tohoku EPCO regions, electricity demand peaks in the summer months; in July, August and September due to the hot and humid climate and ample use of air conditioners. The government announced April 28 that it will seek a 15 per cent across-the-board reduction in summer power consumption, a step back from its initial plan to seek a 25 per cent reduction for volume users, after Tokyo EPCO made upward correction in its supply capacity. In the May 25 meeting of Review Meeting on Power Supply and Demand, the entities exempted from the 15 per cent reduction were announced, which included hospitals, elderly and handicapped care homes, emergency shelters, restricted areas surrounding Fukushima Daiichi Nuclear Power Plant, railways, data centers, facilities possessing clean rooms, public offices of the disaster stricken areas and others. Additionally, the government plans to mandate cuts in consumption for major commercial and industrial customers with daily power-supply contracts of 500 kW or more between hours of 900 to 2000 from July 1 to September 22 for areas served by TEPCO and until 9 September for Tohoku EPCO areas, based on Clause 27 of the Electricity Utilities Industry Act. Intentional overuse will be penalized with a fine less than 1 million yen (approximately 80,000 SEK). This Act will be invoked to restrict the maximum power customers can use at a given time in an effort to prevent massive blackouts. Though the government has ended the rolling-blackouts on April 8 and, in principle, will not use these measures for the summer months, it is left as a safety-net measure, should the effort to curve demand fail.

3.3 Conclusion: towards a new energy strategy for Japan

Even after the summer months, plans to increase supply capacity is to be continued. The following supply-side measures are also mentioned in the May 13 report of the Electricity Supply-Demand Emergency Response Headquarters (then):

- Restoration and launch of thermal power stations (including joint stations and IPP)
- Construction and addition of thermal power stations
- Installation of emergency power supply equipment (such as gas turbines)
- Increase of interconnection lines between western and eastern Japan.
- Promoting the introduction of renewable energy sources
- Promoting the introduction of decentralized generation plants

In the mid to long term perspective on the demand side, a reduction of total demand, rather than curving peak-demand, and accelerating introduction and dissemination of technologies to increase energy efficiency is essential. However, behavioural changes to save energy may actually be the most important in the short term as well as in the long term. The industrial sector has established a voluntary action plan to save energy through its member organization Keidanren and individual companies also introducing measures to save energy. The Tokyo metropolitan government has introduced summertime working hours, and the government has proclaimed a further relaxed dress code "super cool biz", i.e. encouraging employees to, for instance, use short sleeve shirts. Individual households are also encouraged to save energy and energy savings are frequently discussed in media. The follow-up in detail on the various measures introduced will be reported elsewhere, but are in our opinion relevant as a possible inspiration for Sweden and other countries.

The series of incidences surrounding energy generation and electricity supply are already influencing existing policies and spurring discussions for change of basic stance. The Basic Plan for Energy announced in June 2010 stating nuclear power to consist 50 per cent of the electricity supply by 2030, is to be re-evaluated. Prime Minister Naoto Kan has reiterated the government intention on May 11, to redraft the Basic Energy Plan from scratch focusing more on renewable energies and establishment of an energy conserving society, though stating to continue the use of nuclear energy, ref 18. The reviewing process of the nuclear strategy, which was in progress, was officially stopped on April 5. The review of the New Growth Strategy where energy strategies place a part, established in June 2010 is also to start by the end of May and to finalize the suggestions by the end of the year.

Beginning of May, Prime Minister Naoto Kan called to halt the operations of Chubu Electric's Hamaoka Nuclear Plant (NP) in central Japan, intact from the disaster in March, until it can be better defended against a major tsunami. In response to this non-legally binding request, Chubu electric reluctantly agreed to make a shut down of the two reactors in operation on May 9. The Hamaoka NP has been controversial for long, as it was discovered to be situated on a major fault line, and the probability of a magnitude-6.0-earthquake near Hamaoka NP is 84 per cent within 30 years. The probability of earthquakes at other nuclear plants is much less and the request to halt operation will not be extended to other plants. However, the Nuclear Safety Law allows nuclear reactors to operate only for 13 months before commencing safety inspection for two to three months or more. As of June 35 reactors are off the grid and in March 2012, all 54 reactors may be off the grid. The Prime Minister's action may make prefectural governors who has a veto right, hesitant to give approval, for resuming operations of reactors coming off from maintenance. This may lead to further discontinued operation of nuclear power plants and further power shortage. Government officials are now holding talks with governors concerning this issue.

Though differing in natural environment (weather, seismic conditions etc.), supply capacity loss due to halt of nuclear, thermal or other power plants for any reason is a possibility also for Sweden. How Japan has and will handle the situation, e.g. how is the capacity loss compensated for, what policy tools are used, and to what extent society voluntarily can save on energy use, these questions and others can provide valuable learning experiences. Additionally, from a demand perspective, in the reconstruction phase with a possible shift to other energy sources, we argue that Swedish experience may contribute to the rebuilding of the devastated regions of Japan. One notable technology and Swedish expertise is district heating, including aspects connected to utilization of biomass. Interest for an increased utilization of biomass is now steadily increasing in Japan.

4 Disruption of Supply Chains

Japan is a power-house for high precision technological products, and a global leader in the automotive and electronics industry. Many countries also rely on a secure and robust Japan feeding into the global supply chain. The manufacturing industry has led the Japanese economy and is been responsible for 90 per cent of Japan's exports, ref 20.

The March 11 disaster hit the Japanese manufacturing industry hard and it has been claimed that this disruption of industrial supply chain is perhaps the most severe in recent history. The disaster-affected area is a world-wide hub and major source for parts to the manufacturing industry. The world's manufacturing industries, at least until now, have been supported by closely-knit supply chain networks connecting an enormous number of companies. This system is in turn dependent on a well-oiled transport and logistics network. The hub in Tohoku and northern Kanto regions is one of the explanations to why Japan has been able to maintain its place as one of the world's centers for advanced manufacturing – so much critical parts suppliers has been concentrated in this region and the tight relations between companies has been a competitive advantage. In a way, the disruption of the global supply chain caused by the disaster has shown the backside of the famous Japanese paradigms on lean manufacturing, the “Kanban” or just-in-time production, and the tight supply chains that has inspired companies all around the world, ref 21.

Not only was the electronic industry and automotive industry hit hard. Also the chemical industry was hit, whose refineries often lies close to the coast for easy access to deliver crude oil.

4.1 A fast, and not so fast, recovery for the supply chain

The Japanese production machine has already been re-started to a large extent and already this short time after the natural disaster many affected factories have resumed normal or close to normal operation, see ref 22, from a survey done by METI, the Ministry of Economy, Trade and Industry. Lessons from the Kobe earthquake of 1995, where industrial recovery was fast have demonstrated the high level of cooperation - both in-between Japanese companies themselves and between employees and employers - that extreme situations can create. Still, as will be shown, several manufacturers of critical materials, components and systems have been hit hard and will need time to recover.

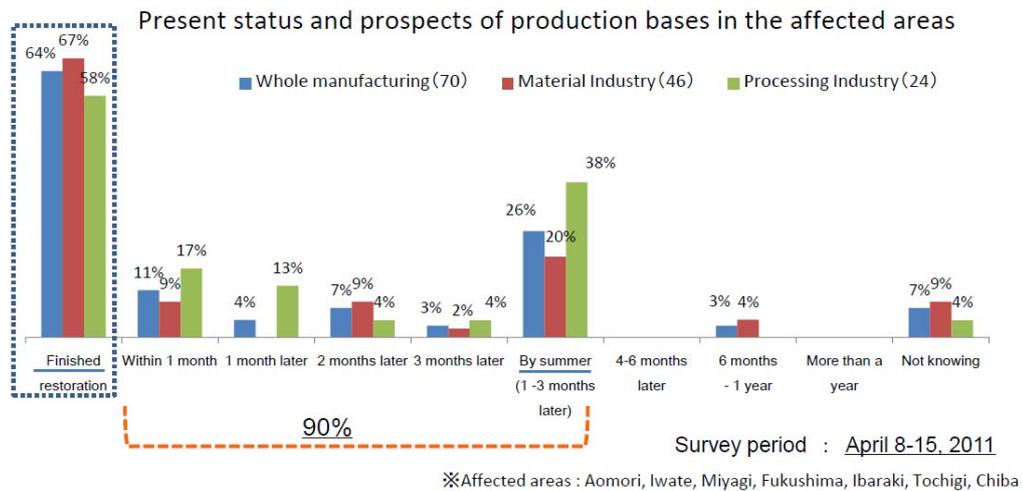


Figure 3: Present status, as of May 30, of recovery of manufacturing production basis. Source: ref 22,

4.1.1 Automotive industry

The earthquake and the tsunami caused widespread damage to the automotive industry in several ways:

1. Destruction of factories and car dealer showrooms.
2. Loss of stock of new cars and spare parts
3. Loss of production due to damaged infrastructure

The top three automobile makers in Japan, Toyota, Honda and Nissan, had to close some factories until late March to the beginning of April (see the figure below for the location of factories of Japanese automobile makers). Though they are gradually restarting production, capacity has been more than 50 per cent less than they had before the earthquake. In addition, it would take another two months (until the end of June) to catch up with back order which was signed before 11th March, ref 23.

All these three have reported significant disruptions to production with large losses as a result. Losses are estimated by Thomson Reuters to 12 billion SEK for Toyota and 6 billion SEK for Nissan in the second quarter of 2011. Lost opportunities are always hard to evaluate – for example Honda has warned its U.S. dealers that the available volumes for the key model Civic Compact will be limited throughout summer. There is also a risk of disruptions leading the three car makers to temporarily lose focus on the Chinese market where they already are behind for example General Motors.

4.1.2 Actions taken and future forecast of Japan automobile industry

Furthermore, the negative effects were not limited to Japan, but extended worldwide. For instance, Toyota announced the temporary close down of thirteen factories in the US as countermeasures for the shortage of parts, Nissan stopped production for around a week in a few factories in the US and Mexico, and Honda temporarily suspended production in the US and mentioned possible halt in production in the UK. As a result, Toyota decreased domestic volume of manufacture by 63 per cent in March than the corresponding period of previous year; Honda, 63 per cent; Nissan, 52 per cent, ref 24. However, this stated, it is now becoming clear that recovery will be faster than expected. Honda will likely have its domestic production nearly back to normal in July, much sooner than expected. Toyota Motor Corp. will have output nearly back to normal this month, as will Nissan Motor Co., and is seeking to increase production capacity from September, see ref. 25.

Still worrying factors remain, for instance a dampened consumer patterns following the quake. Total new-car sales in March decreased by 37 per cent compared to the same period a year ago. Moreover, Toyoda new-car sales dropped by 46 per cent, ref 24.

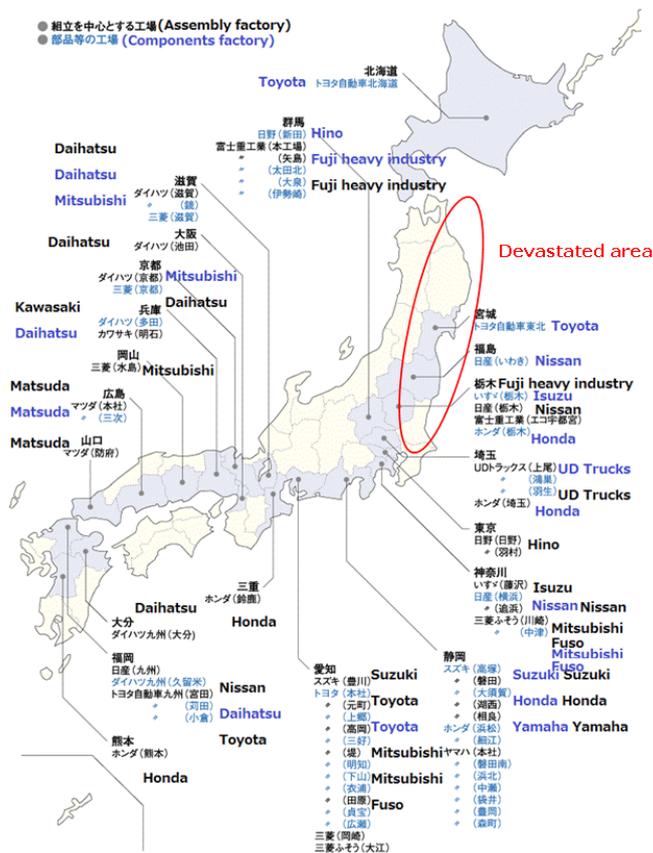


Figure 4: Distribution map of Japanese automobile factories (Copyright (C) ref 19 (Edited by Office of Science and Innovation))

A plunge in domestic demand for new-car and unstable commodity supply might cause other problems for Japan such as the loss of competitiveness of Japanese automotive industry. Reuters announced that Toyota would lose its fame as top leading automobile industry and back down to the third position in global new-car sales in 2011 following to General Motors and Volkswagen, ref 24. Hence, a consequence, positive or negative as seen from outside Japan, may be a shift in the automotive industry away from Japan.

4.1.3 ICT - Electronic components and bottleneck of products

The Japanese ICT and Electronic Industry produce key components and subsystems for products world-wide. Many manufacturers were hit by the earthquake and the tsunami. For instance, with companies Shin-etsu, MEMC and SUMCO having an over 70 per cent share of the world market for Silicon wafers for the electronics, it was estimated that 27 per cent of the global capacity for semiconductor wafer production was halted, for a summary on the effect on the semiconductor industry see, ref 26.

A particular case, highlighted by media, Renesas Electronics Corporation, who has a 42 per cent world market share for microcontrollers for the automotive industry had to stop production lines in its eight different factories in the northeastern part of Japan. Especially, the Naka factory in Ibaraki prefecture got severe damage to the wafer fabrication process lines by the earthquakes. The Naka factory stands for 20 per cent of Renesas production of microcontrollers and for 10 per cent system of the on-chip devices for mobile phones, ref 27. This was early on projected to cause major disruptions world-wide, and will indeed be troublesome. Still, recovery has been faster than expected. On May 11 all damaged factories had already restarted production except the Naka factory, and the production lines at Naka factory was restarted early in June, albeit at a reduced production capacity. Renesas will seek to reach back to normal production volume in October, ref 28. However, electronic chip production takes time, and current stocks of chips will be limited after June, hence further disruptions to the supply chain are to be expected.

Furthermore, as a source in UD Truck part of Volvo Trucks, stated it is not that easy to identify what is the real bottleneck of a product, especially in case of automobiles, because of the huge amount of components in a vehicle: twenty or thirty thousand components. The company may be obtaining a unit for their automobiles from a one supplier in Japan or another country, this unit in turn uses a sub-unit manufactured in yet a different country, and so forth, making the tracking of bottlenecks very difficult, ref 29.

4.2 Conclusion: Just-in-time production slowly back on line

The disaster has reminded the world how important Japan still is in the global supply chain. Global Automotive makers have been especially affected, because both of tight inventory management, the “Kanban” or just-in-time production system, a high proportion of vehicle electronics and the electronics industry being affected, but also because many chemical products, e.g. rubber products and plastics used in the automotive or other industries are made in Japan. Still, as has been shown, given the extent of overall destruction, the recovery has been faster than expected, and the world-wide long term consequences is expected to be less severe than initially thought. This may not be the case so for the Japanese automotive makers because of loss of market share and momentum.

A probable outcome of the crisis will be a change in the thinking of companies globally when it comes to diversifying component sourcing geographically as well as developing second source supply. This will mean that we will see more of distribution of suppliers and/or different manufacturing sites around the world. For policy makers this potential redistribution of global manufacturing is relevant to be aware of.

Relevant follow-ups, mainly for the industrial community is a sensitivity analysis for how resilient regional manufacturing is for major disruptions, from where alternative supplies can be obtained in an emergency, and with respect for industrial policy to what extent supply chain disruptions also could have societal consequences in the form of industries moving out from an affected region, leaving a double-blow to the long term recovery.

5 Economic impact of the disaster

We should distinguish between the primary, and relatively short-term, effects from this catastrophe which includes the immediate damage in the disaster area in north-eastern Japan, and the secondary and often more long-term impact on the economy. Some long-term effects like the possible deterioration of the Japan national brand could turn out to be the most grave, but also the hardest to speculate on. The events should also be seen in the light of two decades of weak Japanese performance with identified problems like lag in globalization, low productivity in the service sector, and inflexible labor market. Chronic budget deficits pushed up gross public debt to an unprecedented 200 per cent of GDP, and net debt to 115 per cent in 2011 (see figure 5).

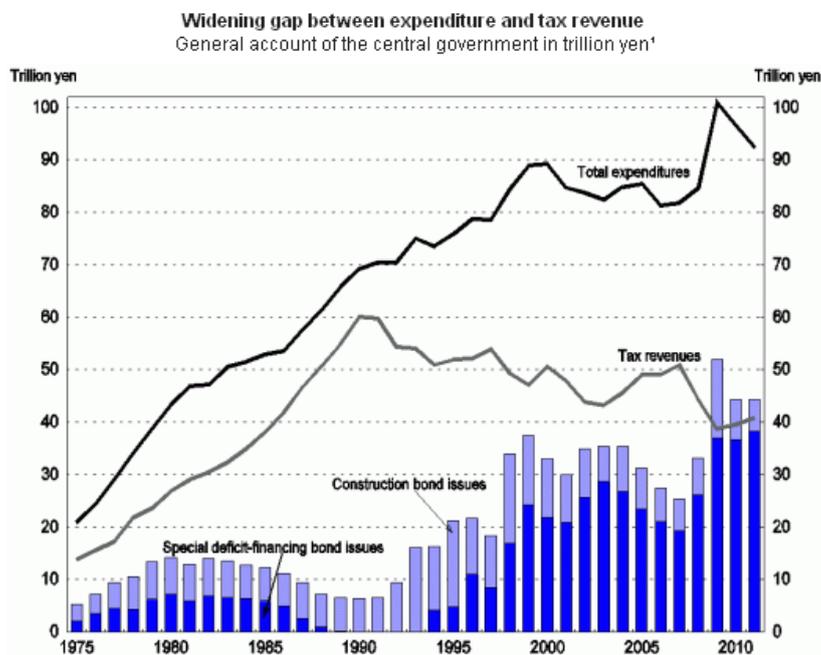


Figure 5: The final budget for FY 1975-2009; the revised budget for FY 2010; and the initial budget for FY 2011. Source: ref 30

5.1 Short-term economic impact

Electricity supply is emerging as the biggest problem for the economic recovery of Japan in the short term. One of the biggest issues in the future in addition to monitoring and remediation of Fukushima Daiichi is the availability of electricity in the country, as mentioned in chapter 3. The impact on reconstruction and the economy from a wider scope because of problems with electricity supply and/or high electricity prices are difficult to estimate but serious. Production capacity among the power companies fell sharply after the closure of the Fukushima. This is also because of the temporary shutdown of other nuclear power plants and extensive damage to the electricity grid. Currently, power outages are minimized thanks to the self-imposed measures for energy efficiency of homes and businesses. TEPCO has also faster than anticipated been able to force back alternative facilities and gradually been able to compensate for about half of the lost capacity. But during the high temperatures in July and August, which normally increase the need for

electricity with 10-15 GW, the situation will be strained even further. If electricity prices surge because of public opinion against Japan's dependence on nuclear power, this could turn into a long-term issue for the economy.

5.2 Long-term economic impact

The consequences for Japan's economy following the earthquake seem to be more far-reaching and damaging than initially thought. Not least in terms of the production and supply line disruptions due to lack of electricity supply. Japan's industrial production fell by as much as 15 per cent in March, and growth forecasts are from several directions revised down considerably for 2011. The Bank of Japan recently released its yearly growth forecast, which shows an estimated growth rate of just 0.6 per cent for 2011. At the same time the Bank of Japan says that growth for 2012 will be better than previously expected due to the stimulation of domestic demand coming as a result of the re-building after the earthquake.

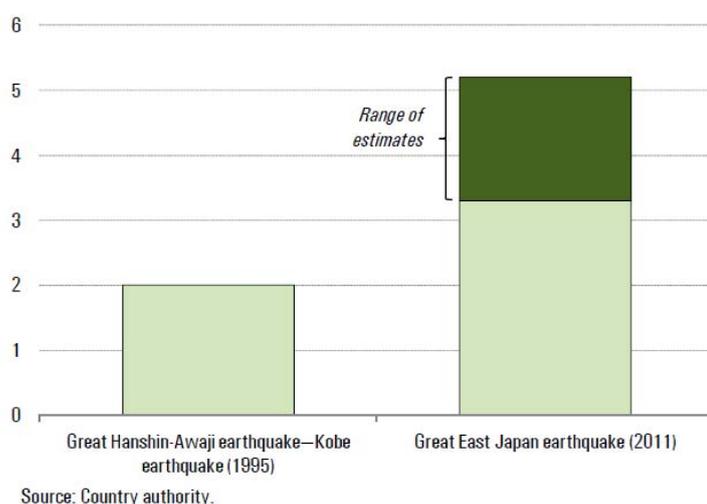


Figure 6: Official Estimate of Damage to Capital Stock following 1995 and 2011 Earthquakes in unit of per cent of GDP. Source: ref 31

The parliament has approved a supplementary budget of around 270 billion SEK (4 trillion JPY) to finance the first reconstruction phase following the earthquake. The final cost of repairing the damage from the disaster is estimated to be around six times as much, estimates range from in between 16 to 25 trillion JPY. If this becomes reality, the natural disaster in Japan March 11, 2011 will become the most costly up to this date in history. Estimates by IMF of damage to Japan's capital stock are 3 to 5 per cent of gross domestic product, or roughly twice that suffered due to the 1995 Kobe earthquake. This figure however does not account for the effects of possible power shortages and ongoing risks associated with the crisis at the Fukushima Daiichi nuclear power plant, ref 31.

It is hard not to make some comparisons to Japan's previous large earthquake - the Great Hanshin-Awaji (Kobe) earthquake in January 1995 - and its rebuilding efforts then. In the case of the Kobe earthquake, industrial production declined by 3 per cent in the first month after the earthquake but rebounded quickly, and reached pre-earthquake levels within one quarter. Reconstruction led to an investment boom and, as employment rose and confidence strengthened. There are unfortunately several differences. Initial estimates of the damage to infrastructure are about twice as large (see Figure 6). The Kanto-region around Tokyo represents a much larger economic activity - around 40 per cent of GDP -

and if these regions continue to be affected by electricity supply shortages the economic effects will be large. As shown in chapter 4, the hardest hit Tohoku-region hosted many key component suppliers in the area, especially in electronics and automobiles which indicates larger disruptions. Also the Japanese macroeconomic situation is graver today than in 1995, giving the politicians less policy flexibility.

The Japanese government has promised compensation to affected farmers and is expected to also take a major responsibility for the restoration of flooded crop fields. It is speculated whether increased state control over agriculture could open the reform of the closed Japanese agricultural market. This could be a catalyzing factor for connecting Japan to the Trans-Pacific Partnership (TPP) where extensive liberalization of agriculture is one of the crucial issues. The TPP agreement is a multilateral free trade agreement that aims to integrate the economies of the Asia-Pacific region.

A quick recovery of Japan has been seen with interest also among its immediate neighbors. The trade ministers of Japan, China and South Korea has in trilateral meetings affirmed the need to step up efforts to swiftly conclude negotiations for a trilateral pact to facilitate investment. In a joint statement the three trade ministers acknowledged that the earthquake has disrupted supply chains across the three countries and globally, and that Japan's recovery is "in the interests of all the three countries." At the same time the hasty reactions and import restrictions from Japan's neighbors with regards to Japanese farming and other imports has been seen with great worry by the Japanese government. These restrictions were put in place triggered by radiation fears after the ongoing crisis at the Fukushima Daiichi power plant.

What the affected Tohoku region need now is more young workers and consumers, more investments, and less red-tape. Many outspoken liberal commentators both in Japan, ref 32, and abroad, ref 33, argue that the catastrophe area of north-east Japan could and should quickly turned into a test bed for opening up the Japanese economy. The already existing in Japan but scarcely used policy tool of special economic zones (or in Japanese *doushu-sei*) could be helpful.

Already in the relief and rebuilding work many current bureaucratic practices has been highlighted as cost-increasing barriers - for example for importing cheap timber to be used for rebuilding homes. It has rightfully been pointed out that developing countries worldwide has been successful in using special economic zones as boosters for specific regions but then the experiences from these regions have in fact helped transform national government. Arguably China's experiment in the Shenzhen region in the 1980s was a fundamental building block in its way to its present capitalism. Special conditions to be considered for a "Tohoku Special Economic Zone" would be a lowered company tax (now 40 per cent in Japan) and free-trade status to waiver restraints on Tohoku's imports and exports. In theory positive experiences from an experiment in Tohoku could lead to a more comprehensive tax-reform and simplification in corporate regulation for the benefit of whole Japan.

As for major changes in Japanese migration policy – despite a “super-aged society” that most hardly affects relatively rural areas like Tohoku - that would be a harder deal to sell to the public. There is simply no support or enough sense of urgency to add this to policy at the moment.

5.3 Conclusion: coming out from the crisis within a crisis

The economic results for the Japanese triple-catastrophe are mainly felt outside Japanese borders through trade channels with an emphasis on the supply side. Looking at Japan's neighbors inputs from Japan account for about 10–15 per cent of the value added produced in some Asian economies, including Malaysia, Thailand, and Taiwan, ref 31.

Over a long time horizon, a switch away from Japan to alternative suppliers is a possibility. This is however over a longer time horizon offset by Japan's status as a highly specialized supplier of electronic components and capital goods. If more prolonged disruptions to production in Japan happen, this could eventually affect other economies along the global supply chain, in particular those industries where Japanese supplies constitute a significant share of global supply, such as advanced materials (e.g., silicon wafers for microchips). For Japan, even if as shown in Chapter 4, recovery seems to progress faster than expected, there may be a need for an assessment if the long term industrial competitiveness of Japan has been affected or not. In 2010, the Industrial Structure Council of METI- the Ministry of Economy, Trade and Industry presented an industrial structure vision to clarify how to strengthen Japan's weakening competitiveness. In the light of the March 11 Earthquake, the Industrial Competitiveness Committee, will again be reconvened what are policies necessary for the recovery, ref 34. The March 11 disaster is, according to METI a "crisis within a crisis". A severe fiscal situation and Japan sliding in competitiveness is not really improved by the country being exposed to one of the worst natural disasters in history.

This stated, while disasters reduce economic activity in the short run, subsequent reconstruction efforts tend to boost output growth. And every large-scale disaster can cause a reexamination of laws, policies and procedures. Simplification of regulations and continuous rethinking on what policy practices that creates sustainable growth will be relevant for Japan. If some of the "unorthodox" measures discussed above, e.g. special economic zones, materializes it could be of great interest to follow up outcomes in the coming years.

Japan's financial system historically has skewed toward bank lending to big business at the expense of entrepreneurs and small to medium-sized enterprise (SMEs), the largest source of job creation. Many small business owners and entrepreneurs must rely on personal savings to fund their companies or bring new ideas to market. Hence SMEs are very hardly hit by the triple earthquake/tsunami/nuclear accident. There are now, starting in May, an arsenal of special actions taken such as regional loan programs, safety-net loans to avoid bankruptcies, and support to loan agencies that could improve the situation for affected SMEs, see ref 35 from METI for a summary. Time will tell if the Japanese government then can encourage both foreign and domestic private capital to smaller and medium-sized firms more broadly to reduce the sector's reliance on loans.

6 References:

1. Prime Minister Naoto Kan, 4:55 PM, March 11, Statement to the People of Japan, http://www.kantei.go.jp/foreign/kan/statement/201103/11kishahappyo_e.html
2. Japan Meteorological Agency portal for the March 11 disaster: http://www.jma.go.jp/jma/en/2011_Earthquake.html (Last access May 27)
3. The Japan Cabinet Office Home page for the disaster management <http://www.kantei.go.jp/foreign/incident/> (Last access May 27)
4. The Government Reconstruction Design Council, official homepage <http://www.cas.go.jp/jp/fukkou/english/index.html>
5. NTT, (2011), “Restoration Status for Damage Caused by the Great East Japan Earthquake and Future Responses”, <http://www.nttdocomo.com/pr/2011/001523.html?x=35&y=16> Last accessed 16 May 2011
6. NTT Docomo, 2011, “Measures against disasters”, http://www.nttdocomo.co.jp/corporate/ir/binary/pdf/library/presentation/110428/noffice_110428-2.pdf Last accessed 17 May 2011
7. Ministry of Economy, Trade and Industry Homepage for the earthquake measures: <http://www.meti.go.jp/english/earthquake/index.html> (Last access May 27)
8. IAEA fact finding mission to Japan, preliminary statement June 1, <http://www.iaea.org/newscenter/focus/fukushima/missionsummary010611.pdf>
9. Japanese government detailed report in response to the IAEA mission: http://www.kantei.go.jp/foreign/kan/topics/201106/iaea_houkokusho_e.html
10. VGB Powertech Presentation on the Fukushima Incident, <http://www.vgb.org/>
11. Prof. Shozo Kaneko, University of Tokyo, Presentation for EU Science Counsellors, May 13, 2011.
12. U.S. Energy Information Administration (2011), “Japan Energy Data, : available <http://www.eia.doe.gov/cabs/Japan/Full.html>
13. Toichi, Tsutomu, (2011), “East Japan Great Earthquake and Its Implications for Japan’s Energy Policy,” Seminar with presentation material in Tokyo, April 6 at EU House
14. Toyo Keizai, (2011), “Electricity Shortage (tentative translation),” 30 April- 7 May Edition (in Japanese)
15. Electricity Supply-Demand Emergency Response Headquarters, (2011). Material from 8 April meeting, available (English) http://www.meti.go.jp/english/earthquake/electricity/pdf/20110408material_1.pdf
16. Electricity Supply-Demand Emergency Response Headquarters, (2011). Material from 13 May meeting, available http://www.meti.go.jp/english/earthquake/electricity/pdf/20110513full_report.pdf
17. Nikkei, (2011), “Government targets 15 per cent reduction in power usage but firms aiming higher,” 2 May, available <http://e.nikkei.com/e/ac/20110502/TNW/Nni20110502FR8ELEC0.htm?NS-query=15%25>
18. NY Times, (2011), “Japan to Cancel Plan to Build More Nuclear Plants,” 10 May, available http://www.nytimes.com/2011/05/11/world/asia/11japan.html?_r=2&ref=global-home
19. Ogimoto, Kazuhiko, (2011), “Future Energy demand and supply- energy integration-,” Seminar with presentation Material in:Tokyo, 25 May at University of Tokyo.

20. METI Measures and Requests in response to the Great East Japan Earthquake (2011), <http://www.meti.go.jp/english/earthquake/recovery/index.html>
21. Fujita, Masahisa (2011), Post-Quake Restoration Policy for East Japan from the Viewpoint of Spatial Economics, Column based on the original Japanese article contributed to and published in the "Keizai kyoshitsu" column in the March 30, 2011 issue of the Nihon Keizai Shimbun
http://www.rieti.go.jp/en/rieti_report/129.html
22. Ministry of Economy Trade and Industry, (2010), Japan's Manufacturing Industry, http://www.meti.go.jp/english/policy/mono_info_service/overall/overview.pdf, Last accessed 17 May
23. Car link (Automobile Industry management info site), (2011), "Management column", Available: <http://www.carlink.jp/fc/column/> Last Accessed: May 6, 2011
24. Automobile info net (自動車情報ネット), (2011), "Automobile news" or Available: xn--hhrq8jhuixy9a5pn.net, <http://自動車情報.net/category/car-new> (in Japanese) Last Accessed: May 6, 2011
25. "Carmakers, Autoparts Firms Put Pedal To Metal To Resume Output", Nihon Keiza Shimbun, June 2, 2011.
26. A summary on the effect on the semiconductor manufacturing industry can be found here: <http://www.semiconportal.com/en/quake/>
27. Press release Renesas, March 28,
<http://www.renesas.com/press/notices/notice20110328b.html>
28. Renesas, 2011, News Release,
<http://www.renesas.com/press/news/2011/news20110511.jsp> Last accessed June 6.
29. Interview: Manager of UD Truck, 2011-05-09
30. Ministry of Finance, "The final budget for FY 1975-2009; the revised budget for FY 2010; and the initial budget for FY 2011", Available:
http://www.oecd.org/document/11/0,3746,en_2649_37443_47651390_1_1_1_37443,00.html, accessed: May 12, 2011
31. IMF, (2011), Regional Economic Outlook, April 2011: Asia and Pacific - Managing the Next Phase of Growth
32. Ota, Hiroko, (2011), "Japan's post-disaster economy", Seminar with presentation material in Tokyo, April 27 briefing at Foreign Press Center Japan, Tokyo
33. The Economist, (2011), "A good place to start", April 20. Available:
http://www.economist.com/node/18586786?story_id=1858678&fsrc=rss Last accessed: May 12, 2011.
34. METI: Industrial Competiveness Council, to be reconvened again (accessed May 31): http://www.meti.go.jp/english/press/2011/0531_08.html
35. METI Small and Medium Enterprise support in response to the March 11 Earthquake (accessed May 31)
<http://www.meti.go.jp/english/earthquake/business/index.html>

The Swedish Agency for Growth Policy Analysis (Growth Analysis) is a cross-border organisation with 60 employees. The main office is located in Östersund, Sweden, but activities are also conducted in Stockholm, Brasilia, Brussels, New Delhi, Beijing, Tokyo and Washington, D.C.

Growth Analysis is responsible for growth policy evaluations and analyses and thereby contributes to:

- stronger Swedish competitiveness and the establishment of conditions for job creation in more and growing companies
- development capacity throughout Sweden with stronger local and regional competitiveness, sustainable growth and sustainable regional development.

The premise is to form a policy where growth and sustainable development go hand in hand. The primary mission is specified in the Government directives and appropriations documents. These state that the Agency shall:

- work with market awareness and policy intelligence and spread knowledge regarding trends and growth policy
- conduct analyses and evaluations that contribute to removing barriers to growth
- conduct system evaluations that facilitate prioritisation and efficiency enhancement of the emphasis and design of growth policy
- be responsible for the production, development and distribution of official statistics, facts from databases and accessibility analyses.

About the Working paper/Memorandum series:

Some examples of publications in the series are method reasoning, interim reports and evidential reports.

Other series:

Report series – Growth Analysis' main channels for publications.

Statistics series – continuous statistical production.

Svar Direkt [Direct Response] – assignments that are to be presented on short notice.