


| Item | Sub-item | Information   | Data Source |
|------|----------|---|-------------|
|      |          | <p>Recovery, Rehabilitation and Reconstruction:</p>  |             |

#### 4) 2011 年 東日本大震災

| Item           | Sub-item                    | Information  | Data Source           |
|----------------|-----------------------------|--|-----------------------|
| Data on Hazard | Date and Time of Occurrence | 2:46PM, March 11, 2011(JST), 05:46 (UTC)   | JMA                   |
|                | Magnitude Depth             | Mw. 9.0, Mj 8.4, 24 km (JMA)<br>M.9.0 (USGS)<br>Mw 8.8, 23.7 km (Univ. of Tokyo)                         | JMA<br>USGS<br>ERI-UT |
|                | Epicenter                   | N38.1, E142.9 (130km ESE off Oshika Peninsula)<br>Off Pacific Coast of Tohoku (North East) Region, Japan | JMA                   |
|                | Intensity of Shaking        | JMA Intensity scale:7,<br>Max. Ground Acceleration: 2933gal  | JMA<br>K-NET          |

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|---|--------------------------------|---|-----------------------------------|-------------------|--------------------|---|----------|-----------|
|   | Ground Motion                  | A strong ground acceleration of over 2933 cm/s/s was observed in K-NET Tsukidate observation station (Miyagi pref.) near the hypocenter, and the strong ground acceleration propagated in broad area. According to the distribution of ground displacement, there was a major ground motion of maximum above 50cm from Tohoku to Kanto area. Especially in Sendai plain there was a huge ground displacement of more than 100cm.  | ERI-UT                            |                   |                    |   |          |           |
|   | Tsunami (maximum height)       | <table><tr><td>Northern part of Tohoku (Sanriku)</td><td>average about 15m</td><td>max more than 30 m</td></tr><tr><td>Southern part of Tohoku (South of Sendai, Ibaraki, Chiba)</td><td>about 5m</td><td>about 10m</td></tr></table>   | Northern part of Tohoku (Sanriku) | average about 15m | max more than 30 m | Southern part of Tohoku (South of Sendai, Ibaraki, Chiba) | about 5m | about 10m |
| Northern part of Tohoku (Sanriku)                         | average about 15m              | max more than 30 m  |                                   |                   |                    |   |          |           |
| Southern part of Tohoku (South of Sendai, Ibaraki, Chiba) | about 5m                       | about 10m   |                                   |                   |                    |   |          |           |
| Data on Damages   | Major Affected Area            | Pacific coast of the Tohoku area - Boso Peninsula (Near Tokyo)  | -                                 |                   |                    |   |          |           |
|   | Human Damage                   | Dead: 15,845<br>Missing: 3,380<br>Injured: 5,894  | NPA (Jan.20, 2012)                |                   |                    |   |          |           |
|   | Damage of Buildings            | Complete destruction: 128,471 houses<br>Partial destruction: 242,309 houses<br>Partial damage: 662,514 houses<br>Fully/partial burned: 281 houses   | NPA (Jan.20, 2012)                |                   |                    |   |          |           |
|   | Infrastructure/Lifeline Damage | Road<br>- Highway: 979 km (closed to traffic)<br>- National Road: 1,119 km (closed to traffic)<br>Railway<br>- Shinkansen: 990 km (Stop Operation)<br>- Main lines: 1,012 km (Stop Operation)<br>Major Port: 15 Port<br>Airport: 13 Airport<br>Electricity: 2.6 million houses power outages (Mar. 12)<br>Water Supply: 1.8 million houses out of water supply (Mar. 16) in 19 Prefectures<br>Sewage System: 48 waste water treatment plants and 78 pumping stations stop operation in 7 prefectures.<br>Gas<br>- piped: 420,000 houses out of supply<br>- supply by cylinders: 1,660,000 houses out of supply<br>Telephone:<br>- Land line 1 million lines stop operation<br>- Cell phone 14,800 base-station stop operation | CAO1                              |                   |                    |   |          |           |
|   | Main Damage Cause              | Most of human and physical damages were caused by the tsunami. More than 90% death and missing were killed by the tsunami (drowning).<br>It is difficult to identify or distinguish the damages by the earthquake in the tsunami affected area, however according to the surveys conducted by the some research team (e.g. Architectural Association), not many buildings were severely damaged by the earthquake.  | SC                                |                   |                    |   |          |           |
|   |                                |   |                                   |                   |                    |   |          |           |

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|      | Characteristics of Damages (Physical/Social Aspects) | <p>Majority of human casualties were caused by the tsunami. Though death and missing were reached almost 20 thousands, amount of injured people of 3,300 was very small, and it would be a typical characteristic of the tsunami disaster.</p> <p>The majority of the building damages were also caused by the tsunami while many of collapsed houses were found and certain amount of damages by earthquake was recognized in some inland areas.</p> <p>Many of damaged building were constructed before the enforcement of new building codes which was enforced in 1981.</p> <p>Damaged to the infrastructures were also limited. Effects of the retrofitting were observed.</p> <p>Factories in the disaster area were kept stop operation for a while and it affected the global "supply chain" (especially parts production to car industry), and eventually it affected to the global industry and economy.</p> <p>Nuclear power plant located on the pacific coast was damaged by the tsunami and totally lost power supply. Due to this power failure, reactors were uncontrolled and damaged. A radiation leaked to the atmosphere and it caused nuclear disaster.</p> <p>Negative impact to the nation's economy by shortage of electricity due to power plant failure. Wide range and complexity damage characteristics</p> | SC Sangiin  |
|      | Direct Economic Loss                                 | <p>Total: about 16.9 trillion yen</p> <p>Buildings (House, Shop, Office, Factory, etc.): about 10.4 trillion yen</p> <p>Lifelines (Water, Gas, Electricity, Telephone, etc.): about 4.3 trillion yen</p> <p>Infrastructures (Road, River, Port, Airport, etc.): about 2.2 trillion yen</p> <p>Agriculture, Forest and Fishery about 1.9 trillion yen</p> <p>Others (School, Gov office, Hospital, etc.): about 2.5 trillion yen</p> <p>(1 trillion yen = 12.5 billion USD)</p>  | CAO2        |

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|                    | Lessons Learned                           | <p>&lt;Gap between pre-disaster assumption and the actual hazards&gt;</p> <p>Because the actual earthquake and tsunami differed from the assumptions, the tsunami height and extent, and the inundation area exceeded expected levels. The estimated inundation area was used for disaster management material including hazard maps. It is possible that the hazard maps that were prepared based on the pre-disaster hazard assumptions lead to providing false sense of security to people, and that the tsunami that exceeded these assumptions led to an expansion of the damage.</p> <p>In such situation, some school students evacuated to the safer place than that of designated place on their own decision, and this shows the good example of disaster education and proper risk communication.</p> <p>&lt;Damage to structures&gt;</p> <p>Looking at the structure measures, while these are effective against tsunamis with tsunami heights within the scope of their design, the massive tsunami and colossal damage witnessed during this disaster exposed the limitations of disaster management measures that rely on coastal protection facilities to an excessive degree.</p> <p>&lt;Under-estimation of the first tsunami warning and its effects&gt;</p> <p>The estimation of earthquake magnitude and the tsunami height by JMA immediately after the earthquake vastly underestimated, and the size of the earthquake and the tsunami warnings were subsequently repeatedly revised upwards over time. It is considered that the impact of the initial tsunami height prediction was particularly great, and it is possible that the evacuation actions of residents and volunteer fire fighters were blunted by the initial tsunami warning, leading to expansion of damage incurred.</p> <p>&lt;Disaster Management Measures&gt;</p> <p>As damages by the disaster greatly exceeding the damage estimate, the former principles for hazard assumption need to be fundamentally reviewed and the disaster management measures have to be rebuilt.</p> | SC          |
| Emergency Response | Rescue activities                         | <p>Rescue activities were carried out mainly by police, firefighter, coast guard and Self Defense Force (SDF). As for the SDF case, about 107,000 personnel were dispatched for SAR and other emergency operation activities.</p> <p>As a result of the efforts, about 27,000 people were rescued.</p>  | CAO2        |
|                    | Medical services                          | <p>DMAT (Disaster Medical Assistance Team): Total of 193 teams were dispatched and provided medical service for about 2 weeks.</p> <p>Other Medical Team: Total of 2,656 teams (12,264 members) from medical association, Red Cross, national hospitals, medical volunteers, etc. provided emergency medical services. In addition to the emergency medical care, some teams have being provided mental care for the disaster victims.</p> <p>Also received medical teams from four countries.</p>  | CAO2        |
|                    | Evacuation shelter                        | <p>Public facilities e.g. schools, community centers, public gymnasium were played as evacuation shelter and most of them were designated as shelters.</p> <p>3 days after the disaster event, about 470 thousand people were kept evacuate in more than 2,100 shelters.</p>  | CAS recon1  |
|                    | Food, water and other relief goods supply | <p>Foods and other relief goods were supplied by the central government, local government and others (NGO, other institutions, etc.)</p> <p>Central government provided 26.2 million meals and 7.9 million water bottles for evacuees during 2 months and a half from the disaster.</p>   | CAO2        |

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|          | Information and communication  | <p>To provide the information to the evacuee, the followings were conducted.</p> <ol style="list-style-type: none"> <li>Handbook <ul style="list-style-type: none"> <li>Livelihood support</li> <li>Livelihood and business reconstruction</li> <li>Guide for temporary shelter life</li> </ul> </li> <li>Flyer</li> <li>Special TV and Radio program for evacuees</li> <li>Newsletter through electric media (Internet)</li> </ol> <p>Handbooks and flyers were distributed through not only official channel but also various channels e.g. volunteers (with explanation) and shops.</p>   | CAS         |
|          | Support from Private Companies | <p>Many private companies provided food and relief goods to the evacuated people in their areas of expertise. Logistics for relief goods were also supported by private companies. Private companies donated money for disaster victims.</p> <p>Internet service providers, other website operators and private companies who had intention to contribute to assist disaster victims opened the special site for donation to the public, and donation through the Internet becomes one of the channels for donation.</p>   | wiki        |
|          | Support from abroad            | <p>163 countries and territories and 43 int'l agencies stated assistance. Received rescue team (incl. medical assistance team) from 29 counties, territories and agencies.</p> <p>Received relief goods from 63 counties, territories and agencies. Received donation (money) from 93 counties, territories and agencies and total amount of donation was more than 17.5 billion yen (USD219 million).</p> <p>US military forces provided special support called "Tomodachi Operation" with more than 20,000 military personnel.</p>   | CAO2        |
|          | Lessons Learned                | <p>Based on the lessons learned previous large-scale disasters, mobilization of SDF, DMAT, Tech-Force and other government institutions were rapidly conducted. A principle for emergency road recovery called "Kushinoha sakusen" was contributed to start the early relief activities, and it was effective to supply relief goods to the affected areas.</p> <p>While many collaboration activities were made, supply of relief goods to the affected area was in trouble because the affected areas were too big and roads along the coast were severely damaged by the tsunami.</p>   | SC MILT1    |
| Recovery | Infrastructure/ Lifeline       | <p>Roads and highways were re-opened in two weeks except the sections that bridges were washed away.</p> <p>50% of railways were restored in one month. About 1.5 months after the disaster, Shinkansen was return to the full operation while some main railway lines were still under restoration because some segments were completely washed away and new alignments of the railways have not been decided yet.</p> <p>Electricity: Restored in about 1 week</p> <p>Water Supply: 50% was restored in 1 week and mostly restored in one month</p> <p>Gas: 50% was restored in 3 weeks and mostly restored in 1.5 months</p> <p>Telephone: 50% was restored in 3 days and 90% restored in 2 weeks</p> <p>Note: Lifelines were restored only the areas where not affected by the tsunami. Restoration of lifelines in the areas affected by the tsunami will be done in accordance with the implementation of reconstruction plan.</p> | SC JSCE1    |
|          | Other services                 | N/A  |             |

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|      | Temporary House                | <p>Provided by prefecture government (Subsidized by the central gov.)<br/> Required number of temporary houses: 53,013 (Completed: 52,182 as of end of Dec. 2011)</p> <p>Iwate: Required: 13,984, Completed: 13,984<br/> Miyagi: Required: 22,095, Completed: 22,095<br/> Fukushima: Required: 16,619, Completed: 16,226</p> <p>Start construction: 2 week after disaster<br/> 50% completion: middle of June<br/> More than 90%: middle of Aug.</p>   | CAO2<br>MLIT<br>kasetu |
|      | Disaster Waste/Debris          | <p>The tsunami produced huge amount (about 23 million tons) of disaster waste. The amount of waste is the equivalent to 19 years' waste amount (15.7 million tons) for Miyagi and 11 years' waste amount (4.8 million tons) for Iwate.</p> <p>As of Nov. 2011, about 62% of waste was removed, however, due to limitation of the processing and disposal capacity, progress of waste disposal was not sufficiently progressed. As capacity of waste dumping sites in the disaster affected area is limited, wide area collaboration for waste disposal is being conducted.</p> | CAS<br>debris          |
|      | Finance                        | Since the scale of damage was huge, local governments could not bear the cost for recovery. Therefore, central government allocate contingent budget for recovery by supplementary budget arrangement, and almost all recovery costs will be bared by the central government.  | MIC<br>news1           |
|      | Support from Private Companies | N/A  |                        |
|      | Support from Abroad            | N/A  |                        |
|      | Lessons Learned                | <p>As the measures had been taken in the various sectors such as road, railways and lifeline service providers etc. based on the lessons learned from the past disasters, rapid recovery was made possible.</p> <p>On the other hand, the scale of disaster was huge and affected wide area and sectors including provision of electricity and supply chains, necessity of BCP (Business Continuity Plan) has been strongly emphasized.</p>  | MILT2<br>news2<br>ntt  |

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| Reconstruction | Principles                     | <p>The Reconstruction Design Council in response to the Great East Japan Earthquake prepared the report and seven principles for reconstruction were proposed.</p> <p>(1) For us, the surviving, there is no other starting point for the path to recovery than to remember and honor the many lives that have been lost. Accordingly, we shall record the disaster for eternity, including through the creation of memorial forests and monuments, and we shall have the disaster scientifically analyzed by a broad range of scholars to draw lessons that will be shared with the world and passed down to posterity.</p> <p>(2) Given the vastness and diversity of the disaster region, we shall make community-focused reconstruction the foundation of efforts towards recovery. The national government shall support that reconstruction through general guidelines and institutional design.</p> <p>(3) In order to revive disaster-afflicted Tohoku, we shall pursue forms of recovery and reconstruction that tap into the region's latent strengths and lead to technological innovation. We shall strive to develop this region's socioeconomic potential to lead Japan in the future.</p> <p>(4) While preserving the strong bonds of local residents, we shall construct disaster resilient safe and secure communities and natural energy-powered region.</p> <p>(5) Japan's economy cannot be restored unless the disaster areas are rebuilt. The disaster areas cannot be truly rebuilt unless Japan's economy is restored. Recognizing these facts, we shall simultaneously pursue reconstruction of the afflicted areas and revitalization of the nation.</p> <p>(6) We shall seek an early resolution of the nuclear accidents, and shall devote closer attention to support and recovery efforts for the areas affected by the accidents.</p> <p>(7) All of us living now shall view the disaster as affecting our own lives, and shall pursue reconstruction with a spirit of solidarity and mutual understanding that permeates the entire nation.</p> | recon       |
|                | Key issues                     | N/A   |             |
|                | Organizations                  | <p>National Level: Reconstruction Agency (established in Feb. 2012)</p> <p>Prefecture level:</p> <p style="padding-left: 40px;">Branch office of Reconstruction Agency</p> <p style="padding-left: 40px;">Reconstruction Headquarters of prefectural government</p> <p>City/Town Level:</p> <p style="padding-left: 40px;">Implementing body for reconstruction esp. land use planning</p>  | recon1      |
|                | Finance                        | <p>Since required amount of fund for reconstruction is too large to bear by the local governments. Therefore, central government will directly provide fund to the local governments as well as subsidy to the activities done by local governments.</p> <p>To secure the fund for reconstruction, central government established "Special Tax for Reconstruction" and will raise a "Special Bond for Reconstruction".</p> <p>Reconstruction funds in prefectural level will be prepared and some of reconstruction works will be done using the funds.</p>   | MOF recon3  |
|                | Support from Private Companies | N/A   |             |
|                | Support from abroad            | N/A   |             |

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|      | Reconstruction Schedule                          | <p>Reconstruction of major infrastructures e.g. roads, rivers, transport facilities are being implemented and it planned to be completed in a few years.</p> <p>33 out of 43 cities/towns have already prepared their reconstruction plans.</p> <p>Many of the reconstruction plans have target period of reconstruction with the range of 7 to 10 years, and also set phases of reconstruction e.g. years for recovery, rehabilitation and reconstruction with development.</p> | recon1<br>miyagi<br>kesen<br>rikuzen |
|      | Key Target, featured strategies/ approaches etc. | <p>Key target, strategies and approaches for reconstruction are varied depending on the existing situation of the cities/towns.</p> <p>Some approaches, i.e. "creating a safe city for disasters", "creating a vibrant city", are common in many cases.</p> <p>To create a safe city, especially for avoiding any human land use plans have been prepared by restricting the residents in tsunami affected areas and relocation of village to the high land.</p>                 | recon1<br>miyagi<br>kesen<br>rikuzen |
|      | Economic Recovery                                | N/A (Reconstruction is on progress.)   |                                      |
|      | Other Characteristics                            | N/A  |                                      |
|      | Lessons Learned                                  | N/A (Reconstruction is on progress.)   |                                      |



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|------------|-------------|--|-------------|
| References | Reports     | <p>JMA: <a href="http://www.jma.go.jp/jma/en/2011_Earthquake.html">http://www.jma.go.jp/jma/en/2011_Earthquake.html</a></p> <p>USGS: <a href="http://earthquake.usgs.gov/earthquakes/eqinthenews/2011/usc0001xgp/">http://earthquake.usgs.gov/earthquakes/eqinthenews/2011/usc0001xgp/</a></p> <p>ERI-UT: <a href="http://outreach.eri.u-tokyo.ac.jp/eqvolc/201103_tohoku/eng">http://outreach.eri.u-tokyo.ac.jp/eqvolc/201103_tohoku/eng</a></p> <p>K-NET: <a href="http://www.kyoshin.bosai.go.jp/kyoshin/topics/html20110311144626/main_20110311144626.html">http://www.kyoshin.bosai.go.jp/kyoshin/topics/html20110311144626/main_20110311144626.html</a></p> <p>Joint Survey Group: <a href="http://www.coastal.jp/tsunami2011/">http://www.coastal.jp/tsunami2011/</a></p> <p>NPA: <a href="http://www.npa.go.jp/archive/keibi/biki/index.htm">http://www.npa.go.jp/archive/keibi/biki/index.htm</a></p> <p>CAO1: <a href="http://www.cao.go.jp/shien/2-shien/1-infra.html">http://www.cao.go.jp/shien/2-shien/1-infra.html</a></p> <p>CAO2: <a href="http://www.bousai.go.jp/">http://www.bousai.go.jp/</a></p> <p>Sangiin: <a href="http://www.sangiin.go.jp/japanese/annai/chousa/keizai_prism/backnumber/h23pdf/20119201.pdf">http://www.sangiin.go.jp/japanese/annai/chousa/keizai_prism/backnumber/h23pdf/20119201.pdf</a></p> <p>CAS: <a href="http://www.cas.go.jp/jp/fukkou/">http://www.cas.go.jp/jp/fukkou/</a></p> <p>MIC: <a href="http://www.soumu.go.jp/main_content/000117828.pdf">http://www.soumu.go.jp/main_content/000117828.pdf</a></p> <p>MILT2: <a href="http://www.thr.mlit.go.jp/road/jisinkannrenjouhou_110311/kushinohasakusen.html">http://www.thr.mlit.go.jp/road/jisinkannrenjouhou_110311/kushinohasakusen.html</a></p> <p>MILT2: <a href="http://www.thr.mlit.go.jp/road/jishinkanrenjouhou_110311/fukkyuuriyuu.pdf">http://www.thr.mlit.go.jp/road/jishinkanrenjouhou_110311/fukkyuuriyuu.pdf</a></p> <p>MOF: <a href="http://www.mof.go.jp/public_relations/finance/201112e.pdf">www.mof.go.jp/public_relations/finance/201112e.pdf</a></p> <p>recon1: <a href="http://www.reconstruction.go.jp/">http://www.reconstruction.go.jp/</a></p> <p>recon2: <a href="http://www.cas.go.jp/jp/fukkou/english/index.html">http://www.cas.go.jp/jp/fukkou/english/index.html</a></p> <p>recon3: <a href="http://www.reconstruction.go.jp/topics/doc/20110729houshin.pdf">www.reconstruction.go.jp/topics/doc/20110729houshin.pdf</a></p> <p>debris: <a href="http://kouikishori.env.go.jp/material/">http://kouikishori.env.go.jp/material/</a></p> <p>SC: <a href="http://www.bousai.go.jp/jishin/chubou/higashinihon/index_higashi.html">http://www.bousai.go.jp/jishin/chubou/higashinihon/index_higashi.html</a></p> <p>JSCE1: <a href="http://committees.jsce.or.jp/2011quake/node/86">http://committees.jsce.or.jp/2011quake/node/86</a></p> <p>news1: <a href="http://sankei.jp.msn.com/affairs/news/110327/dst11032712020031-n1.htm">http://sankei.jp.msn.com/affairs/news/110327/dst11032712020031-n1.htm</a></p> <p>news2: <a href="http://sankei.jp.msn.com/economy/news/110605/biz11060523270007-n1.htm">http://sankei.jp.msn.com/economy/news/110605/biz11060523270007-n1.htm</a></p> <p>rekuzen: <a href="http://www.city.rikuzentakata.iwate.jp/kategorie/fukkou/fukkou-keikaku/fukkou-keikaku.html">http://www.city.rikuzentakata.iwate.jp/kategorie/fukkou/fukkou-keikaku/fukkou-keikaku.html</a></p> <p>kesen: <a href="http://www.city.kesennuma.lg.jp/www/contents/1318004527115/index.html">http://www.city.kesennuma.lg.jp/www/contents/1318004527115/index.html</a></p> <p>miyagi: <a href="http://www.pref.miyagi.jp/seisaku/sinsaihukkou/keikaku/index.htm">http://www.pref.miyagi.jp/seisaku/sinsaihukkou/keikaku/index.htm</a></p> <p>ntt; <a href="http://www.keieiken.co.jp/monthly/2011/1109-04/index.html">http://www.keieiken.co.jp/monthly/2011/1109-04/index.html</a></p> <p>wiki: <a href="http://ja.wikipedia.org/wiki/東日本大震災に対する支援活動">ja.wikipedia.org/wiki/東日本大震災に対する支援活動</a></p> |             |
|            | Data/photos | <p>&lt;Photo&gt;</p> <p><a href="http://www.mod.go.jp/j/approach/defense/saigai/tohokuoki/photo_001.html">http://www.mod.go.jp/j/approach/defense/saigai/tohokuoki/photo_001.html</a></p> <p><a href="http://www.pref.miyagi.jp/snd-doboku/">http://www.pref.miyagi.jp/snd-doboku/</a></p> <p><a href="http://mainichi.jp/select/weathernews/20110311/etc/photo.html">http://mainichi.jp/select/weathernews/20110311/etc/photo.html</a></p> <p><a href="http://www.asahi.com/photonews/gallery/tsunami/">http://www.asahi.com/photonews/gallery/tsunami/</a></p> <p><a href="http://archive.shinsai.yahoo.co.jp/">http://archive.shinsai.yahoo.co.jp/</a></p>  |             |