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THE TSUNAMI OF MARCH 2011 AND THE SUBSEQUENT NUCLEAR INCIDENT AT FUKUSHIMA: WHO COMPENSATES THE VICTIMS?

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INTRODUCTION

A 9.0 magnitude undersea megathrust earthquake hit Japan on March 11, 2011, with an epicenter approximately 130 kilometers (eighty miles) off the coast of the city of Sendai.[1] The earthquake triggered destructive tsunami waves, which reached estimated heights of up to 38.9 meters in the Miyako Prefecture,[2] and traveled up to six kilometers (3.7 miles) inland in the Miyagi area.[3] The Japanese National Police Agency has confirmed 15,870 dead, 6119 injured, and 2813 missing, as well as over one million buildings damaged or destroyed.[4] The earthquake and tsunami have caused extensive and severe damage, including heavy damage to roads, railways, and households.[5] Estimates of the damage are still

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[1] *Fukushima Accident 2011*, WORLD NUCLEAR ASS'N, http://www.world-nuclear.org/info/fukushima_accident_inf129.html (last updated Sep. 17, 2012). Sendai is located about 350 kilometers (220 miles) north of Tokyo.

[2] INT'L ATOMIC ENERGY AGENCY, IAEA INTERNATIONAL FACT FINDING EXPERT MISSION OF THE FUKUSHIMA DAI-ICHI NPP ACCIDENT FOLLOWING THE GREAT EAST JAPAN EARTHQUAKE AND TSUNAMI 19 (2011), *available at* http://www-pub.iaea.org/mtcd/meetings/pdfplus/2011/cn200/documentation/cn200_final-fukushima-mission_report.pdf.

[3] *Tsunami Damage*, OPINION 3/11: VIEWS FROM JAPAN ON THE MARCH 11 DISASTER (June 29, 2011), http://japanecho.net/311-data/1205/.

[4] *Damage Situation and Police Countermeasures Associated with 2011 Tohoku District—Off the Pacific Ocean Earthquake*, JAPANESE NATIONAL POLICE AGENCY, http://www.npa.go.jp/archive/keibi/biki/higaijokyo_e.pdf.

[5] Nam-Yi Yun & Masanori Hamada, *A Comparative Study on Human Impacts Caused by the 2011 Great East Japan Earthquake and Disaster Mitigation*, INT'L SYMP. ON

increasing every day, and already total several hundred billion Japanese yen.[6] This makes the March earthquake the most expensive recorded natural disaster in Japan.[7]

Fukushima is a prefecture located in the Tōhoku region, 175 kilometers (109 miles) away from the epicenter of the earthquake.[8] The earthquake led to the shut down of three units in the Fukushima Daiichi nuclear power plant.[9] A 15-meter tsunami followed the earthquake and arrived at Fukushima, which topped the plant's six meter seawall and lead to the failure of the cooling system.[10] The equipment failures resulted in core melt down and releases of radioactive materials.[11] The severity of the nuclear accident is rated 7 on the International Nuclear Event Scale ("INES"),[12] the same as the Chernobyl disaster of April 1986.[13]

The earthquake and tsunami in Japan have caused serious casualty and property damage. Substantial economic losses can also be expected from the nuclear accident; the total losses in terms of personal injury, property damage, and economic losses resulting from the tsunami and nuclear accident are yet unknown.[14]

ENGINEERING LESSONS LEARNED FROM THE 2011 GREAT EAST JAPAN EARTHQUAKE, 1666 (2012), *available at* http://www.jaee.gr.jp/event/seminar2012/eqsympo/pdf/papers/61.pdf.

[6] *See* Victoria Kim, *Japan Damage Could Reach $235 Billion, World Bank Estimates*, L.A. TIMES (Mar. 21, 2011), http://www.latimes.com/business/la-fgw-japan-quake-world-bank-20110322,0,3799976.story; Bo Zheng, *Top 5 Most Expensive Natural Disasters in History*, ACCUWEATHER.COM (Mar. 30, 2011), http://www.accuweather.com/blogs/news/story/47459/top-5-most-expensive-natural-d.asp.

[7] *See* Bo Zheng, *supra* note 6.

[8] U.S. GEOLOGICAL SURVEY, *Magnitude 9.0—Near the East Coast of Honshu, Japan*, http://earthquake.usgs.gov/earthquakes/recenteqsww/Quakes/usc0001xgp.php.

[9] WORLD NUCLEAR ASS'N, *supra* note 1.

[10] *See Japan 'Unprepared' for Fukushima Nuclear Disaster*, BBC NEWS (June 7, 2011), http://www.bbc.co.uk/news/mobile/world-asia-pacific-13678627.

[11] *Id.*

[12] WORLD NUCLEAR ASS'N, *supra* note 1. The INES was introduced in 1990 by the International Atomic Energy Agency ("IAEA") to communicate to the public the importance of safety regarding nuclear and radiological events. *INES: The International Nuclear and Radiological Event Scale*, INT'L ATOMIC ENERGY AGENCY, http://www.iaea.org/Publications/Factsheets/English/ines.pdf (last visited Nov. 2, 2012). "[T]he INES Scale explains the significance of events from a range of activities, including industrial and medical use of radiation sources, operations at nuclear facilities, and transport of radioactive material." *Id.* Events are classified on the scale at seven levels. The severity of an event is about ten times greater for each increase in level on the scale. *Id.*

[13] Richard Black, *Fukushima: As Bad as Chernobyl?*, BBC NEWS (Apr. 12, 2011), http://www.bbc.co.uk/news/science-environment-13048916.

[14] *See* Bo Zheng, *supra* note 6.

This article examines how the catastrophic losses that resulted from the natural disaster and from the nuclear accident can be compensated in Japan. We examine this on the basis of the preexisting legal rules intended to address victim compensation. To the extent that they are already known, we also provide the estimates of the losses and the amount of the payments already made, although these numbers continue to change. Through this lens, the compensation systems for earthquake damage and nuclear damage are critically analyzed. The question how to ensure adequate compensation to victims is especially important, given the problem of whether the tsunami could be considered a "*force majeure*," which would exclude the liability of the nuclear power plant operator. We compare the compensation models available in Japan to international conventions, as well as national legislation in the U.S. and some European legal systems. We are especially interested in the question of what type of compensation mechanism (operator or third-party liability, private insurance, or government intervention) is in place and how these work together to compensate victims. Following this analysis, we discuss the compensation system for natural disasters and more particularly for earthquake damage in Japan; next, we discuss the compensation system for nuclear damage and provide a brief comparison with other compensation mechanisms.

I. THE COMPENSATION SYSTEM FOR NATURAL DISASTERS IN JAPAN

Japan has an extensive record of catastrophic events, including earthquakes, volcanic eruptions, typhoons, and tsunamis.[15] Twenty percent of the world's earthquakes and ten percent of earthquakes of magnitude 6.0 or higher have occurred in the Japanese archipelago.[16] In Japan, more than 1000 earthquakes are felt every year, many of which cause damage.[17] It is reported that from the Meiji Period until 2004 (1891–2004), there were at least twenty-two major earthquakes in Japan, with death tolls varying from twenty-five to 142,000 casualties.[18]

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[15] *See* Ishaan Tharoor, *Japan and the Quake: A Long History of Living with Disaster*, TIME, Mar. 12, 2011, http://world.time.com/2011/03/12/japan-and-the-quake-a-long-history-of-living-with-disaster/.

[16] NON–LIFE INSURANCE RATING ORGANIZATION OF JAPAN, EARTHQUAKE INSURANCE IN JAPAN 4 (2008), *available at* http://www.nliro.or.jp/english/earthquake.html (last visited Nov. 2, 2012) [hereinafter NLIRO].

[17] *See* Takuji Imai, *Earthquake Insurance on Dwelling Risks in Japan*, *in* ASIAN CATASTROPHE INSURANCE 59, 59 (Charles Scawthorn & Kiyoshi Kobayashi eds., 2008).

[18] *See* CABINET OFFICE OF JAPAN, EARTHQUAKES IN JAPAN, http://www.bousai.go.jp/jishin/chubou/taisaku_gaiyou/pdf/hassei-jishin.pdf. These numbers include both dead and missing persons. *Id.*

TABLE 1: MAJOR EARTHQUAKES IN JAPAN SINCE THE MEIJI PERIOD[19]

Name of the Earthquake	Date of Occurrence	Seismic Intensity	Damage	
			Dead and Missing Persons	Buildings Completely Destroyed
Mino-Owari Earthquake	10/28/1891	8.0	7273	142,177
Sanriku	6/15/1896	8.5	About 22,000	11,723
Kanto (Kwanto)	9/1/1923	7.9	About 142,000	576,262
Tango	3/7/1927	7.3	2925	12,629
Sanriku	3/3/1933	8.1	3064	6067
Tottori	9/10/1943	7.2	1083	7736
Tonankai	12/7/1944	7.9	1251	19,367
Mikawa	1/13/1945	6.8	2306	5539
Nankaido	12/21/1946	8.0	1443	13,119
Fukui	6/28/1948	7.1	3769	40,035
Hokkaido	3/4/1952	8.2	33	921
	5/23/1960	9.5	139	2830
Niigata	6/16/1964	7.5	26	2250
Off the East Coast of Honshu	5/16/1968	7.9	52	691
Off the Coast of Izu Peninsula	5/9/1974	6.9	30	139
Izu-Oshima	1/14/1978	7.0	25	96
Miyagi-Oki	6/12/1978	7.4	28	1183
Central Japan Sea	5/26/1983	7.7	104	987
West Nagano	9/14/1984	6.8	29	24
Hokkaido Nansei-Oki	7/12/1993	7.8	230	601
Kobe	1/17/1995	7.3	6436	111,054
Near the West Coast of Honshu	10/23/2004	6.8	46	2827

In response to natural catastrophes, Japan's government and markets have established several programs and instruments to provide compensation to victims, with a particular focus on insurance. Insurance

[19] *See* CABINET OFFICE OF JAPAN, EARTHQUAKES IN JAPAN, http://www.bousai.go.jp/jishin/chubou/taisaku_gaiyou/pdf/hassei-jishin.pdf.

policies are, for example, available for the risks of volcanic eruptions, floods and storms.[20] Coverage of these disasters is granted systematically by private companies and then distributed via the international reinsurance market.[21] Because earthquakes are one of the most serious catastrophes confronting Japan, a comprehensive compensation system has been established separate from and unique to this market. This section focuses on the compensation system for damage from earthquakes in Japan.

Earthquakes and tsunamis can result in catastrophic damage to society, including personal injury and death, business interruption, and damage to infrastructure, including roads and harbors, and buildings.[22] In addition to personal injury and death, the damage to households, businesses, and industry are the most significant losses arising from an earthquake. In Japan, two different regimes have been established, one for households and one for business and industry.[23] For risks to households, two systems are available for providing insurance coverage: one is provided by private insurers with strong government involvement, and the other one is provided by cooperative insurers, known as Kyosai.[24] Commercial and industrial risks are covered primarily by the private insurance market.[25] This section examines the two separate compensation systems in turn. In addition to insurance for households and commercial/industrial risks, there are a few other insurance policies that cover earthquake damage. Some of these products are briefly discussed as well.

Insurance is not the only form of compensation available to the victims of catastrophes; government also plays an important role in providing relief to the victims. This section also tries to sketch the framework of the various government-supported regimes.

A. Compensation for Households in Case of an Earthquake

The large earthquakes in the history of Japan have triggered the establishment of an elaborate compensation system that evolves with every new disaster. For example, an earthquake insurance system for residential

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[20] CONSORCIO DE COMPENSACIÓN DE SEGUROS, NATURAL CATASTROPHES INSURANCE COVER: A DIVERSITY OF SYSTEMS 86–87 (2008), *available at* http://consorseguros2.tirea.es/textos/datos/pdf/extra/naturalCatastrophes.pdf (last visited Nov. 2, 2012).
[21] *Id.* at 86.
[22] L. Don Leet, *Earthquake*, *in* 9 THE ENCYCLOPEDIA AMERICANA INTERNATIONAL EDITION 544, 544–46 (1999).
[23] NLIRO, *supra* note 16, at I.
[24] CONSORCIO DE COMPENSACIÓN DE SEGUROS, *supra* note 20, at 91.
[25] *See id.*

buildings and household goods was established after the Great Niigata Earthquake in 1964.[26] This system is unique because of its cooperation between private non–life insurance companies and the national government.[27] In addition, insurance can also be provided by cooperative insurers, known in Japan as Kyosai.

In addition to the insurance system, other instruments have evolved to indemnify victims in case of damage. For example, the Kobe earthquake of 1995, also referred to as the Great Hanshin earthquake, which centered in the Hyogo Prefecture, led to the establishment of a mutual aid system in that prefecture.[28] The insurance provided by private insurers, cooperative insurers, and other compensation instruments are discussed respectively here.

1. Earthquake Insurance for Households Provided by Private Insurers

a. History of the System

The 1964 Niigata Earthquake killed twenty-six, injured 447 others, destroyed 1960 residences completely and partially destroyed 6640 others.[29] Responding to the huge amount of damage, the Minister of Finance consulted with the Insurance Council, requesting a report about potential

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[26] NLIRO, *supra* note 16, at 29.

[27] Yuichi Takeda, *Government as Reinsurers of Last Resort: The Japanese Perspective*, *in* CATASTROPHE RISKS AND REINSURANCE: A COUNTRY RISK MANAGEMENT PERSPECTIVE 225, 226–27 (Eugene N. Gurenko ed., 2004).

[28] HYOGO PREFECTURE, PHOENIX MUTUAL AID SYSTEM (2010), http://web.pref.hyogo.jp/wd34/documents/kyosaieibunpamphlet.pdf. The Kobe earthquake of 1995 triggered the introduction of a governmental aid system. Under this system, the government provides financial support to disaster victims whose homes are totally destroyed or who suffer similar damage. In addition, some local governments also try to provide aid for victims of earthquake damage. The Mutual Housing Recovery Support System established in the Hyogo Prefecture provides such an example. *Id; see also* Norio Maki, *How Can Public Sector Support Recovery of Privately Owned Individual Housing after Natural Disaster? Possibility of Setting Housing Recovery Grant in Japan*, 2ND INT'L CONFERENCE ON URBAN DISASTER REDUCTION (2007), *available at* http://www.ncdr.nat.gov.tw/2ICUDR/2icudr_cd/PDF/7_3_2.pdf. A more detailed discussion of government aid and the mutual system occurs later in this article.

[29] *See* Kazuhiro Kawachimaru, *Disaster Risk Management in Japan*, CONFERENCE ON CATASTROPHIC RISKS AND INSURANCE 3 (2004), *available at* http://www.oecd.org/dataoecd/16/39/33912671.pdf.

measures to stabilize the livelihood of the nation after major earthquakes.[30] The Insurance Council made its report on the earthquake insurance system in 1965, ushering in an era of change to the industry.[31]

The Japanese insurance industry was initially reluctant to provide earthquake insurance due to scarce reinsurance capacity and difficulties in determining insurance costs.[32] Later, the government and insurance industry made a promise to establish a public-private partnership to provide earthquake insurance coverage. Under this kind of system, insurers provide insurance and are reinsured by the government.[33]

Three laws were passed to create the new system. The Law Concerning Earthquake Insurance ("the Law") was passed in 1966.[34] "The objective of this law is to promote the diffusion of earthquake insurance by having the Government reinsure the earthquake insurance liabilities" and help "stabilize the livelihoods of the victims."[35] The Enforcement Order for the Law Concerning Earthquake Insurance ("the Enforcement Order") and the Regulation for Enforcing the Law Concerning Earthquake Insurance ("the Regulation") were passed in the same year.[36]

Coverage under the system was originally somewhat limited. The insurance system established under this regime only provided coverage for residential buildings and household goods.[37] It covered losses due to earthquakes, volcanic eruptions, or tsunami.[38] The insurance contract was made incidental to householders' comprehensive insurance,[39] and it covered only total loss.[40] In later amendments, coverage was broadened to half loss and partial loss.[41] The insured amount for the earthquake risk

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[30] *See* NLIRO, *supra* note 16, at 29.
[31] *Id.*
[32] *See* Imai, *supra* note 17, at 60–62.
[33] Takeda, *supra* note 27, at 226–27.
[34] Jishin hoken ni kansuru houritsu [The Law Concerning Earthquake Insurance], Law No. 73 of 1966, art. 1 (Japan), *translated in* NLIRO, *supra* note 16, at 76–80.
[35] *Id.*
[36] NLIRO, *supra* note 16, at 81–85.
[37] The Law Concerning Earthquake Insurance, art. 2, para. 2, (1).
[38] *Id.* at art. 2, para. 2, (2).
[39] As originally enacted, the earthquake insurance policy was automatically attached to the householder's comprehensive insurance. In other words, the attachment was compulsory in 1966. *See* ASIAN DEVELOPMENT BANK, EARTHQUAKE INSURANCE: LESSONS FROM INTERNATIONAL EXPERIENCE AND KEY ISSUES FOR DEVELOPING EARTHQUAKE INSURANCE IN THE PRC, app. (2008), *available at* http://www.adb.org/sites/default/files/developing-earthquake-insurance-prc.pdf (last visited Nov. 2, 2012).
[40] NLIRO, *supra* note 16, at 112.
[41] *Id.* at 113.

was thirty percent of householders' comprehensive insurance, with a limit of 900,000 yen (11,553 USD)[42] for buildings and 600,000 yen (7,702 USD) for household goods.[43] The limit of the total payment amount for insurance claims due to a single earthquake was capped at thirty billion yen (385 million USD).[44]

This legislation has been revised several times since its initial enactment. The most recent revision of the Law took place in 1999,[45] while the most recent revisions of the Enforcement Order and Regulation were in 2011.[46] After decades of development, some significant changes have been made to the earthquake insurance system. For example, the attachment method—whereby one form of insurance can be bound with others—was changed to "automatic attachment in principle,"[47] and earthquake insurance has been attached to fire insurance since 1980.[48] The proportion insured under these policies was extended from thirty percent of the value of the homeowners' comprehensive insurance to a range of thirty to fifty percent of the total fire insurance.[49] The limit of earthquake insurance is now set at 50 million yen (642 thousand USD) for a residential building and 10 million yen (132 thousand USD) for household and personal goods.[50] The coverage provided by the insurance policy has also been extended to incorporate half loss and partial loss.[51]

Correspondingly, the premium rates have also been changed. Since the recent revision, there are two kinds of premium rates: the basic rate and the discount rate.[52] The basic rate is based on the location, the

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[42] The transfer of Japanese Yen and Euro into USD in this article is based on the exchange rate on October 1, 2012. *Foreign Exchange Rates*, BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM, http://www.federalreserve.gov/releases/h10/current/ (last visited Nov. 2, 2012).
[43] NLIRO, *supra* note 16, at 29.
[44] *Id.*
[45] *Id.* at 76.
[46] *Id.* at 81, 85.
[47] *Id.* at 31. Under this system, the earthquake insurance policy is automatically added to all types of fire insurance policies, but policyholders can still choose to exclude it. Therefore, under the revision in 1980, the attachment for the earthquake insurance changed from compulsory to optional. *Id.*; *see also* Hiroaki Tsubokawa, *Japan's Earthquake Insurance System*, *in* 4 JOURNAL OF JAPAN ASSOCIATION FOR EARTHQUAKE ENGINEERING 154, 156 (2004).
[48] Tsubokawa, *supra* note 47, at 156.
[49] NLIRO, *supra* note 16, at 112–13.
[50] Shikorei Jishin hoken ni kansuru houritsu [The Enforcement Order for the Law Concerning Earthquake Insurance], Cabinet Order No. 164 of 1966, art. 2 (Japan), *translated in* NLIRO, *supra* note 16, at 81 [hereinafter Enforcement Order].
[51] NLIRO, *supra* note 16, at 112–14.
[52] *See id.* at 36.

extent of the damage and whether the buildings have wooden structures.[53] The new system also provides a discount rate for residences with a high earthquake-resistance capacity.[54]

b. Features of the Existing Insurance Policy

The existing earthquake insurance policy covers loss of or damage to "building[s] for residential use and/or household and personal goods" from "fire, destruction, burial or being carried away in a flood resulting directly or indirectly from an earthquake or volcanic eruption, or tsunami."[55] The insurance contract cannot be entered into independently and must be incidental to the fire insurance coverage.[56] One major difference between earthquake insurance in Japan and similar insurance in North America or Europe is that in Japan, fires following earthquakes are covered under earthquake insurance rather than under fire insurance.[57]

Earthquake insurance can be contracted for a "short term, one year [or] long term (two to five years)."[58] The amount of earthquake insurance ranges from thirty percent to fifty percent of the amount of fire insurance, with an upper limit of 50 million yen (642 thousand USD) for buildings and 10 million yen (132 thousand USD) for home contents.[59] The insurance scheme provides complete coverage in the event of total loss, fifty percent of the amount insured in the event of half loss, and only five percent of the amount insured in the event of partial loss.[60] This limited coverage is considered problematic.

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[53] *See id.* at 42–43.
[54] *See id.* at 36–37.
[55] The Law Concerning Earthquake Insurance, art. 2, para. 2, (1)–(2).
[56] This was done to prevent the danger of adverse selection. *See* Imai, *supra* note 17, at 64.
[57] Tsubokawa, *supra* note 47, at 155. By contrast, in the U.S., a fire caused by an earthquake is covered under the fire insurance policy. Thus, in the U.S., a homeowner can collect damages from an earthquake-caused fire even without buying earthquake insurance. For example, in the 1906 San Francisco earthquake, "most of the damage was caused by fire, and [fire] insurers were obligated to cover these losses." Howard Kunreuther, *Catastrophe Insurance: Challenges for the US and Asia*, *in* ASIAN CATASTROPHE INSURANCE 3, 18 (Charles Scawthorn & Kiyoshi Kobayashi eds., 2008).
[58] JAPAN EARTHQUAKE REINSURANCE CO., ANNUAL REPORT 2010—INTRODUCTION TO EARTHQUAKE REINSURANCE IN JAPAN 3 (2010), *available at* http://fulltextreports.com/2011/03/16/annual-report-2010-introduction-to-earthquake-reinsurance-in-japan/.
[59] *Id.*
[60] *Id.* at 4.

The premium rate for earthquake insurance is calculated by the Non–Life Insurance Rating Organization of Japan ("NLIRO").[61] NLIRO is a non-profit private organization established under the Law Concerning Non–Life Insurance Rating Organizations ("Rating Organization Law") and supervised by the Financial Services Agency.[62] NLIRO can "calculate 'reference loss cost rates' (advisory pure risk premium rates) for fire insurance, personal accident insurance, automobile insurance, and nursing care payments insurance."[63] It can also calculate "'standard full rates' (advisory premium rates) for compulsory automobile liability insurance (CALI) and earthquake insurance."[64] The Rating Organization Law was revised in 1951, and at that time, members were obliged to use the rates calculated by the Organization, which at that point was called the Property and Casualty Insurance Organization.[65] This requirement was abolished in a later revision.[66]

Today, insurers are free to follow NLIRO's advice or to ignore it. In practice, however the recommendations provided by NLIRO have a large impact, essentially *de facto* setting the rates that will be charged.[67] The premium rate contains both a risk premium rate, based on the actuarial premium, and a loading rate, based on the expenses of operating the earthquake insurance, the paperwork costs, and adjustment costs.[68] According to the Law Concerning Earthquake Insurance, the premium shall be as low as possible while maintaining equilibrium between income and expenses.[69]

Two kinds of premium rates are set by NLIRO: the basic rate and the discount rate.[70] The basic rate consists of a risk premium rate and a loading premium rate. As severe earthquakes are a low-frequency, high-magnitude risk, the risk premium for earthquake insurance needs to be considered over the long term. NLIRO sets rates, at the equilibrium level,

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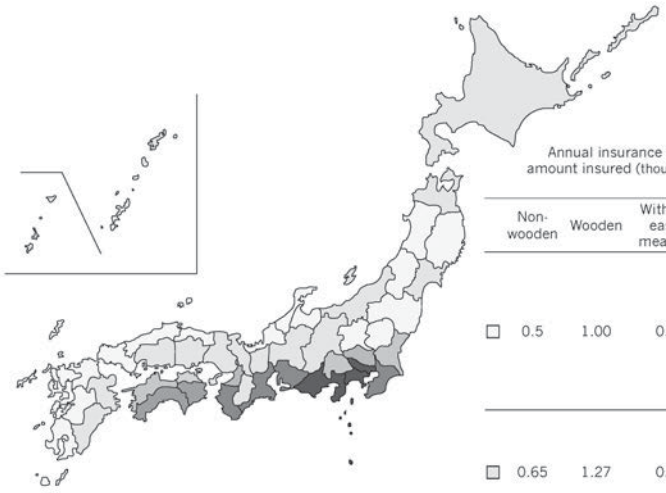
[61] *See* NLIRO, *supra* note 16, at 51.
[62] THE INSTITUTE OF ACTUARIES OF JAPAN, *Non–Life Insurance in Japan—Automobile Insurance & Fire Insurance* 13 (Nov. 18, 2009), http://www.casact.org/education/annual/2009/handouts/c16-tanaka.pdf.
[63] Nobuyoshi Yamori & Taishi Okada, *The Japanese Insurance Market and Companies: Recent Trends*, *in* HANDBOOK OF INTERNATIONAL INSURANCE: BETWEEN GLOBAL DYNAMICS AND LOCAL CONTINGENCIES 147, 201 (J. David Cummins & Bertrand Venard eds., 2007).
[64] *Id.*
[65] NOBORU KOBAYASHI ET AL., INSURANCE LAW IN JAPAN 76 (2010).
[66] *Id.*
[67] Telephone Interview with Mr. Kuni Shimada, Principal International Policy Coordinator, Global Environment Bureau, Ministry of Environment (Japan) (Dec. 26, 2011) [hereinafter Shimada Interview].
[68] *See* NLIRO, *supra* note 16, at 53.
[69] *Id.*
[70] *Id.* at 36.

based upon "375 destructive earthquakes that had happened over a period of 506 years from 1494 to 1999."[71] The location and structural composition of a residential building affects its premium rate, based on how well it could withstand an earthquake.[72] Japan's prefectures are now divided into seven categories, based on earthquake risk, that form the foundation for location-based calculations.

TABLE 2: ANNUAL INSURANCE PREMIUM/AMOUNT INSURED[73]



Annual insurance premium (per insurance year)/ amount insured (thousand yen of earthquake insurance)

(Unit: yen)

Non-wooden	Wooden	With cost easing measures	Prefecture
0.5	1.00	0.65	Iwate-ken, Akita-ken, Yamagata-ken, Fukushima-ken, Tochigi-ken, Gunma-ken, Toyama-ken, Ishikawa-ken, Fukui-ken, Tottori-ken, Shimane-ken, Yamaguchi-ken, Fukuoka-ken, Saga-ken, Nagasaki-ken, Kumamoto-ken, Kagoshima-ken
0.65	1.27	0.84	Hokkaido, Aomori-ken, Miyagi-ken, Niigata-ken, Nagano-ken, Gifu-ken, Shiga-ken, Kyoto-fu, Hyogo-ken, Nara-ken, Okayama-ken, Hiroshima-ken, Oita-ken, Miyazaki-ken, Okinawa-ken
0.65	1.56	0.84	Kagawa-ken
0.91	1.88	1.18	Ibaraki-ken, Yamanashi-ken, Ehime-ken
1.05		1.36	Saitama-ken, Osaka-fu
0.91	2.15	1.18	Tokushima-ken, Kochi-ken
1.69	3.06	2.19	Chiba-ken, Aichi-ken, Mie-ken, Wakayama-ken
	3.13		Tokyo-to, Kanagawa-ken, Shizuoka-ken

As this Table shows, the basic premium is risk-related, depending on the nature of the building and on its location. The highest construction-based premium is applied to wooden buildings, as they are considered to be most exposed to the risk of destruction in an earthquake.[74] A premium

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[71] HANDBOOK OF INTERNATIONAL INSURANCE: BETWEEN GLOBAL DYNAMICS AND LOCAL CONTINGENCIES, *supra* note 63, at 192.
[72] *See* JAPAN EARTHQUAKE REINSURANCE CO., *supra* note 58, at 5.
[73] *Id.* at 6.
[74] *See* NLIRO, *supra* note 16, at 42.

reduction is awarded for the non-wooden buildings, or for wooden buildings that incorporate risk reducing measures.[75] For example, if the building is a seismic isolated building constructed according to applicable laws, a discount rate of thirty percent applies.[76] If the building corresponds to the earthquake-resistance class as described by law, a discount from ten percent to thirty percent can be used.[77] Besides, if an earthquake-resistance diagnosis shows the building has an earthquake resistance capacity equivalent to that stipulated by laws or the building was constructed during or after June 1981, a discount of ten percent applies.[78] Additionally, the premium is related to the location of the building. The higher the earthquake risk in a particular region, the higher the premium will be.[79] The result is a fully risk-based system where the highest premiums are assigned to high-risk buildings in high-risk areas, the lowest to low-risk buildings in low-risk areas, with a sliding scale in between based on the interplay between geographic and construction factors.

c. The Reinsurance Scheme

Earthquake risks are correlated with high potential losses. This creates challenges for private insurance markets to provide insurance coverage. The Japanese system chooses government-supported reinsurance to make the earthquake risks insurable. To provide government-supported reinsurance, the Japan Earthquake Reinsurance Company ("JER") was established in 1966.[80] This system is described below.

First, private insurance companies selling earthquake insurance in Japan enter into an Earthquake Reinsurance Agreement ("Agreement A") with the JER.[81] According to Agreement A, the JER provides reinsurance coverage for full liability of all earthquake insurance contracts.[82] The reinsurance terms are determined according to the latest risk-exposure analysis and prices determined by the government. The price is not market-based,

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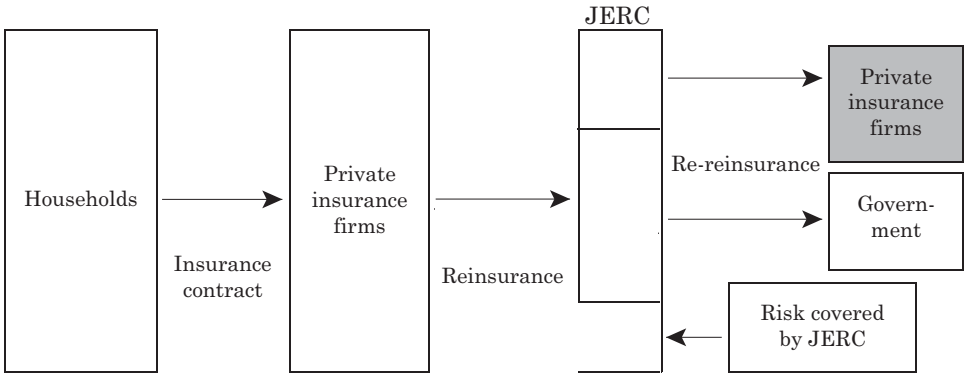
[75] *See id.*
[76] *See id.* at 41–42.
[77] The earthquake resistance class is identified in earthquake resistance capacity certificates. The certificates are issued by designated organizations set forth in the Quality Guarantee Law or the Building Standards Law. *Id.* at 42.
[78] *Id.*
[79] *Id.* at 42–43.
[80] Janet L. Kaminski Leduc, *Insurance and Financial Assistance for Natural Catastrophes in the United States and Other Countries*, OFFICE OF LEGISLATIVE RESEARCH (Feb. 4, 2009), http://www.cga.ct.gov/2009/rpt/2009-R-0010.htm.
[81] *Id.*
[82] JAPAN EARTHQUAKE REINSURANCE CO., *supra* note 58, at 10.

but considers a general fair-value principle.[83] For example, the rate should be sustainable whether the government subsidizes it or the private reinsurance market becomes unstable.[84]

Second, the JER retains parts of the risks it undertook from Agreement A. JER can retrocede part of the risk to various private insurance companies, including the primary insurance companies and Toa Reinsurance Co., Ltd. ("Toa Re") under a separate reinsurance agreement ("Agreement B").[85] This means that partial risk spreading takes place between the reinsurer (JER) and private insurers, because the private insurers will in turn partially reinsure the earthquake risk run by JER.[86]

Third, JER can obtain reinsurance from the government to cede part of the risk it undertook under Agreement A. This reinsurance agreement with the government is referred to as "Excess of Loss Reinsurance" ("Agreement C").[87] Under this agreement, reinsurance claims are paid if the total payment of insurance claims caused by a single earthquake exceeds a benchmark amount.[88] Systematically, the earthquake reinsurance for earthquakes in Japan can be summarized as follows:

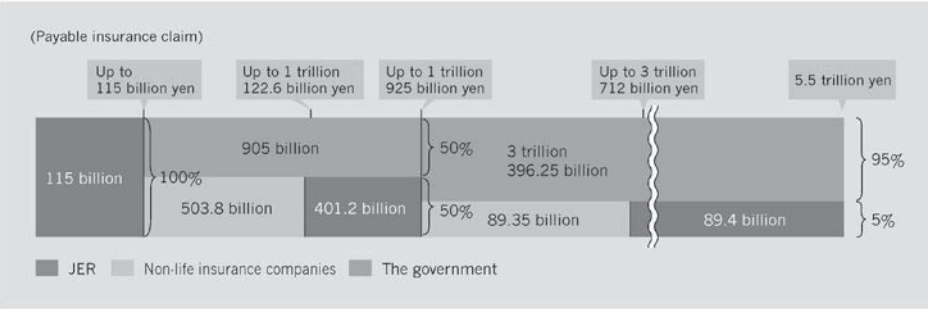
TABLE 3: EARTHQUAKE REINSURANCE IN JAPAN[89]



[83] CATASTROPHE RISKS AND REINSURANCE: A COUNTRY RISK MANAGEMENT PERSPECTIVE, *supra* note 27, at 231.
[84] *Id.*
[85] NLIRO, *supra* note 16, at 45–46.
[86] *Id.*
[87] *Id.*
[88] *Id.*
[89] Nobuyoshi Yamori & Takeshi Kobayashi, *Do Japanese Insurers Benefit From a Catastrophic Event? Market Reactions to the 1995 Hanshin-Awaji Earthquake*, 16 J. JAPANESE AND INT'L ECON. 92, 98 (2002).

According to the Law, there is an aggregate limit of reinsurance coverage for each earthquake, and the amount is set by a decision of the National Diet[90] for each year.[91] If the insurance claims made for a single earthquake exceed this amount, the insurance companies shall be able to reduce the payment correspondingly.[92] This amount is set at 5.5 trillion yen (70.6 billion USD) as of 2010.[93] Liability for the first layer of 115 billion yen (1.5 billion USD) is undertaken by JER.[94] According to the Enforcement Order, for the payment amount of 115 billion yen (1.5 billion USD) and up to 1.925 trillion yen (25 billion USD) the insurance companies (including the JER and other private insurers)[95] and the government shall each bear fifty percent of the payment of insurance claims.[96] For amounts exceeding 1.925 trillion yen, the government shall bear ninety-five percent and the insurance companies shall bear the remaining five percent of payments.[97] The total existing reinsurance scheme is illustrated below.

TABLE 4: EARTHQUAKE REINSURANCE SCHEME[98]



[90] The Diet is the name of the national parliament in Japan. NIHONKOKU KENPŌ [KENPŌ] [CONSTITUTION], art. 41 (Japan), *available at* http://www.shugiin.go.jp/itdb_english.nsf/html/kenpou/english/constitution.htm.
[91] The Law Concerning Earthquake Insurance, art. 3.
[92] *Id.* at art. 4.
[93] JAPAN EARTHQUAKE REINSURANCE CO., *supra* note 58, at 12.
[94] *Id.*
[95] *Id.*
[96] *Id.*
[97] *Id.*
[98] JAPAN EARTHQUAKE REINSURANCE CO., *supra* note 58, at 12.

TABLE 5: THE LIABILITY LIMIT FOR JER, PRIVATE INSURERS AND THE GOVERNMENT[99]

JER	605.60 billion yen
Non-life insurance companies	593.15 billion yen
The government	4,301.25 billion yen
Total (limit amount of payable insurance claims)	5.50 trillion yen

The coverage for earthquake-related damage in Japan can hence be characterized as a multilayered approach, with different responsibilities of private insurance companies, the reinsurer JER, and the government. The government responsibilities increase as the damage amount increases.

Even in a country with high earthquake risks like Japan, the frequency of earthquake disasters is still low. It is difficult to predict when such a disaster will happen in the near future.[100] Hence the Regulation requires insurance companies to set aside a "net pure premium," premium income minus operating expenses, as underwriting reserves.[101] JER and the government are also required to save risk reserves. All the investment profits are also saved liability reserves.[102] The government's liability reserves, the reinsurance premiums and the investment profits, are accumulated separately from general accounting under the Law Concerning Special Accounts.[103] Different insurance companies accumulate the insurance premiums and corresponding investment profits as liability reserves.[104] For the private insurance companies, primary insurers and the Toa Re, the liability reserves consist of their retrocession premiums.[105] They must deposit the whole amount of retrocession premiums with the JER, which then invests the funds on their behalf.[106] JER manages these reserves so as to promote a quick payment. The balance of risk reserves held

[99] *Id.*
[100] Regulation for Enforcing the Law Concerning Earthquake Insurance, art. 7.
[101] *Id.*
[102] *See* NLIRO, *supra* note 16, at 47.
[103] *Id.*
[104] *Id.*
[105] Masao Wakuri & Yasuyuki Yasuhara, *Earthquake Insurance in Japan*, 9 ASTIN BULLETIN 329, 350 (1977), *available at* http://www.actuaries.org/LIBRARY/ASTIN/vol9no3/vol9no3.pdf.
[106] *Id.* at 323–24.

by JER, private insurance companies, and the government at the end of fiscal year 2011 was:

TABLE 6: LIABILITY RESERVES[107]

JER	496.7 billion yen
Non-life insurance companies	524.3 billion yen
The government	1,270.8 billion yen
Total	2,291.9 billion yen

According to the General Insurance Association of Japan ("GIAJ"), private insurers have paid 1.18 trillion yen (15 billion USD) for residential damage through November 2011 for damage resulting from the Tōhoku earthquake.[108] The reserves of this insurance system are higher than the estimated insured losses for residences for the Tōhoku earthquake.[109] However, this estimate was based on a low penetration rate of earthquake insurance into the market.[110] According to the Japanese Cabinet Office, the current estimated damage to buildings caused by the March 2011 earthquake and tsunami is about 10.4 trillion yen (153 billion USD).[111] It is still not clear whether the insurance system has sufficient capacity to compensate for the whole damage if the penetration rate is high.

2. Earthquake Insurance for Households Provided by Cooperative Insurers

The above section outlined the insurance system established under the Law Concerning Earthquake Insurance. Under that system, earthquake insurance is provided by primary private insurers and is reinsured by the government. A second system of insurance available in Japan, which

[107] JAPAN EARTHQUAKE REINSURANCE CO., *supra* note 58, at 13.
[108] *Key Figures Related to Insurance Claims Due to the Earthquakes and Tsunamis in Eastern Japan*, GEN. INS. ASS'N OF JAPAN (Jan. 10, 2012), http://www.sonpo.or.jp/en/news/2011/1111_01.html.
[109] *See* OLIVIER MAHUL & EMILY WHITE, WORLD BANK, KNOWLEDGE NOTE 6-2: EARTHQUAKE RISK INSURANCE 9 (2012), *available at* http://wbi.worldbank.org/wbi/Data/wbi/wbicms/files/drupal-acquia/wbi/drm_kn6-2.pdf.
[110] *Id.* at 4.
[111] DEP'T OF INT'L AFFAIRS OF JAPAN SCI. & TECH. AGENCY, THE GREAT EAST JAPAN EARTHQUAKE INFORMATION FROM OFFICIAL WEBSITES 16 (July 20, 2011), *available at* http://www.jst.go.jp/pr/pdf/great_east_japan_earthquake.pdf.

is not covered by the Law Concerning Earthquake Insurance, is provided by cooperative insurers known as Kyosai.[112] "Kyosai is considered to be a scheme formed by residents in the same region or persons engaged in the same occupation, which provides a certain amount of benefits from the pooled financial contributions of the membership for disaster, death or accident."[113] Kyosai provide the bulk of Japanese household coverage.[114] In 2008, Kyosai issued over thirty-four million policies, compared to ten million issued by private insurers.[115] The largest Kyosai is the National Mutual Insurance Federation of Agricultural Cooperatives ("Zenkyoren"), which accumulates approximately eighty-five percent of the total cooperative insurer's fire insurance premium.[116]

Unlike the insurance provided by private insurers, which is attached to the fire insurance policy, Zenkyoren's residential earthquake exposure comes "primarily from its building endowment policy."[117] The building endowment policy is provided on a five-year basis or longer, and it "automatically covers residential buildings and property from damages caused by fire, flood, earthquakes and other disasters."[118] In addition to property damage, this coverage also extends to personal injury and death caused by a natural disaster.[119]

The Kyosai are non-profit organizations. However, the premiums they charge are higher than the total losses they expect to pay after disasters. This enables them to accumulate a substantial premium income.[120] Most of the premium income is set aside as liability reserves. Because of this, the endowment policy can be considered a long-term savings policy that funds essential home repairs.[121] In addition to covering natural disaster induced loss, a Kyosai policy provides a partial refund of premium to pay for essential home repairs, such as fixing a leaking roof.[122] A partial

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[112] *See About Unregulated Kyosai*, FIN. SERVICES AGENCY (2012), http://www.fsa.go.jp/en/refer/ins/kyosai.html.
[113] *Id.*
[114] Georgina Crowhurst & Garrett Moore, *The Tohoku Earthquake and Tsunami*, 19 ENVTL. LIABILITY 23, 25 (2011).
[115] *Id.* at 25.
[116] *See* Sean McAllister & Elizabeth Cohen, *Japanese Casualty Insurers Show Resilience*, CONTINGENCIES, Sep./Oct. 2011, at 68.
[117] *Id.*
[118] *Id.*
[119] *Id.*
[120] "According to an A.M. Best ranking of international insurance companies, Zenkyoren ranked seventh in the world in terms of net written premium in 2009." *Id.* at 72.
[121] McAllister & Cohen, *supra* note 116, at 68.
[122] *Id.*

refund will also be provided if the policy expires without claiming a total loss.[123] The policy provided by Kyosai provides all-hazard coverage.[124] Hence the "earthquake component of the building endowment rate is not segregated from the total rate and does not vary by location."[125]

Instead of being reinsured by the government, the insurance provided by Kyosai is reinsured by the international reinsurance market. It is reported that Zenkyoren purchases "one of the world's largest catastrophe reinsurance programmes, placed predominantly in the London and Bermuda markets."[126] A preliminary loss estimate shows that Zenkyoren may suffer a loss of 650 billion yen (8.3 billion USD) from its building endowment policies as a result of the March 11 earthquake and tsunami.[127] It is expected to cede 380 billion yen (4.6 billion USD) to international reinsurers and retain 270 billion yen (3.3 billion USD).[128] In addition to the use of reinsurance, Zenkyoren also uses catastrophic bonds to distribute risk throughout the market.[129] The use of catastrophic bonds will be discussed later in this Article.

B. Compensation for Commercial and Industrial Losses in Case of Earthquake

Unlike earthquake insurance for residences, earthquake insurance for business and industry is operated in the private market without government's direct support. Earthquake insurance for commercial and industrial losses began to develop in 1956.[130] This policy often takes the form of fire insurance and extended perils.[131] Earthquake coverage is not

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[123] *Id.*
[124] *See id.* at 72.
[125] *Id.* at 68.
[126] Crowhurst & Moore, *supra* note 114, at 25.
[127] *See* McAllister & Cohen, *supra* note 116, at 70.
[128] *Id.*
[129] For example, Zenkyoren was the ultimate beneficiary of the Muteki CAT bond, a $300 million bond issued by Munich Re in 2008. The Muteki CAT bond provided fully collateralized protection for Japanese earthquake exposure, and is the first catastrophic bond that resulted in a total loss of principal. *Id.* at 70.
[130] AON RISK SOLUTIONS, JAPAN EARTHQUAKE COVERAGE: INSURANCE POLICY OVERVIEW 1 (2011), *available at* http://www.oesa.org/Doc-Vault/Industry-Information-Analysis/Japan-Earthquake-Information/AON-Japan-Earthquake-Coverage-Insurance-Policy-Overview-Mar-22.pdf.
[131] *See* Crowhurst & Moore, *supra* note 114, at 26.

automatically included in the standard policies but is available through "endorsements," or upgrades to the regular policy.[132] These endorsements come in several forms: earthquake coverage endorsement, which "covers loss or damage caused by fire following earthquake and destruction or burying caused by earthquake"; earthquake bursting and explosion coverage, which "covers loss or damage caused by a sudden explosion of gas or vapor caused by earthquake"; earthquake water damage coverage, which "covers loss or damage caused by water perils" and earthquake shock exclusion endorsement which "excludes earthquake shock damage."[133]

To tailor risk premiums, insurers divide Japan into twelve zones for cover limits and seven risk exposure zones.[134] The premium rate is set according to the "structure of the building insured (five classes) and risk exposure (seven zones)."[135] The insurance contracts often contain different deductibles and sublimits, such as percentage deductibles and sublimits specific to "unit of insurance," contingent business interruption deductibles, waiting periods, and so on.[136] To respond to potential catastrophes, the insurers for commercial and industrial risks are also required to set aside reserves with a minimum level of two percent of the annual line net premiums.[137]

In addition to coverage for property damage that directly results from the earthquake, business interruption insurance is also relevant. Instead of reinsurance by the government, earthquake insurance for industrial and commercial risks is reinsured in the international market.[138] Generally, commercial earthquake risks are reinsured "under 60–70 percent quota share treaties in the international reinsurance markets."[139]

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[132] *Id.*
[133] AON RISK SOLUTIONS, *supra* note 130.
[134] RICHARD ROTH, FOREIGN EARTHQUAKE INSURANCE PROGRAMS 20 (1999), *available at* http://www.iclr.org/images/Foreign_Earthquake_Insurance.pdf.
[135] *Id.*
[136] AON RISK SOLUTIONS, *supra* note 130, at 4–5. Sublimits subject to "unit of insurance" means that under such a policy, "[b]uilding, [b]usiness [p]ersonal [p]roperty and [t]ime [e]lement[s] . . . may all have separate deductibles and sublimits." *Id.* at 4. Contingent business interruption deductibles "may include the business interruption values at insured locations affected by the loss." *Id.* at 5. Waiting periods can be used as "qualifiers," which means no coverage is provided "until a business is interrupted in excess of the stated 'qualifying' period of time." *Id.* With contingent business interruption deductibles, the loss is calculated from when the loss began, whereas with waiting periods, the loss is calculated from the time that the waiting period is eclipsed. *See id.* at 4–5.
[137] *See* Roth, *supra* note 134, at 21.
[138] *See* Crowhurst & Moore, *supra* note 114, at 26.
[139] *Id.*

The reinsurance capacity is limited. In this case, the capital market can be used as an alternative to improve the insurance capacity. One highly popular instrument in this respect is the catastrophe bond ("cat bond").[140] Cat bonds evolved as an alternative to reinsurance in the 1990s.[141] When a cat bond is issued by an insurer, the "investors pay the principal amount to a 'special-purpose vehicle' ("SPV"), which acts as a clearing institution."[142] If the trigger event occurs, the insurer is exempted from its obligation to pay interest or a fraction of the principal.[143] In exchange for assuming this risk, investors benefit from a higher promised interest on their bond.[144]

In Japan, several insurers have issued cat bonds to transfer some of the financial risk caused by earthquakes, since the first issue in 1997.[145] It is worth noting that the international insurance market participates not only in the insurance for commercial and industrial risks but also in the insurance for households provided by cooperative insurers. Therefore, cat bonds can be relevant for both kinds of insurance. It is estimated that there are more than 1.7 billion USD in cat bonds that are potentially affected by the Japanese earthquake.[146] Because of the different structure of those bonds, the extent to which they will lead to a loss to the investors still remains to be seen. Until now, only one cat bond is "expected to experience a full loss."[147] It is Muteki Ltd. Series 2008-1, a bond issued by Muteki Ltd., which Munich Re structured for the Japanese carrier Zenkyoren.[148]

C. Other Insurance Policies

As discussed earlier, insurance policies are not only available for households and commercial/industrial risks. Some other insurance policies are also relevant in case of an earthquake, such as personal accident/

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[140] *See* Silke Finken & Christian Laux, *Catastrophe Bonds and Reinsurance: The Competitive Effect of Information-Insensitive Triggers*, 76 J. RISK & INS. 579, 580 (2009).
[141] *Id.* at 579–80.
[142] *Id.* at 580. *See also* Veronique Bruggeman, *Capital Market Instruments for Natural Catastrophe and Terrorism Risks: A Bright Future?*, 40 ENVTL. L. REP. 10136, 10139 (2010).
[143] Finken & Laux, *supra* note 140, at 580–81.
[144] *Id.*
[145] *Id.* at 580.
[146] Sarah Mortimer, *Cat Bond Investors Not Scared Off by Japan Quake*, INS. J. (May 16, 2011), http://www.insurancejournal.com/news/international/2011/05/16/198576.htm.
[147] *Id.*
[148] *Id.*; *see also Moody's Downgrades Muteki Ltd. Series 2008-1, a Catastrophe Bond Program Exposed to Japan Earthquake*, MOODY'S (Mar. 31, 2011), http://www.moodys.com/research/Moodys-downgrades-Muteki-Ltd-Series-2008-1-a-catastrophe-bond--PR_216840.

life insurance, business interruption insurance, motor insurance, and marine insurance.[149]

Personal accident policies typically cover death, permanent disability and hospitalization.[150] However, death and personal injury resulting from an earthquake or tsunamis are "only written by endorsement, for an additional premium."[151] Eqecat estimated the life insurance losses as a result of the Tōhoku earthquake of March 11 to be in the range of 2 to 3 billion USD.[152]

Business interruption insurance is another category affected by an earthquake. Usually, if there is "initial physical loss or damage to the insured," coverage is available for the incidental interruption to the insured's electricity, gas, and other utility services.[153] A related policy is a Contingent Business Interruption ("CBI") policy. It covers losses to the insured caused by physical damage to a supplier and his client.[154]

Motor vehicle insurance is one of the most important non–life insurance policies in Japan. It consists of a required basic third-party liability automobile insurance and voluntary motor vehicle insurance, which covers third party property damage, own damage and personal accidents.[155] It is worth noting that "losses arising out of an earthquake or tsunami are usually excluded and available only by way of endorsement."[156]

Marine insurance is also relevant because an earthquake and tsunami can damage ships, cargo, piers, and wharves.[157] The damage covered by marine insurance is estimated to be in the range of 1 to 3 billion USD as a result of the 2011 earthquake.[158] Different types of marine insurance exist in Japan. Damage to ships caused by a tsunami is covered by hull insurance.[159] For the ships' cargo, coverage is divided into two categories, both of which are involved in the insurance market: inland transit and ocean marine insurance.[160] Under the clauses which govern coastal cargo

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[149] Crowhurst & Moore, *supra* note 114, at 24.
[150] *Id.*
[151] *Id.*
[152] *Id.* ("This estimate is based on average life insurance policy limits of approximately $360,000, while assuming 10,000 people either dead or missing.").
[153] *Id.*
[154] *Id.* at 24–25.
[155] Crowhurst & Moore, *supra* note 114, at 26.
[156] *Id.*
[157] *See id.*
[158] *Id.*
[159] *Id.*
[160] *Id.* at 27.

transit and transport, "earthquake losses for shipments on land are usually excluded."[161] For the insurance of marine cargo, there has been a shift from the Institute Cargo Clauses of 1963 to the new Institute Cargo Clauses of 2009, which come in three categories: A, B or C Clauses.[162] The cargo covered under the "all risks" A or B Clauses are also covered against earthquake-related risks.[163] But for coverage under the C Clauses, "there is no insurance for earthquake-related losses."[164]

D. Government Support and Local Mutual Funds

The previous section discussed the use of insurance to cover earthquake damage, with a focus on insurance for households. In spite of the availability of a variety of products, the earthquake insurance system in Japan is not compulsory, and the rate of market penetration is not very high. A study indicates that recently, in five areas with a higher probability of an earthquake occurring within the next thirty years, the percentage of households covered by private earthquake insurance varies from 24.6 percent to 27.95 percent.[165] This means that on average only one quarter of residences exposed to an earthquake risk have insurance coverage.[166] This means three out of four residences are not covered by insurance. This indicates that without mandatory coverage requirements, insurance alone can not provide sufficient compensation and recovery after an earthquake disaster to the wide range of victims affected.

As a country with a serious risk of natural disasters, Japan has established a comprehensive system of public support for disaster victims.

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[161] Crowhurst & Moore, *supra* note 114, at 27.
[162] *Id.*
[163] *Id.*
[164] *Id.*
[165] The JER's 2010 report shows the percentage of households purchasing earthquake insurance in areas at risk of major earthquakes. JAPAN EARTHQUAKE REINSURANCE CO., *supra* note 58, at 14. The report identifies the five areas as follows: Kanto, metropolitan Tokyo, Tokai, Tonankai, and Nankai. *Id.* According to the 2010 version of the National Seismic Hazard Maps provided by the Headquarters for Earthquake Research Promotion of the Japanese government, the probability of an earthquake occurring in any one of these five areas in the next 30 years is respectively: 0–1%, 70%, 87%, 60–70%, and 60%. *Id.* The percentage of households with insurance, respectively: 26.83%, 27.52%, 27.95%, 25.86%, and 24.60%. *Id.*
[166] This number, however, only concerns households that are insured by private insurers; insurance is also provided by the Kyosai, which may increase the coverage, but still coverage remains low. *See* JAPAN EARTHQUAKE REINSURANCE CO., *supra* note 58, at 14; *see also* FINANCIAL SERVICES AGENCY, *supra* note 112.

Provisions include economic support for livelihood, house provision and reconstruction, as well as support for small- and medium-sized enterprises and the self-employed.[167] Support can take the form of a monetary grant, subsidized loans, publicly provided housing and so on. In addition to the national public support system, several local governments have also introduced their own housing recovery systems.[168] One example is the Mutual Housing Recovery Support System established in the Hyogo Prefecture in 2005.[169] This section separately discusses the national public support and the local mutual aid systems.

1. Government Support

In Japan, many methods can be employed to relieve individuals and small enterprises from the significant influence of natural disasters with post-disaster funding. Government support can be provided in different ways: direct monetary support can be given to individuals or families for their living expenses; support can be provided for repair and reconstruction of houses; and beyond support for the basic livelihood of individuals, support can be also provided for business enterprises.[170]

The support provided can be either material or monetary. The shelter, temporary houses, and urgent repair provided by the government fall into the first category. The second category contains many different programs, such as monetary aid provided under the Act Concerning Support for Reconstructing Livelihoods of Disaster Victims (Act No. 66),[171] reduction or exemption of taxes and premiums for some public insurance, and subsidized loans.[172] A comprehensive and detailed introduction of all those instruments is outside the scope of this Article, but a brief explanation will be useful to better understand the compensation system currently in place.

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[167] *See infra* Part I.D.1.
[168] *See infra* Part I.D.2.
[169] *See* THE CLAUSE OF HYOGO MUTUAL AID PROGRAM FOR HOUSING RECONSTRUCTION (2005), *available at* https://www.jutakusaiken.jp/000085979.pdf. For an English introduction to this program, see *Join Hyogo Mutual Aid Program for Housing Reconstruction*, 14 ASHIYA NEWSLETTER (Mar. 1, 2006), http://www.city.ashiya.lg.jp/sankaku/kokusai/documents/20060301.pdf.
[170] A SUMMARY OF THE VARIOUS SUPPORTING REGIMES FOR VICTIMS, CABINET OFFICE (June 30, 2012), *available at* http://www.bousai.go.jp/fukkou/kakusyuseido.pdf.
[171] Hisaisha Seikatsu Saiken Shien Ho [Act Concerning Support for Reconstructing Livelihoods of Disaster Victims], Law No. 66 of 1998 (Japan).
[172] GUIDANCE ABOUT THE VARIOUS SUPPORTING REGIMES FOR CATASTROPHIC VICTIMS, CABINET OFFICE, *available at* http://www.bousai.go.jp/hou/kentou/tyukan/sankou.pdf.

The following laws and programs are discussed in this section: support under the Disaster Relief Act, the Condolence Grant Program, support for reconstructing the livelihoods of disaster victims, financial aid for victims of major disasters, and the reconstruction fund.

a. Disaster Relief Act

The Disaster Relief Act stipulates the emergency measures the government should carry out after a disaster occurs.[173] The purpose of this legislation is "to protect victims of disaster and maintain social order by causing the Central Government to provide needed relief services on an emergency basis in cooperation with Local Public Entities and the Red Cross, other entities, and the people of Japan."[174] The relief provided under the Disaster Relief Act is mainly in-kind support, such as the provision of shelters, the provision of food through cooking, the provision of water, the provision or lending of clothes, beds, and other necessities and so on.[175]

Monetary aid is only of secondary importance: it is provided only when governors of prefectures deem it necessary.[176] In case of a disaster, the prefectural government needs to carry out relief activities. The prefectures shall pay for the expenses of the relief activities. However, when the expenses exceed a given proportion of the general tax revenues of the prefecture, the national treasury shall pay from fifty to ninety percent of the expenses.[177]

The Disaster Relief Act prescribes the emergency relief measures that should be taken by government in case of a disaster. However, it is limited to in-kind support. This limits where individuals can reside and makes the reconstruction in new places difficult. Besides, the free provision of temporary housing makes the residents reluctant to leave once they have moved in.[178]

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[173] Saigai Kyujo Ho [Natural Disaster Victims Relief Act], Law No. 108 of 1947, art. I (Japan).
[174] *Id.*
[175] *Id.* art. 23.
[176] *Id.*
[177] *Id.* art. 36.
[178] Eiji Tajika & Takeshi Miyazaki, *Disaster Relief and the Role of Fiscal Assistance—The Case of the Niigata Chuetsu Earthquake*, 91 FIN. REV. 22 (2008). The paper was presented in English at the International Symposium on "5.12" Wenchuan Massive Earthquake Restoration, Reconstruction and Catastrophe Response, *available at* http://www.sc.gov.cn/zwgk/zwdt/bmdt/201009/t20100922_1032087.shtml.

b. The Condolence Grant Program

Under the Act Concerning the Provision of Disaster Condolence Grants, cash payment is provided to relieve the victims and family members of deceased or seriously injured victims.[179] It provides three kinds of relief: grants to family members of the deceased, grants to the seriously injured, and loans to disaster victims.[180] The first program gives relief payment to the family members of the deceased, with five million yen (64,000 USD) for the death of heads-of-household and 2.5 million yen (32,000 USD) for the death of other family members.[181] In the event of serious injury, a family can be paid 2.5 million yen (32,000 USD) for injury to the head-of-household or 1.25 million yen (16,000 USD) for injury to another family member.[182] Municipalities are responsible for the payment of these grants. According to the act, one third of the expenses shall be born by prefectures.[183] The national government will pay two thirds of the prefectures' expenses.[184]

In addition to the direct grant, the government can also provide a "loan as disaster aid fund."[185] If the head of a household is injured or a family suffers damage to their house or household goods to an extent defined by government orders, a loan can be provided.[186] A grace period of three years—which can under extraordinary situations be set at five years—applies, and the loan must be repaid within ten years from the day of borrowing.[187] The national government bears two-thirds of the expenses of this loan, while the prefectural government bears the remaining third.[188]

The Condolence Grant Act provides emergency financial support to a limited number of persons in the form of a condolence grant or a low-interest loan, which the borrowers are supposed to repay in three to five years.[189] However, defaults pose a problem in case of a major disaster. The

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[179] *See* DISASTER RELIEF AND SUPPORT FOR VICTIMS, MINISTRY OF HEALTH, LABOUR AND WELFARE, *available at* http://www.mhlw.go.jp/english/wp/wp-hw5/dl/23010813e.pdf.
[180] Act on the Provision of Disaster Condolence Grants, Law No. 82 of 1973, art. 3 (Japan).
[181] *See* DISASTER RELIEF AND SUPPORT FOR VICTIMS, *supra* note 179.
[182] *Id.*
[183] Aya Okada & Louise Comfort, *"Black Swan" in Northeastern Japan: Interdependent Systems, Escalating Disaster on March 11, 2011* 17 (Graduate Sch. For Pub. & Int'l Affairs, Working Paper No. 1201).
[184] *Id.*
[185] Tajika & Miyazaki, *supra* note 178.
[186] *See id.*
[187] *Id.*
[188] *Id.*
[189] *Id.*

Kobe earthquake led to irrecoverable loans of up to 25.1 billion yen (321 million USD).[190] Scholars argue that these defaults can provoke a sense of unfairness among the debtors and create a moral hazard problem.[191] Therefore, they call for a stringent review of the existing loan program.[192]

c. The Act Concerning Support for Reconstructing Livelihoods of Disaster Victims

The Kobe earthquake in 1995 damaged a large number of houses.[193] At the time, the penetration of earthquake insurance was low. The main source for housing recovery up to the earthquake was donated money.[194] In the case of Kobe, the total amount of donated money was large, but so was the total number of victims; because of this, each household was given only 257,070 yen (3300 USD).[195] This clear inadequacy led to discussions among "local government, various organizations, and political parties" about "measures for supporting disaster victims in house reconstruction and in restoring their lives."[196] In 1998, the Act Concerning Support for Reconstructing Livelihoods of Disaster Victims ("Act No. 66") was enacted.[197] It provides financial support to any "disaster victim[] whose house has been totally destroyed or who suffer similar damage."[198] The amount of assistance should be no more than one million yen (13,000 USD) and should be used for "purchasing household goods necessary for reconstructing their lives."[199]

Although the Act started to provide a structural solution to the provision of financial support, instead of loans, Act No. 66 "was criticized for the strict requirements for designation of the areas covered" and for the low eligibility requirements as far as annual income was concerned.[200] As

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[190] *Id.*
[191] *See* Tajika & Miyazaki, *supra* note 178.
[192] *Id.*
[193] *See* NLIRO, *supra* note 16, at 71; *see also* Hiroo Kanamori, *The Kobe (Hyogo-ken Nanbu), Japan, Earthquake of January 16, 1995*, 66 SEISMOLOGICAL RESEARCH LETTERS 6, 6 (1995), *available at* http://mh-gps-p1.caltech.edu/uploads/File/People/kanamori/HKsrl95b.pdf.
[194] Maki, *supra* note 28.
[195] *Id.*
[196] *See* NLIRO, *supra* note 16, at 71.
[197] *Id.*
[198] *Id.*
[199] *Id.*
[200] *Id.* The criticism referred to the fact that only those who had an income lower than a particular threshold were eligible for compensation. *Id.*

a result, many households were not eligible for financial support under the Act. Act No. 66 was revised in 2004 and in 2007.[201] Under the 2004 system, financial aid is provided in an amount "not more than two million yen (26,000 USD) for demolition expenses for rebuilding houses, house rents" and other actual expenses, "in addition to the support already offered under the old Act regarding living expenditures to be allocated for the purchase of necessary contents."[202] The 2007 revision relaxed the requirements for grant support and "adopted a flat-rate provision of financial support according to the degree of house damage and the manner of house reconstruction."[203] The financial aid provided falls into two categories: aid based on the degree of damage to the house and aid based on the manner of reconstruction of the house.[204] The aid provided under the first category could be one million yen or half a million yen (6504 USD), depending on whether the house is totally destroyed or largely destroyed.[205] The aid provided under the second category could be two million yen, one million yen, or half a million yen, depending on the method of reconstruction.[206] The use of financial support was not restricted to a specific purpose, such as rebuilding or renting, as required under the 2004 revisions.[207]

Under the existing financial aid system, the requirements regarding the annual income and age of recipients have been abolished. Eligibility for financial support is determined according to the specified geographic areas which suffered from a certain disaster and the extent of damage suffered by the victims.[208] The aid can be provided up to three million yen (39,000 USD) per household, with three quarters that amount available to a single-person household.[209] Aid is still provided under two categories: aid based on the degree of house damage and aid based on the manner of house reconstruction (construction or purchase, repair and house rent).[210] According to the act, the prefectural government can authorize a supporting legal person to distribute the financial aid.[211] The prefectural government will

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[201] *Id.* at 72.
[202] NLIRO, *supra* note 16, at 72.
[203] *Id.* at 72–73.
[204] *Id.* at 73.
[205] *Id.*
[206] *Id.*
[207] *Id.* at 72–73.
[208] NLIRO, *supra* note 16, at 73.
[209] *See id.*
[210] *Id.*
[211] Act Concerning Support for Reconstructing Livelihoods of Disaster Victims, *supra* note 171, art. 4.

finance the supporting legal person according to the mutual aid principle.[212] In addition, the central government will provide half of the aid paid by the support legal person if a greater fund is necessary.[213] It is estimated that by 2008, the reserve fund accumulated by the prefecture amounted to 113 billion yen (1.47 million USD).[214] This has been criticized by scholars as insufficient if a large-scale earthquake were to occur.[215]

The recent Tōhoku earthquake has proved the insufficiency of the system. The cabinet office reported that the death toll from this earthquake was 15,843, and that 3809 persons were missing.[216] It led to 118,480 houses totally destroyed and 182,825 houses half destroyed.[217] The property damage was estimated by the cabinet office to be 16,900 billion yen (220 billion USD).[218]

d. The Law for Financial Aid for Major Disasters

In addition to direct payments to disaster victims, a system aiming at reconstructing and recovering the economy also exists in Japan. The systems for financial aid for major disasters and reconstruction funds have this purpose.[219] In case of a catastrophic disaster that "will inflict a far-reaching and serious effect upon the national economy" and in the event that "it is deemed necessary to alleviate the local financial burden caused by the disaster or to provide special subsidies to the victims," special measures will be taken.[220] Those measures are established under the Law Concerning Special Financial Aid to Deal with Major Disasters ("Major Disasters Law").[221] When a disaster is designated as a "major disaster" according to the Major Disaster Designation Standard, special financial aid can be disbursed to promote the recovery of public civil engineering

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[212] *Id.* art. 9.
[213] *Id.* art. 18.
[214] *See* Tajika & Miyazaki, *supra* note 178.
[215] *Id.*
[216] CABINET OFFICE, TOHOKU-PACIFIC OCEAN EARTHQUAKE (2011), *available at* http://www.kantei.go.jp/saigai/pdf/201110041700jisin.pdf.
[217] *Id.*
[218] MOTOHIRO SATO & LAURA BOUDREAU, WORLD BANK, KNOWLEDGE NOTE 6-4: THE FINANCIAL AND FISCAL IMPACTS 4 (2012), *available at* http://wbi.worldbank.org/wbi/Data/wbi/wbicms/files/drupal-acquia/wbi/drm_kn6-4.pdf.
[219] *See* Law Concerning Special Financial Aid to Deal with Major Disasters, Law No. 150 of 1962, art. 1 (Japan).
[220] Tajika & Miyazaki, *supra* note 178.
[221] *Id.*

facilities.[222] Special aid can also be provided for small- and medium-sized enterprises and to the agricultural, forestry and fishery industries.[223] The available aid under this Act includes the national treasury's share of the expenses for projects to recover public civil engineering works, low interest loans to the agricultural, forestry, and fishery industries, and credit security for small- and medium-sized enterprises.[224] The Major Disaster Designation Standard is a nationwide standard.[225] There may be situations where an area suffers serious localized damage that does not have national influence, and so cannot benefit from a major disaster designation. To deal with these cases, the Localized Major Disaster Designation Standard was also set up.[226]

e. The Reconstruction Fund

The reconstruction fund is also frequently used to supplement the government's efforts in case of a major disaster. For example, after both the Kobe earthquake of 1995 and the Niigata Chuetsu earthquake of 2004, a reconstruction fund was established with the aim to "supplement the existing reconstruction measures in post-disaster recovery, carry out relief activities for and help the self-reliance of disaster victims, and facilitate steadily and dynamically comprehensive reconstruction measures in disaster-stricken areas from a long-term perspective."[227] The reconstruction fund can be used to provide socioeconomic rehabilitation aids for victims, provide housing aid, support industries such as agriculture, forestry and fishery.[228]

A reconstruction fund works as follows: the prefectural government borrows money by issuing bonds from banks and makes a loan to the reconstruction fund.[229] The national government pays the interest with tax grants; this amount will be deducted from the annual tax grants to the prefecture in the following years.[230] The prefectural government then lends

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[222] *Id.*
[223] *Id.*
[224] *Id.*
[225] *Id.*
[226] Tajika & Miyazaki, *supra* note 178.
[227] *Id.*
[228] *Id.*
[229] *Id.*
[230] *Id.* Under the Japanese system, the national government makes financial transfer to prefectures and municipalities through tax grants every year to protect the autonomy of

this without interest.[231] The fund then "uses the loan from the prefecture to buy loan claims owned by the banks."[232] The money actually transferred is the interest for the debt. In other words, the principle of the fund comes from the amount provided by the national government.[233]

2. Local Mutual Support Funds

Some prefecture governments have also established a housing recovery support system.[234] Many of those systems simply complement the national system.[235] The Hyogo Prefecture established a different support system.[236] Having been severely affected by the Kobe earthquake, the Hyogo Prefecture created a house rehabilitation mutual aid system in 2005.[237] It enacted the Regulation on the Mutual Aid Program for Housing Reconstruction and the corresponding Clause of Mutual Aid Program for Housing Reconstruction in 2005.[238] The Mutual Aid System for Housing Reconstruction ("Housing System") provides relief to victims who suffer from "storms, heavy rain, heavy snow, flooding . . . earthquakes, tsunami, [volcanic] eruptions or any other disaster caused by abnormal natural phenomena."[239] It is a kind of mutual insurance system, run by the local government.

Participation in this system is voluntary, and contributions are fixed. All people who live in the Hyogo Prefecture, whether they own or rent, can participate in the system.[240] At the time the system was established, the annual premium was 5000 yen (64 USD).[241] Relief can be paid if the member suffers total or partial damage to her house. Relief is available up to 6 million yen (77,000 USD), depending on the extent of

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the local areas and balance the finances of different areas. *See* NOBUKI MOCHIDA, WORLD BANK INSTITUTE, TAXES AND TRANSFERS IN JAPAN'S LOCAL PUBLIC FINANCES 2–4 (2001), *available at* http://siteresources.worldbank.org/WBI/Resources/wbi37171.pdf.

[231] Tajika & Miyazaki, *supra* note 178.

[232] *Id.*

[233] *Id.*

[234] *See* Maki, *supra* note 28.

[235] *Id.*

[236] *Id.*

[237] *Id.*

[238] HYOGO PREFECTURE, *supra* note 28, at 7.

[239] *Id.*

[240] *Id.*

[241] *Id.* at 2.

damage and whether the victim needs to reconstruct, purchase, or repair the house.[242]

In 2010, a similar mutual aid clause was established for household goods.[243] Under that system, a premium up to 1500 yen (19 USD) can purchase coverage up to 500,000 yen (6418 USD).[244] The Mutual Aid System for Household Articles Restoration ("Household Articles System") is independent from the mutual aid system for residences.[245] However, if a member already participates in the Housing System, then his contribution to the Household Articles system is discounted (1000 yen [13 USD] per year).[246] The penetration rate of this system is still low. The Hyogo Prefecture reports that the rate of participation in the mutual aid system for houses in 2010 is only eight percent, while that for household goods is 1.6 percent.[247]

E. Evaluation

1. Risk Differentiation

A positive aspect of the insurance system in Japan is undoubtedly that premiums are risk-related. As discussed above,[248] recommendations on premiums by NLIRO are differentiated on the basis of the location and on the basis of the construction material used.[249] However, a problematic aspect is that in practice, the recommendations by NLIRO are automatically transposed into premiums by the commercial insurers.[250] These types of recommendations limit competition.[251] Moreover, the risk differentiation only applies to earthquake insurance offered by private insurance companies. The Kyosai provide all-inclusive insurance, including earthquake coverage, that does not vary by location and lacks the mitigation incentives that stem from risk differentiation.[252]

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[242] *Id.*
[243] *Id.* at 9.
[244] HYOGO PREFECTURE, *supra* note 28, at 2.
[245] *Id.*
[246] *Id.* at 5.
[247] Noting that the Household Articles System was only established in 2010. *See* http://web.pref.hyogo.jp/contents/000186201.pdf (last visited Nov. 2, 2012).
[248] *See* JAPAN EARTHQUAKE REINSURANCE CO., *supra* note 58, at 5.
[249] *Id.*
[250] *See supra* note 67 and accompanying text.
[251] *See* Michael Faure & Roger Van den Bergh, *Restrictions of Competition on Insurance Markets and the Applicability of EC Anti-Trust Law*, 48 KYKLOS 65 (1995).
[252] *See supra* Part I.A.2.

There seems to be an adequate supply of different earthquake insurance mechanisms. Individuals seeking coverage for earthquake risks can choose between commercial private insurers, the Kyosai, and in some cases local mutual funds. In principle, potential victims wishing to seek insurance coverage in Japan can choose from a large variety of options.[253] However, a problem may arise from the fact that there is little competition between the various insurers, an issue exacerbated by the fact that the Japanese insurance market is still relatively closed to penetration by foreign insurers.[254] Only insurance companies operating via internet would offer lower rates, but since trust and credibility are very important in Japanese society there may be a reluctance to purchase earthquake insurance over the internet.[255]

2. Remaining Inefficiencies

In spite of the positive aspects of the catastrophic insurance system in Japan, there are still some inefficiencies in this system. The literature has shown some problems in the household insurance provided by private insurers. Indeed, the penetration rate of earthquake insurance for households provided by private insurers is still low.[256] This can be attributed to three factors. First, many people tend to underestimate the earthquake risks. When facing low-frequency, high-magnitude risks, people tend to assume that "[i]t will not happen to me," and do not have sufficient incentives to buy insurance or take mitigation measures.[257] A sudden rise in insurance participation rates following a major earthquake reflects the underestimation of earthquake risk.[258] After the 1995 Kobe earthquake,

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[253] Shimada Interview, *supra* note 67.
[254] *Id.*
[255] *Id.*
[256] According to NLIRO, the average proportion of fire insurance policies with the attachment of earthquake insurance in 2011 in Japan was 53.7%. *See* NLIRO, TREND OF EARTHQUAKE INSURANCE ATTACHMENT RATE BY PREFECTURE (2011), *available at* http://www.nliro.or.jp/english/pdf/data/e_data10.pdf. The penetration rate when considering only households is even lower. According to JER, as of 2011, this rate is 23.7%. *See* JAPANESE EARTHQUAKE REINSURANCE CO., http://www.nihonjishin.co.jp/topics/t110829.pdf (last visited Nov. 2, 2012). These numbers show that in general (looking at commercial risks and Household Insurance) the earthquake coverage is limited (48.1%), but that this number is even lower when only households are considered (23.7%).
[257] *See* Kunreuther, *supra* note 57, at 9; Pierre Picard, *Natural Disaster Insurance and the Equity-Efficiency Tradeoff*, 75 J. RISK & INS. 17 (2008).
[258] RISK MANAGEMENT SOLUTIONS, 1995 KOBE EARTHQUAKE 10-YEAR RETROSPECTIVE 9, *available at* http://www.rms.com/publications/KobeRetro.pdf.

the penetration rate of earthquake insurance was seven percent in the whole country, and three percent in Hyogo Prefecture, the epicenter of the earthquake.[259] Immediately after the disaster, "the demand for earthquake cover doubled to 15 percent of Japanese households."[260]

A second reason for the low penetration of earthquake insurance is the lack of trust in Japan's earthquake insurance system. The strict conditions mandated for insurance payment, differing assessments of the damage by policyholders and insurers, and newspaper reports about non-payment by insurers all contribute to the distrust of households.[261] Some scholars attribute the ambiguity of insurance payments to the information asymmetry between policyholders and insurers, as well as the lack of experience on both sides of the transaction that results from the rarity of earthquakes.[262]

A third reason is the adverse selection problem. A certain level of risk differentiation has been achieved in the premium setting. The basic rating is set according to the structure of the building and the location of the insured households.[263] A discount rate can be granted if some risk resistant measures are taken.[264] However, this system of premium setting is still criticized by some scholars as insufficient.[265] A uniform community rating system has been adopted in Japan. The estimate of earthquake risks and correspondingly, the premiums, are computed at the geographical level of the prefectures.[266] Each prefecture is then classified into one of the rating zones.[267] The division of zones has been criticized by some scholars as "extremely rough and crude."[268] They are in favor of a system based on the risk estimate from the Probabilistic Seismic Hazard Map ("PSHM").[269] The

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[259] *Id.*
[260] *Id.*
[261] *See* Nobuyoshi Yamori et al., *Preparing for Large Natural Catastrophes: The Current State and Challenges of Earthquake Insurance in Japan* 15 (Munich Personal RePEc Archive, MPRA Paper No. 8851, 2009), *available at* http://mpra.ub.uni-muenchen.de/8851/1/MPRA_paper_8851.pdf.
[262] *See* Toshio Fujimi & Hirokazu Tatano, *Ambiguity, Risk and Earthquake Insurance Premium: An Empirical Analysis*, 49 ANNUALS OF DISASTER PREVENTION RESEARCH INST. 137, 137–38 (2006).
[263] *See* NLIRO, *supra* note 16, at 41–42.
[264] *See id.*
[265] *See* Michio Naoi et al., *Community Rating, Cross Subsidies and Underinsurance: Why So Many Households in Japan Do Not Purchase Earthquake Insurance*, 40 J. REAL ESTATE FIN. ECON. 544, 560 (2010).
[266] *Id.* at 547.
[267] *Id.*
[268] *Id.* at 547–48.
[269] *Id.* at 559–60.

PSHM is provided by the National Research Institute for Earth Science and Disaster Prevention and shows the probability of earthquake occurrence and the likely range of seismic intensity.[270] Using the PSHM leads to more accurate risk calculations, because while the risk classification under the existing rating system is based on the prefectural level, the PSHM shows that the earthquake risk also differs within a prefecture.[271] Moreover, the possibility of an earthquake over magnitude six in the next thirty years varies drastically by region, from more than twenty-six percent to less than 0.1 percent.[272] According to the existing zone classification system, the premium disparity between Class 1 (low risk) and Class 4 (high risk) is only 1.19 yen per thousand yen insured for non-wooden structures and 2.13 yen per thousand yen insured for wooden structures.[273] The significant variation in earthquake risk between classes is not sufficiently reflected in the premium rating.[274] The existing community uniform rating may cross subsidize inhabitants in high risk areas at the expense of inhabitants in low risk areas who are currently charged similar premiums.[275]

3. Earthquake Insurance and the Role of Government

The above arguments are made mainly from the perspective of efficiency. Premiums should be risk-based, so that households will have incentives to buy insurance and take risk mitigation measures.[276] An insurance system needs to be fair and affordable as well; there is a tradeoff between efficiency and equity in designing the compensation system for natural disasters.[277] Efficiency requires premiums to reflect risks. On the other hand, insurance needs to be affordable, especially for the ones who are now residing in the hazard-prone areas.[278] This tradeoff can be achieved with a certain level of government intervention.

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[270] *Id.* at 553.
[271] *See* Naoi et al., *supra* note 265, at 553–54.
[272] *See What Are the National Seismic Hazard Maps for Japan?*, JAPAN SEISMIC HAZARD INFORMATION STATION, http://www.j-shis.bosai.go.jp/en/shm.
[273] NLIRO, *supra* note 16, at 42.
[274] *See* Yamori et al., *supra* note 261, at 19–20.
[275] *See* Naoi et al., *supra* note 265, at 560.
[276] *See* Picard, *supra* note 257, at 19.
[277] *Id.* at 26–27; *see also* Scott E. Harrington & Greg Niehaus, *Government Insurance, Tax Policy, and the Affordability and Availability of Catastrophe Insurance*, 19 J. INS. REG. 591, 603–05 (2001).
[278] *See* Kunreuther, *supra* note 57, at 12–13.

The government can provide insurance directly, act as a reinsurer, set uniform insurance premiums, or use some other policy measures, with less direct intervention, such as tax policy. Usually, there is a preference to stimulate competitive insurance markets rather than having direct government support.[279] Direct government support may create moral hazard problems by giving the consumer false incentives in preparing for, and taking mitigation measures for, a natural disaster. Moral hazard is less of a problem in the case of insurance. A survey conducted by NLIRO in 2003 shows that one third of the respondents who had earthquake insurance coverage responded that they "had considered the method of construction and manufacturing of residential property at the time of construction," while the proportion falls to about eighteen percent for non-insured respondents.[280] This result shows that taking an earthquake insurance policy does not deteriorate the incentives to take mitigation measures.

In a competitive insurance market, the government can still take some measures to make insurance affordable and fair. However, it should be kept in mind that government interventions aimed at subsidizing insurance should only be targeted at people who are currently residing in the risk-prone areas. Insurance subsidies for incoming residents will encourage the development of those areas and exacerbate the potential catastrophic losses.[281] Targeting only current residents can be achieved by tax subsidy transfers,[282] providing insurance vouchers to those who are now residing in hazard-prone areas,[283] or allowing insurers to make tax-deferred reserves.[284] In Japan, a tax-deferred reserve is adopted for household earthquake

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[279] *See id.* at 10–11.

[280] Yamori et al., *supra* note 261, at 12–13. This survey is referred to as the "Consumer Awareness Survey Regarding the Danger of Major Earthquakes" and is one of the few large scale surveys of attitudes regarding household earthquake insurance in Japan. *Id.* The survey was conducted nationwide on 3700 households, of which 3361 responded. *Id.* Of those respondents, 1435 were policyholders of earthquake insurance, 961 with only fire insurance, and 965 were not covered by non–life insurance. *Id.*

[281] *See* Kunreuther, *supra* note 57, at 12–13.

[282] *See* Picard, *supra* note 257.

[283] Kunreuther, *supra* note 57, at 12; *see also* Howard Kunreuther & Mark Pauly, *Rules Rather than Discretion: Lessons from Hurricane Katrina*, 33 J. RISK UNCERTAINTY 101 (2006).

[284] Scott Harrington & Greg Niehaus, *Government Insurance, Tax Policy, and the Affordability and Availability of Catastrophe Insurance*, 19 J. INS. REG. 591, 606 (2001). Under such a system, insurers are allowed to make tax deductible contributions from premium income to a special reserve. *Id.* The funds from this reserve would be available for catastrophic losses. *Id.* The total accumulation of tax-deferred contributions is "limited to specified multiples of premiums (net of reinsurance) for each line of business." *Id.*

insurance.[285] In 2006, a new premium tax deduction system for earthquake insurance was introduced.[286] Individuals can deduct the amount of premiums paid from their income up to 50,000 yen (651 USD) under the Income Tax Law and 25,000 yen (325 USD) under the Local Tax Law.[287]

Another proposal has been given to overcome some of the inefficiencies of the existing catastrophic insurance system: to provide long-term homeowner insurance and to cover all hazards.[288] A long-term insurance policy will give policyholders stability and an assurance for the protection of their property during the whole period of ownership. It also gives policyholders incentives to invest in mitigation, since their investment will be repaid with the reduction in premiums in the following years. All-hazard coverage is desirable because the costly process of determining the reason for the damage is no longer necessary.[289] The insurers do not need to determine whether the damage is caused by earthquake or fire if both are covered.[290] It also reduces homeowners' confusion as to whether or not they have coverage.[291] Besides, the "diversification of risk across many hazards" reduces the risks for insurers.[292] Of course, this proposal also has challenges, such as the pricing and acceptability of such policies. However, it provides another avenue to address the difficulties in providing catastrophic insurance.

In Japan, this proposal has been put into practice. The insurance provided by Kyosai is one of the examples. This insurance policy is provided for five or more years.[293] This policy covers residential buildings and property from damage caused by fire, flood, earthquakes, and other disasters.[294] This system applies quite broadly, even more broadly than earthquake insurance provided by private insurers.[295]

The government plays an active role in the provision of earthquake insurance by supporting the reinsurance scheme.[296] As discussed

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[285] Alberto Monti, *Policy Approaches to the Financial Management of Large Scale Disasters*, *in* 12 POLICY ISSUES IN INSURANCE: FINANCIAL MANAGEMENT OF LARGE-SCALE CATASTROPHES 75, 78 (2008).
[286] *Id.*
[287] *Id.*
[288] Kunreuther, *supra* note 57, at 18–19.
[289] *Id.*
[290] *See id.*
[291] *Id.*
[292] *Id.*
[293] Yamori & Okada, *supra* note 63, at 190.
[294] *See id.*
[295] *See id.*
[296] *See supra* Part I.A.1.c.

previously,[297] the government bears a substantial part of the reinsurance risk. JER provides reinsurance and the government plays a role in this respect as well.[298] It is unclear whether the government charges a fee for the support to the reinsurance scheme. To the extent that this is not the case, this intervention by the government in the earthquake reinsurance scheme could be considered a subsidy, which could be criticized from an economic perspective.

Another problem is the fact that government support is still provided in addition to insurance. This type of government support can lead to a so-called "charity hazard," meaning that the compensation would create a moral hazard problem on the side of victims who would have no incentive any longer to demand disaster insurance.[299] That is why economists often consider government-provided compensation as a "catastrophic response to catastrophic risk."[300]

The compensation provided by the government in Japan seems to be relatively limited. While there is support for reconstructing livelihoods, and there are condolence grant programs, the support provided by these government aid programs seems to be more modest than the compensation payments offered via insurance coverage.[301] Since insurance coverage is not complete, some government aid (via disaster relief programs) is focused on in-kind support that would not be provided via insurance coverage.[302]

Cash payments through government aid are very limited.[303] That is why the government support programs exist in addition to, not in place of, insurance. However, the question can still be asked whether the relative generosity of government support programs in Japan may also be one of the causes of the low penetration of earthquake insurance. A criticism on generous government support for natural disasters is that this government support usually does not provide any incentives for risk reduction, while

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[297] *See id.*
[298] *See* Yamori, *supra* note 63, at 192.
[299] *See* Mark J. Browne & Robert E. Hoyt, *The Demand for Flood Insurance: Empirical Evidence*, 20 J. RISK UNCERTAINTY 291, 293 (2000). *See generally* Paul A. Raschky & Hannelore Weck-Hanneman, *Charity Hazard—A Real Hazard to Natural Disaster Insurance?*, 7 ENVTL. HAZARD 321, 321–29 (2007).
[300] Richard A. Epstein, *Catastrophic Responses to Catastrophic Risks*, 12 J. RISK UNCERTAINTY 287, 287 (1996); Louis Kaplow, *Incentives and Government Relief for Risk*, 4 J. RISK UNCERTAINTY 167, 172–73 (1991).
[301] *See supra* Part I.D.
[302] *See id.*
[303] *See id.*

insurance programs do.[304] However, in Japan it is apparently not considered problematic that all victims may benefit from government relief even though some victims have purchased insurance and others did not. It is apparently considered very important to treat all victims in an equal manner.[305] Since insurance coverage[306] only is limited to 30% to 50% of the amount of fire insurance, government support is meant to come on top of the insurance coverage. For example, the Act Concerning Support for Reconstructing Livelihoods of Disaster Victims, discussed above,[307] allows victims to receive up to 3 million yen in cash (39,000 USD) in addition to insurance.[308] However, given that insurance coverage is limited, this should not necessarily create a charity hazard.

The precise interplay between insurance and government-provided compensation in Japan may still merit further attention, particularly with respect to the question to what extent the government-provided compensation would influence the incentives to seek insurance coverage.

4. Mandatory Insurance?

Above we indicated that the penetration rate of privately provided earthquake insurance for households is relatively low: only about one quarter.[309] Even if one adds the coverage provided via the Kyosai,[310] coverage remains limited.[311] On the other hand, data shows Japan's vulnerability to serious earthquakes.[312] Table 1, provided above, shows that in the past century Japan has been hit by many major earthquakes,[313] and the literature also indicates that the probability of new earthquakes occurring in Japan has to be taken seriously as well.[314] The following table provides an estimate of these occurrence probabilities concerning earthquakes:

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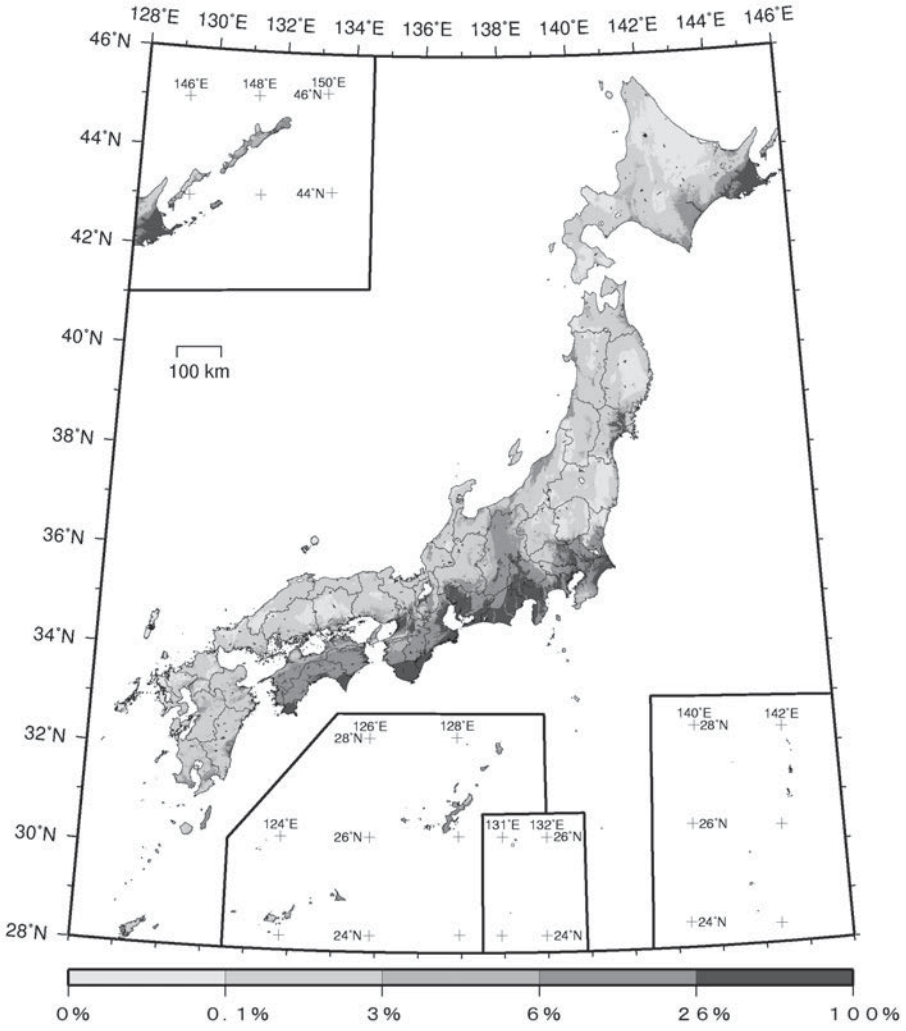
[304] George L. Priest, *The Government, the Market and the Problem of Catastrophic Loss*, 12 J. RISK UNCERTAINTY 219, 228 (1996); Scott E. Harrington, *Rethinking Disaster Policy*, 23 REG.—THE CATO REV. OF BUS. AND GOV'T 40, 43 (2000).
[305] Shimada Interview, *supra* note 67.
[306] NLIRO, *supra* note 16, at 31–32.
[307] *See supra* Part I.D.1.c.
[308] NLIRO, *supra* note 16, at 73.
[309] *See supra* Part I.E.2.
[310] *See supra* Part I.A.2.
[311] Shimada Interview, *supra* note 67.
[312] *See* JAPAN SEISMIC HAZARD INFORMATION STATION, *supra* note 272.
[313] *See* Table 1, *supra* Part I.
[314] *See* NLIRO, *supra* note 16, at 55.

TABLE 7: OCCURRENCE PROBABILITY OF EARTHQUAKES WITH GROUND MOTIONS EQUAL TO OR LARGER THAN JAPAN METEOROLOGICAL AGENCY SEISMIC INTENSITY 6 LOWER WITHIN 30 YEARS.[315]



Taking into account the relatively low penetration rate of earthquake insurance and the relatively high probability of earthquakes in Japan, the question could be asked whether the insurance system should be made compulsory or not. Strong arguments in favor of mandatory comprehensive insurance for the coverage of natural disasters have been

[315] *See* JAPAN SEISMIC HAZARD INFORMATION STATION, *supra* note 272.

presented in economic literature.[316] Given the particular vulnerability of Japan and the behavioral biases preventing people from taking adequate insurance coverage, which apparently play a serious role in Japan as well, there seem to be strong arguments in favor of comprehensive earthquake insurance in Japan. Comprehensive insurance may also have the advantage that it could deal with the problem of reduced incentives to purchase insurance which may follow from generous government support.

II. THE COMPENSATION SYSTEM FOR NUCLEAR DAMAGE[317]

Nuclear energy is an important energy source in Japan. It is reported that as of 2009, "fifty-four commercial nuclear power plants are operating at 17 stations with a total licensed generating capacity of 48,847 MWe which was approximately 20% of the total capacity of electric power generation."[318] In 2009, the total amount of power generated by nuclear power plants was 279.80 TWh, or about thirty percent of Japan's total electric power supply.[319]

In a country like Japan, where nuclear energy is so prominent, the liability system to prevent and compensate nuclear damage is extremely important. Japan does not participate in any international convention on civil liability for nuclear damage.[320] Japan has not felt the need to join international conventions, since other major nuclear powers, like the U.S., India, and China, were not party to the international nuclear liability conventions either.[321] Japan established its own national regime through four major legislative instruments: the Act on Compensation for Nuclear Damage ("Act on Compensation"), the Order for the Execution of the Act on Compensation for Nuclear Damage ("Order on Compensation"), the Act

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[316] *See, e.g.*, Howard Kunreuther, *The Case for Comprehensive Disaster Insurance*, 11 J.L. & ECON. 133, 162 (1968); *see also* Howard Kunreuther, *Mitigating Disaster Losses Through Insurance*, 12 J. RISK UNCERTAINTY 171, 182–83 (1996).

[317] For a detailed analysis of the compensation system for nuclear damage in Japan as well as of the Fukushima incident, see Julius Weitzdörfer, *Die Haftung für Nuklearschäden Nach Japanischem Atomrecht—Rechtsprobleme der Reaktorkatastrofe von Fukushima I, Zeitschrift für Japanisches Rech*, 31 J. OF JAPANESE LAW 61 (2011) (*Liability for Nuclear Damages Pursuant to Japanese Atomic Law—Legal Problems Arising from the Fukushima I Nuclear Accident*).

[318] JAPAN NUCLEAR ENERGY SAFETY ORG., CURRENT STATUS OF NUCLEAR FACILITIES IN JAPAN 1 (2010), *available at* http://www.jnes.go.jp/english/activity/unkan/e-unkanhp1/e-unkanhp1-2010/book1/book.pdf.

[319] *Id.* at 4.

[320] *See Liability for Nuclear Damage*, WORLD NUCLEAR ASS'N, http://www.world-nuclear.org/info/inf67.html (last updated Mar. 2012).

[321] Shimada Interview, *supra* note 67.

on Indemnity Agreement for Compensation of Nuclear Damage ("Act on Indemnity") and the Order for the Execution of the Act on Indemnity Agreement for Compensation of Nuclear Damage ("Order on Indemnity").[322] A number of principles of the international third-party liability regimes are embodied in those laws.[323]

A. Liability Rules for Nuclear Damage

The Act on Compensation for Nuclear Damage of 1961 shapes the major structure of the liability rules for nuclear damage and the corresponding financial requirements.[324] The Act on Compensation was initially passed in 1961, and was amended in 2009.[325] Many different kinds of activities were covered under the Act on Compensation: reactor operation, production, reprocessing, the use of nuclear fuel, storage of spent fuel, and waste disposal of nuclear fuel or material contaminated by nuclear fuel.[326] The scope of the nuclear operation is quite broadly defined: not only nuclear reactors, but also many other facilities in the nuclear cycle are covered.[327] The Japanese law is the result of a careful compromise between the interests involved, which is made clear in Section 1, which states that the Act on Compensation aims both at the protection of victims as well as at the promotion of the further development of nuclear energy.[328] The text of Section 1 literally reads: "[t]he purpose of this act is to protect persons suffering from nuclear damage and to contribute to the sound development of the nuclear industry by establishing the basic system regarding compensation in case of nuclear damage caused by reactor operation."[329]

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[322] Copies of English translations can be found at the website of NEA; *see Japan*, NUCLEAR ENERGY AGENCY, http://www.oecd-nea.org/law/legislation/japan.html (last visited Nov. 2, 2012).

[323] The major principles underlying the international nuclear liability conventions contain: strict liability, channeling of liability to the nuclear operator, limited liability, compulsory insurance, exclusive jurisdiction and public funding. For the details of those principles, see Tom Vanden Borre, *Nuclear Liability: An Anachronism in EU Energy Policy?*, *in* EURO. ENERGY L. REP. VII 177, 184 (Martha M. Roggenkamp & Ulf Hammer eds., 2010). Some of those principles are followed in Japanese nuclear law, such as strict liability, channeling of liability and compulsory financial coverage. The major difference is that unlimited liability applies in the Japanese system. The details of those features are discussed in the following section. *See infra* Part II.A.

[324] Genshiryoku Songai no Baisho ni Kansuru Houritsu [The Act on Compensation for Nuclear Damage], Law No. 147 of 1961, *amended by* Act No. 19 of 2009 (Japan).

[325] *Id.*

[326] *Id.* § 2.

[327] *Id.*

[328] *Id.* § 1.

[329] *Id.*

The Act on Compensation stipulates liability for nuclear damage. The term "nuclear damage" is defined as "any damage caused by the effects of the fission process of nuclear fuel, or of the radiation from nuclear fuel etc. or of the toxic nature of such materials."[330] This is broader than the U.S. nuclear liability regime. In the U.S., the Price-Anderson Act imposes the "public liability" for nuclear damage, which means "any liability arising out of or resulting from a nuclear incident or precautionary evacuation."[331] Under the Japanese regime, there is no requirement of a sudden incident.[332] In other words, either damage caused by a nuclear incident or gradual damage can be covered under the Act on Compensation.

As in the international regime, a strict liability regime for nuclear damage is established in Japan, and the liability is channeled to the nuclear operator.[333] However, if the damage is caused by the willful act of a third party, the operator who has compensated the damage has a right of recourse against the third party.[334] Moreover, a nuclear operator can enter into a "special agreement with any person regarding rights of recourse."[335] In other words, through a special contractual arrangement, a nuclear operator has the possibility to recover damages from the contractors who actually contributed to the risks, including plant designers or builders.

If the nuclear damage is caused by a "grave natural disaster of an exceptional character or by an insurrection," the nuclear operator can be exonerated from liability.[336] The phrase "of an exceptional character" is essential to determine the exoneration of liability in the context of the Fukushima accident.[337] Nuclear operators can still be held liable for the nuclear damage caused by an ordinary natural disaster, such as earthquake or volcanic eruption, but they can cover such losses through an indemnity agreement with the government.[338] In the other words, if the natural disasters can not be identified as of an exceptional nature, the operators are still liable. Since insurers usually exclude the damage caused

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[330] The Act on Compensation for Nuclear Damage § 2(2).
[331] 42 U.S.C. § 2014(w).
[332] The Act on Compensation for Nuclear Damage §§ 1–2.
[333] *Id.* § 3. The Act on Compensation makes clear that when nuclear damage is caused, the nuclear operator who is engaged in the reactor operation shall be liable for the damage. *Id.* The title mentions that it is a "liability without fault." *Id.* Section 4 holds a channeling provision which is formulated as follows: "Where nuclear damage is covered by the preceding section, no other person other than the nuclear operator who is liable for the damage pursuant to the preceding section shall be liable for the damage." *Id.* § 4.
[334] *Id.* § 5.
[335] *Id.*
[336] *Id.* § 3.
[337] *Id.*
[338] *Id.* § 10.

by natural disasters from liability insurance policies, this kind of risk is covered by an indemnity agreement concluded with the government.[339]

A major difference between the Japanese regime and the international regime is that in Japan the liability of the nuclear operator is unlimited.[340] Although there is a minimum for the requirement of financial security that has to be provided by the operator, he is still liable for damage in excess of this amount.[341] The details of the financial security are discussed in the following subsection. The prescription period is not specifically stipulated in the Act on Compensation, and is thus determined by the Civil Code.[342] According to Article 724 of the Civil Code, the claim should be made within three years from the date on which the victims had knowledge both of the damage and of the person liable for such damage.[343] The right to compensation is also extinguished twenty years after the date on which the tort occurred.[344] There is often a long lapse between the occurrence of a nuclear accident or exposure and the appearance of the damage.[345] To apply the usual prescription period to nuclear damage hence provides insufficient protection to victims. Even if the claim falls within the limitation period, the claims may be difficult because of the challenges of proving causation.[346]

In case of a nuclear accident, the Dispute Reconciliation Committee for Nuclear Damage Compensation ("Reconciliation Committee") may be established as an organization attached to the Ministry for Education, Culture, Sport, Science, and Technology ("MEXT").[347] The Reconciliation Committee "shall be in charge of mediating reconciliation of any dispute arising from compensation of nuclear damage and of preparing general instructions to help operators reach a voluntary settlement of such disputes."[348] Reconciliation Committees usually are established after a major

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[339] *See* Act on Indemnity Agreements for Compensation of Nuclear Damage, Act No. 148 of 1961, § 3 (Japan), *amended by* Act No. 19 of 2009.
[340] *See* Ximena Vásquez-Maignan, *Fukushima: Liability and Compensation*, 29 NEA NEWS, no. 2, 2011, at 9.
[341] The Act on Compensation for Nuclear Damage §§ 6–7.
[342] MINPŌ [Civil C.] 1896, art. 724 (Japan). An unofficial English translation is available at http://tomeika.jur.kyushu-u.ac.jp/transaction/legislation/civil_code.pdf.
[343] *Id.*
[344] *Id.*
[345] *See Disasters: Nuclear Accidents*, POLLUTIONISSUES.COM, http://www.pollutionissues.com/Co-Ea/Disasters-Nuclear-Accidents.html (last visited Nov. 2, 2012).
[346] Akihiro Watabe, *An Economic Analysis of Nuclear Accidents in Japan*, *in* PERSPECTIVES ON INTERNATIONAL STATE AND LOCAL ECONOMICS 209, 228 (Gerald V. Liu ed., 2006).
[347] The Act on Compensation for Nuclear Damage § 18(1).
[348] *Id.*

accident. For example, after both the Tokai-mura accident in 1999 and the Fukushima accident, a Reconciliation Committee was established to deal with the compensation.[349] The task of this Reconciliation Committee is to "mediate reconciliation of any dispute arising from the compensation of nuclear damage," to "draft instructions establishing the scale of the nuclear damage and other general instructions" to help the settlement of the dispute, and to "investigate and assess nuclear damage."[350]

B. Financial Requirements

Nuclear damage may turn out to be catastrophic, which can dwarf the financial capacity of the liable operators. Financial security provided by operators can be used to guarantee the availability of a certain level of assets in case of damage. The Act on Compensation imposes on the nuclear operators obligations to provide financial security up to a certain level.[351] The financial security is set as 120 billion yen (1.6 billion USD) for each installation site or nuclear-powered ship, though the Cabinet Order may provide for a lower amount.[352] The details of the financial security are set more specifically in the Order for the Execution of the Act on Compensation for Nuclear Damage.[353] For the operation of a reactor "with a maximum thermal rating of less than 10,000 kWth" and reprocessing facilities, the amount is set as 120 billion yen (1.54 billion USD).[354] For other installations, the financial security varies between 4 billion yen (51 million USD) and 24 billion yen (308 million USD).[355] The operator can satisfy his financial obligation by using a contract of liability insurance for nuclear damage, an indemnity agreement (with the government) or a deposit approved by MEXT. The operators have the obligation both to establish and maintain the required level of financial security during their operation.[356] After the

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[349] *See* Secretariat of the OECD Nuclear Energy Agency, *Tokai-Mura Accident, Japan, Third Party Liability and Compensation Aspects*, *in* INDEMNIFICATION OF DAMAGE IN THE EVENT OF A NUCLEAR ACCIDENT 127, 129 (2003) [hereinafter *Tokai-Mura Accident*] (discussing the Tokai-Mura Reconciliation Committee); *Emergency Support Measures for Nuclear Sufferers*, MINISTRY OF ECONOMY, TRADE AND INDUSTRY (May 12, 2011), http://www.meti.go.jp/english/earthquake/nuclear/pdf/20110512_provisional_payment_1.pdf (establishing the Reconciliation Committee for the Fukushima accident).

[350] The Act on Compensation for Nuclear Damage § 18(2).

[351] *Id.* § 6.

[352] *Id.* § 7.1.

[353] Order for the Execution of the Act on Compensation for Nuclear Damage, Cabinet Order No. 44 of 1962, § 2 (Japan), *amended by* Cabinet Order No. 201 of 2009.

[354] *Id.* § 2(i).

[355] *Id.* § 2.

[356] The Act on Compensation for Nuclear Damage § 7(1).

payment of compensation for nuclear damage, the amount available for compensation of nuclear damage may fall below the required level. If MEXT deems it necessary to ensure full compensation, it may order the operators to bring the amount available for compensation of nuclear damage up to the required amount by a given time.[357] The use of liability insurance and the indemnity agreement is now discussed respectively.

1. Liability Insurance

Liability insurance is the primary instrument to provide financial security for nuclear damage in Japan. The contract of liability insurance for nuclear damage is defined as "the contract under which an insurer undertakes to indemnify a nuclear operator for his loss arising from compensating nuclear damage, where the nuclear operator becomes liable for such nuclear damage."[358] A nuclear accident has the potential to create catastrophic losses and the amount of financial security required from nuclear operators is also too large for a single insurance company. Therefore, as is also the practice in other countries, the insurers in Japan pooled together to provide insurance coverage for nuclear risks.[359] The nuclear liability insurance policy is provided by the Japan Atomic Energy Insurance Pool ("JAEIP"), an organization established by twenty-three private insurers.[360] Unlike American nuclear insurance pools, JAEIP provides both a liability insurance policy and property damage policies.[361]

When the Act on Compensation was initially passed in 1961, the amount required for financial security was 5 billion yen (64 million USD).[362] This amount proved too low to compensate for the potential catastrophic nuclear damage. It is also lower than the compensation available under the Paris Convention and the Brussels Complementary Convention.[363] The

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[357] *Id.* § 7(2).
[358] *Id.* § 8.
[359] Carolyn Bandel & Natalie Obiko Pearson, *Atomic Cleanup Cost Goes to Japan's Taxpayers, May Spur Liability Shift*, BLOOMBERG (Mar. 23, 2011, 8:45 AM), http://www.bloomberg.com/news/2011-03-23/nuclear-cleanup-cost-goes-to-japan-s-taxpayers-may-spur-liability-shift.html.
[360] *Liability for Nuclear Damage*, *supra* note 320.
[361] Joanne Wojcik, *Coverage Restrictions Expected to Limit Nuclear Claims*, BUS. INS. (Mar. 20, 2011, 6:00 AM), http://www.businessinsurance.com/article/20110320/ISSUE01/303209974.
[362] *See Prof Koide June 2011 Lecture*, FUKUSHIMA311WATCHDOGS.ORG (2011), *available at* http://www.fukushima311watchdogs.org/biblio/8/Prof%20Koide%20June%202011%20lecture.pdf.
[363] Supplementary Convention to the Paris Convention of 29 July 1960 on Third Party Liability in the Field of Nuclear Energy, art. 3, Jan. 31, 1963, 1041 U.N.T.S. 358 (as amended by the Additional Protocol of 28 January 1964 and by the Protocol of 16 November 1982).

amount for financial security in Japan was increased to 120 billion yen in 2009.[364] However, this total amount of 120 billion yen is not completely covered by insurance. It can also be covered by an indemnity agreement or a deposit.[365]

Under the liability policy provided by the JAEIP, the coverage contains compensation for nuclear damage, legal expenses (including costs for litigation, arbitration, settlement and mediation, which is approved by the insurer), the costs of preservation of rights, and the costs of measures to prevent the expansion of damage.[366] The liability insurance policy differentiates between nuclear damage and general damage.[367] The term nuclear damage contains the "nuclear damage" referred to in the Act on Compensation, personal injury, property damage which results from the radioactivity, explosion, and other harmful features of nuclear material.[368] The term "general damage" refers to personal injury and property damage other than that contained in "nuclear damage."[369] For the nuclear damage, the accumulated limit of coverage as under other national nuclear pools (a limit for the whole life cycle) is used.[370] The limit for general damage can be automatically reinstated after the payment for an accident.[371] The insurance policy excludes several kinds of damage: the damage caused intentionally by the insured; a grave natural disaster of an exceptional character or by an insurrection; the use of atomic energy for non-peaceful purpose, earthquake, fire or tsunami; damage to the property owned, used or managed by the insured; or damage to other property which is on-site and used in connection with the insured's facility.[372]

Not all nuclear damage for which an operator is liable is covered by liability insurance. When the damage is not covered by insurance or other financial security, the operator can enter an indemnity agreement with the government to cover those losses.

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[364] The Act on Compensation for Nuclear Damage § 7. The current version of Section 7 states that "financial security shall be provided by the conclusion of a contract of liability insurance for nuclear damage and an indemnity agreement for compensation of nuclear damage or by a deposit, approved by the Minister for Education, Culture, Sport, Science, and Technology . . . as an arrangement that makes available for compensation of nuclear damage, 120 billion yen." *Id.*

[365] *Id.*

[366] Fujimi & Tatano, *supra* note 262, citing Liability Insurance for Nuclear Installations, Common Clause 2000, art. 3 [hereinafter Clause 2000].

[367] *Id.*

[368] *Id.* art. 2.

[369] *Id.*

[370] *Id.* art. 4.

[371] *Id.*

[372] Clause 2000, art. 7.

2. Indemnity Agreements

To compensate for the damage that is not covered by liability insurance or other means of financial security, a nuclear operator can enter an indemnity agreement with the government. The Act on Indemnity Agreements for Compensation of Nuclear Damage ("Act on Indemnity Agreements") and the Order for the Execution of the Act on Indemnity Agreements for Compensation of Nuclear Damage ("Order on Indemnity Agreements") lay down the rules for such agreements.[373]

Nuclear damage caused by natural disasters is less predictable for insurers, so it is excluded from insurance coverage in Japan. Nuclear damage is also unique in its delayed manifestation: sometimes injuries or damages from nuclear exposure only appear decades after the accident and exposure to radiation.[374] This "long tail" characteristic poses a challenge to the insurance market, which often only covers damage that happens within ten years after the occurrence of the nuclear event.[375] These terms are the norm in Japan.[376] Damage caused by natural disaster and damage claimed beyond a period of ten years from the date of an event are covered in the indemnity agreements.[377]

The indemnity clause also covers nuclear damage caused by normal operation, and other damages provided for in the Cabinet Order.[378] To further clarify the concepts, the Order on Indemnity Agreements excludes three kinds of damage from the category "damage caused by normal operation"[379]: damage caused by a breach of some specified sections of the Regulation of Nuclear Source Material, Nuclear Fuel and Reactors; "damage to an installation for reactor operation"; and damage caused by a "natural cataclysm or the act of a third party."[380] Other damage covered by the Cabinet Order refers to the damage resulting from a tidal wave.[381] In other

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[373] *See* Act on Indemnity Agreements for Compensation of Nuclear Damage, Act No. 148 of 1961 (Japan); Order for the Execution of the Act on Indemnity Agreements for Compensation of Nuclear Damage, Act No. 45 of 1962 (Japan).
[374] Miles O'Brien, *Fukushima After the Meltdown*, PBS NEWSHOUR (Mar. 15, 2012), http://www.pbs.org/newshour/multimedia/fukushima/.
[375] *Liability for Nuclear Damage*, *supra* note 320.
[376] Act on Indemnity Agreements for Compensation of Nuclear Damage § 3.
[377] *Id.*
[378] *Id.*
[379] *Id.*
[380] Order for the Execution of the Act on Indemnity Agreements for Compensation of Nuclear Damage § 1.
[381] *Id.* § 2.

words, the damage resulting from a tidal wave is not covered by insurance, but it is covered under the indemnity agreement with the government.[382]

As stated above, Section 3 of the Act of 1961 provides that the operator of a nuclear facility is not strictly liable "in the case where the damage is caused by a grave natural disaster of an exceptional character or by an insurrection."[383] However, Section 17 makes clear that where this exoneration of the operator's liability applies or where nuclear damage is deemed to exceed the amount covered by insurance, "the Government shall take the necessary measures to relieve victims and to prevent the damage from spreading."[384] Though Section 17 does not give the victim a subjective right to compensation it does make clear that when the exoneration of the operator's liability for a grave natural disaster of an exceptional character would apply, victims would still be compensated since in that case the government would step in.[385] That is precisely the function of the indemnity agreement between the operator and government.

The amount covered by the indemnity agreement with the government should total the required amount of financial security (120 billion yen), less the amount available by other means (insurance or other indemnity agreements).[386] The duration of the indemnity agreement is from the "time of its conclusion to the time when the reactor operation . . . has ceased."[387] To seek the coverage of an indemnity agreement, the operator has to pay the government an indemnity fee. The indemnity fee is determined by multiplying the indemnity agreement amount by the rate that the Order provides.[388] According to the Order that rate shall be 3 (indemnity fee) for 10,000 (amount being indemnified) or 1.5 for 10,000 for the reactor in universities and technical colleges.[389] The rate can be increased later by the government if the amount available for indemnity at the time the indemnity fee is paid is insufficient.[390] The operators have an obligation to notify the government of a number of operational details and specifications.[391] The government has the right to cancel the indemnity agreement

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[382] *Id.* § 2.
[383] Act on Compensation for Nuclear Damage § 3.
[384] *Id.* § 17.
[385] *Id.*
[386] Act on Indemnity Agreements for Compensation of Nuclear Damage § 4.
[387] *Id.* § 5.
[388] *Id.* § 6.
[389] Order for the Execution of the Act on Indemnity Agreements for Compensation of Nuclear Damage § 3.
[390] *Id.*
[391] Notification requirements are set for different kinds of indemnity agreements, such as for the indemnity agreement relating to reactor operation, to production, reprocessing, the

if the operators do not meet the required level of financial security with all combined factors, fail to pay the indemnity fee, fail to notify or take measures pursuant to specified regulations, or breach the requirement to take the necessary steps to prevent or mitigate nuclear damage when such damage occurs or is likely to occur.[392] When the operators breach some specified requirements, they may be subject to fines of an amount equivalent to 1/10th of the indemnification received or 100,000 yen (1283 USD).[393]

This means that the Japanese state intervenes in the compensation for the victims of a nuclear accident on the basis of an indemnity agreement for which the operator pays a fee to the state. Moreover, the total coverage of 120 billion yen is not a maximum but rather a minimum amount, to be covered via a combination of insurance and indemnity agreements.[394] If the damage is still higher, the state could intervene under Section 16 of the Act on Compensation.[395] This refers to the case when the amount of the damage is higher than the required security of 120 billion yen. Further state intervention is possible on the basis of a political decision.[396] This provision comes into play where an operator could become insolvent if liability is too high.

The compensation system, also taking into account the case of a natural disaster, can hence be summarized as follows:

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use of nuclear fuel, and so on. For example, in the indemnity agreement relating to the reactor operation, the nuclear operator needs to notify the government of the following issues: the use of the nuclear reactor, type, the thermal rating and number of nuclear reactors; name and address of the installations or sites equipped with a nuclear reactor; location, structure and equipment of the building housing the nuclear reactor, types and quantity of the nuclear materials to be used as fuel in the nuclear reactor; and the method of disposing of spent fuel and information about the liability insurance contract. *See* Order for the Execution of the Act on Indemnity Agreements for Compensation of Nuclear Damage § 4.

[392] *See* Act on Indemnity Agreements for Compensation of Nuclear Damage, § 15; Order for the Execution of the Act on Indemnity Agreements for Compensation of Nuclear Damage § 9.

[393] Order for the Execution of the Act on Indemnity Agreements for Compensation of Nuclear Damage § 11.

[394] Act on Compensation for Nuclear Damage § 7.

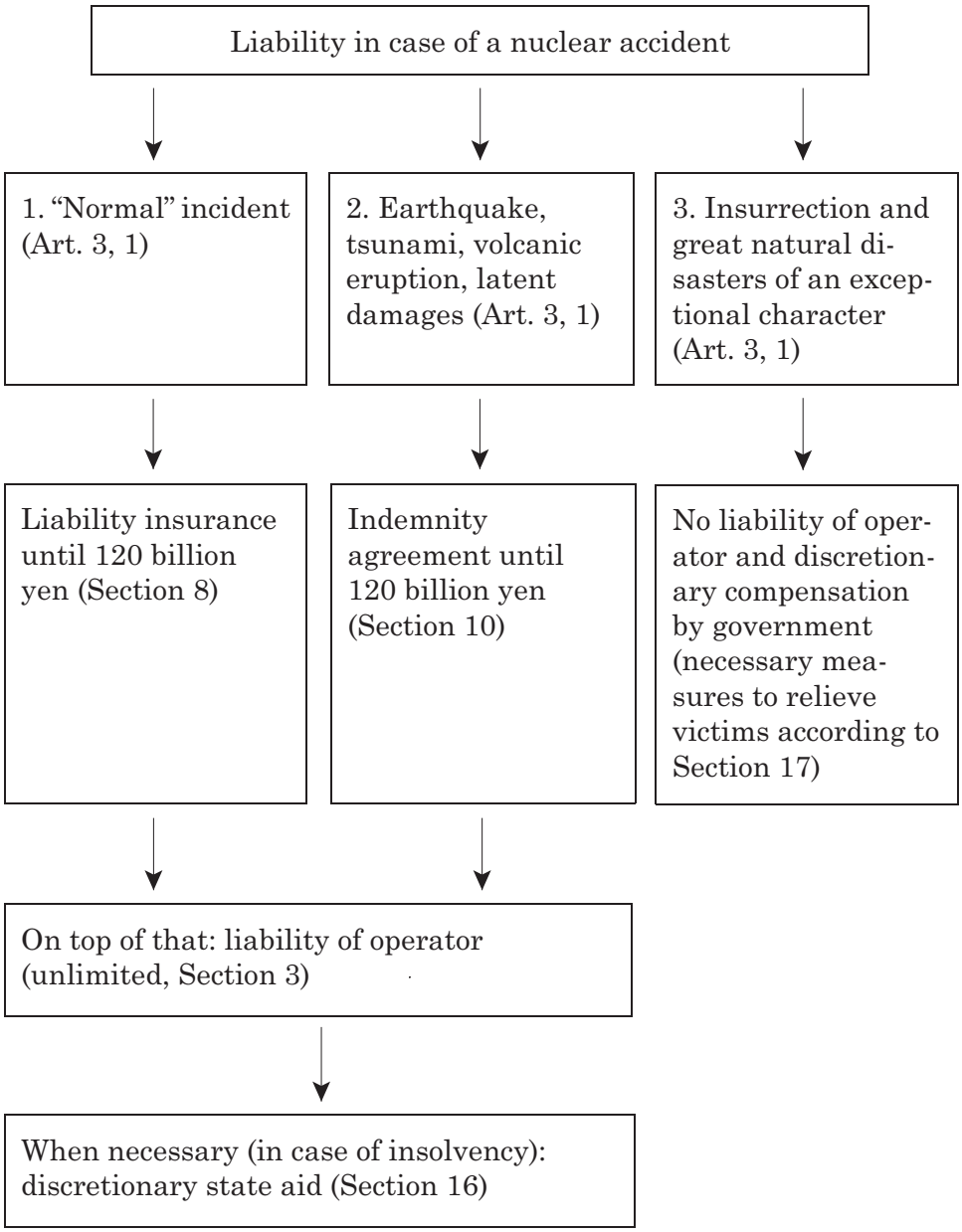
[395] Section 16 states:

> [w]here nuclear damage occurs, the Government shall give a nuclear operator (except the nuclear operator of a foreign nuclear ship) such aid as is required for him to compensate the damage, when the actual amount which he should pay for the nuclear damage pursuant to Section 3 exceeds the financial security amount and when the government deems it necessary in order to attain the objectives of this act.

Act on Compensation for Nuclear Damage § 16(1).

[396] Indeed, Section 16(2) of the Act on Compensation provides that this aid shall be given to the extent that the government is authorized to do so by decision of the National Diet. Ultimately, the decision is the Japanese parliament's. Act on Compensation for Nuclear Damage § 16(2).

TABLE 8: LIABILITY IN CASE OF A NUCLEAR ACCIDENT IN JAPAN[397]



[397] Weitzdörfer, *supra* note 317, at 75.

C. Government Aid

The Act on Compensation requires operators to provide financial security up to the amount of 120 billion yen.[398] However, catastrophic nuclear damage can cost much more than that. When such catastrophes happen, the government shall give a nuclear operator aid needed for compensation if the government deems it necessary.[399] Such aid should be given to the extent authorized by the National Diet.[400] When the damage is caused by a grave natural disaster of an exceptional character or by an insurrection, the government shall take the necessary steps to "relieve victims and to prevent the damage from spreading."[401] Unlike an indemnity agreement with the government, under which the actual rights and obligations of the government and the operator have been clearly established and the indemnity amount is determined before a disaster, aid distribution in these cases is not clear and is to a large extent determined *ad hoc* by the government. Unlike an indemnity agreement, which requires a fee, such *ad hoc* arrangements do not require the operators to pay a price for such aid.

D. Case Study: The Tokai-Mura and Fukushima Accidents

The Act on Compensation and Act on Indemnity Agreements came into force in the 1960s.[402] However, given the infrequency of nuclear accidents, the Acts were not applied for the first time until 1999.[403] A criticality accident occurred at the facility of JCO Company Ltd. in Tokai-mura in 1999.[404] Some workers were exposed to radiation doses and the nearby residents were required to evacuate.[405] The accident triggered the first application of the Act on Compensation in Japan, but was relatively small. The Fukushima Accident, which has had far larger off-site impact than the Tokai-mura accident,[406] may create challenges to compensation under

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[398] Act on Compensation for Nuclear Damage § 7.
[399] *Id.* § 16.
[400] *Id.*
[401] *Id.* § 17.
[402] *See id.*; Act on Indemnity Agreements for Compensation of Nuclear Damage.
[403] *See* Tatsuya Murakami, *The Compensation of Damage Following the Tokai-Mura Accident*, *in* INDEMNIFICATION OF DAMAGE IN THE EVENT OF A NUCLEAR ACCIDENT 117, 121 (2003).
[404] *Id.* at 118.
[405] *Id.*
[406] *See* David McNeill, *The Fukushima Nuclear Crisis and the Fight for Compensation*, THE ASIA-PACIFIC J.: JAPAN FOCUS, http://www.japanfocus.org/-David-McNeill/3707 (last visited Nov. 2, 2012).

the existing nuclear liability regime.[407] This section analyzes those two cases respectively to show how nuclear damage is compensated in practice in Japan.

1. The Tokai-Mura Accident[408]

Japan's first criticality accident occurred in a conversion test building at the JCO Company, Ltd.'s nuclear fuel fabrication plant in Tokai-mura, in the Ibaraki Prefecture on September 30, 1999.[409] JCO is a wholly owned subsidiary of Sumitomo Metal Mining Co. ("SMM") of Tokyo.[410] The criticality state continued for approximately twenty hours, contributed by the recklessly executed mitigation operation carried out by JCO workers.[411] The accident was caused by non-approved operating procedures applied to the uranium fuel solutions.[412] This accident was rated Level 4 on the INES, indicating an event that would have little off-site risk.[413] Three workers suffered acute radiation syndrome, two of whom died.[414] One hundred sixty-one people who were within a 350-meter radius of the JCO plant were evacuated.[415] Another 310,000 people within a tem kilometer radius of the JCO plant were asked by the Ibaraki Prefecture to stay indoors for approximately eighteen hours.[416]

In response to the accident, JCO opened up a contact point to facilitate the consultation of victims on October 4, 1999.[417] On October 22, 1999, a Dispute Reconciliation Committee for Nuclear Damage Compensation was established by the Science and Technology Agency ("STA") in accordance with the Act on Compensation.[418] On the same day, the STA also established the Nuclear Damage Investigation Study Group ("Study

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[407] *See* Murakami, *supra* note 403, at 121–22 (describing the problems that Tokai-mura faced with respect to indemnification).
[408] For an overview of the Tokai-mura incident, see J. Mark Ramseyer, *Why Power Companies Build Nuclear Reactors on Fault Lines: The Case of Japan*, 31 THEORETICAL INQUIRIES IN L. 457 (2011).
[409] K. Komura et al., *The JCO Criticality Accident at Tokai-Mura, Japan: An Overview of the Sampling Campaign and Preliminary Results*, 50 J. ENVTL. RADIOACTIVITY 3, 4 (2000).
[410] *Tokaimura Criticality Accident*, WORLD NUCLEAR ASS'N (July 2007), http://www.world-nuclear.org/info/inf37.html.
[411] *See id.*
[412] *Id.*
[413] *Id.*
[414] *Id.*
[415] *Id.*
[416] Komura et al., *supra* note 409, at 4.
[417] *Tokai-Mura Accident*, *supra* note 349, at 129.
[418] *Id.*

Group") to analyze the accident and to establish criteria for determining which nuclear damages should be compensated.[419] It is reported that 8018 claims have been filed by citizens, businesses, and industrial organizations by 2010; 6983 claims have been compensated.[420] Mediation and negotiation played an important role during the compensation procedure.[421] The prefectural government and other local authorities offered mediation between JCO and victims for an early settlement.[422] According to this settlement, JCO made 5.4 billion Japanese yen in provisional payments by the end of 1999.[423] "[A] Special Consultation Centre was set up in the Ibaraki Prefecture Office from 31 January to 25 February 2000" to promote negotiations with victims.[424]

a. Compensable Damages

The Tokai-mura accident triggered the application of the Act on Compensation. As was mentioned above, the Act established strict liability for nuclear damage.[425] However, the definition of nuclear damage focuses on the cause of the damage (whether it is the fission process or radiation of nuclear fuel, the toxic natural of such materials), but remains vague as to what actually constitutes damage.[426] It is not clear whether the operators are only liable for personal injury and property damage, or also liable for consequential economic losses, and decontamination costs.

Toward this end, on May 26, 2000, the Study Group finalized a report which established guidelines "to determine what damage caused by the Tokai-mura accident would be qualified as 'nuclear damage'" under the Act on Compensation.[427] According to the report, eight categories of damage can be compensated under the Act, including personal injuries, medical examination expenses, evacuation expenses, property inspection expenses, loss of contaminated property, lost income, business damage due to both physical losses and reputational injuries, and mental suffering.[428]

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[419] *Id.*
[420] *Overview of Compensation for the JCO Criticality Accident*, JAPANESE MINISTRY OF EDUCATION, CULTURE, SPORTS, SCIENCE, AND TECHNOLOGY, http://www.mext.go.jp/b_menu/shingi/chousa/kaihatu/016/shiryo/__icsFiles/afieldfile/2011/04/20/1305111_5.pdf.
[421] *See Tokai-Mura Accident*, *supra* note 349, at 129.
[422] *Id.*
[423] *Id.*
[424] *Id.*
[425] Act on Compensation for Nuclear Damage § 3.
[426] *Id.* § 2.
[427] *See Tokai-Mura Accident*, *supra* note 349, at 129.
[428] *See id.* at 129–30.

From the broad formulation, it can be concluded that the compensable losses contain evacuation costs, personal injury, property damage, and economic losses.[429] The category of "personal injury" contained not only medical examination expenses and radiation injuries caused by exposure as a result of the accident, but also mental suffering.[430] Defining mental suffering, the report clarifies that mental anguish without physical injury does not qualify "unless the claimants can irrefutably prove a causal relationship and the proportionality of the amount of compensation sought."[431]

"Economic loss" contains property damage, which is evaluated through the reduction of economic value of the property.[432] In the case of movable property, the compensable loss is the depreciated value of the property; in the case of real estate, the damage is only compensable when there was a firm intention to sell the property or other clear economic loss.[433] The contamination itself and the costs of decontamination are not compensable under this category.[434] In other words, environmental damage was not a compensable category in this case.[435] An explanation for this may be that the accident was classified at level 4 INES, which means there was no significant off-site impact.[436]

Another issue worth noting is that the economic losses did not only contain damage due to physical effects, but also extended to damage due to reputational injury.[437] The damage to reputation is a pure economic loss and is not always compensable.[438] To define and constrict the scope of this

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[429] *Id.*
[430] *Id.*
[431] *Id.* at 130.
[432] *Id.*
[433] *See Tokai-Mura Accident*, *supra* note 349, at 130.
[434] *See id.*
[435] *See id.*
[436] *Tokaimura Criticality Accident*, *supra* note 410.
[437] *Tokai-Mura Accident*, *supra* note 349, at 130. In Japan, some criteria are established to limit economic losses caused by a nuclear accident (both due to physical effects and to rumor). After the JCO accident, "economic loss suffered between the time of the accident and 30 November 1999, within a 10 km radius of the accident site, and caused by loss of custom which is estimated to be reasonable given the circumstances of the accident," was eligible for compensation. *See Tokai-Mura Accident*, *supra* note 349, at 130.
[438] Under the international regimes for nuclear liability, the scope of compensable economic losses is limited. Under the Paris Convention on Third Party Liability in the Field of Nuclear Energy, only damage to or loss of life and any person, as well as damage to or loss of property are compensable. Convention on Third Party Liability in the Field of Nuclear Energy art. 3, *opened for signature* July 29, 1960, 956 U.N.T.S. 264. Under the 2004 protocol of Paris Convention, the economic losses become compensable, however, only to the extent that they are arising from personal injury or property damage. Final Act of the Conference on the

category, the report sets some conditions, such as the time at which such loss was caused, the distance from the accident site, whether the loss of customers was estimated to be reasonable and the actual decrease in income.[439] Since damage to reputation is also compensated for a nuclear accident that does not have significant off-site impact, the compensation has extended all over the Ibaraki Prefecture.[440]

According to the Act on Compensation, the nuclear operators are obliged to seek financial security up to the amount determined in the Act or corresponding Cabinet Order.[441] The operators can either fulfill this obligation by seeking insurance coverage or by concluding indemnity agreements with the government.[442] At the time of the Tokai-mura accident, the amount of coverage required for a nuclear power plant was 30 billion yen.[443] For facilities producing nuclear fuel, such as the JCO plant, the required amount was only 1 billion yen.[444] This amount was far from sufficient to cover the damage caused by this accident. Moreover, the amount of compensation available from JCO was also insufficient.[445] To make sure sufficient assets would be available to compensate for the damage, the local authorities chose extra-legal measures, like organizing negotiations with JCO's parent company, SMM, about the compensation.[446] By September 30, 2000, "98% of the claims were settled for a total amount of 12.73 billion" yen (163 million USD), of which 1 billion yen (13 million USD) was covered by the Japan Atomic Energy Insurance Pool.[447] The insurance pool determined its own claims handling standards for damage claims arising from

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Revision of the Paris Convention and of the Brussels Supplementary Convention, Feb. 12, 2004. Similar stipulations can be found in the Vienna Convention, as amended by the Protocol of 1997 to amend the Vienna Convention on Civil Liability for Nuclear Damage. Vienna Convention on Civil Liability for Nuclear Damage art. 1, *opened for signature* May 21, 1963, 1063 U.N.T.S. 266. In other words, also others than those who suffer personal injury or property damage can claim for economic losses, while the one who suffers from rumors without material damage cannot be compensated.

[439] *See Tokai-Mura Accident*, *supra* note 349, at 130.

[440] According to a presentation by Mr. Tatsuya Murakami, the Mayor of Tokai-mura village, the Ibaraki Prefecture received 364 million yen and Tokai-mura received 56 million yen by 2000. *See* Murakami, *supra* note 403, at 121.

[441] Act on Compensation for Nuclear Damage § 7.

[442] *Id.*

[443] *See* Murakami, *supra* note 403, at 121.

[444] *Id.*

[445] It is difficult to estimate the exact available amount. However, by then, JCO's assets were estimated to be approximately 4 billion yen, but, as is the case with most companies, their total assets could not be fully mobilized. *See Tokai-Mura Accident*, *supra* note 349, at 131.

[446] *See* Murakami, *supra* note 403, at 121.

[447] *See Tokai-Mura Accident*, *supra* note 349, at 130–31.

the accident, which were in line with the Study Group guidelines.[448] Since JCO could not cover all the damage, SMM "provided assistance in respect of the payment of the remainder."[449] It is reported that SMM put approximately 127 million dollars in the special budget in 2000 to compensate victims of the JCO accident.[450]

b. The Victims

Three groups of persons were affected by the accident and filed claims against JCO. The first category is the workers.[451] This is different from the American system, where the claims under state or federal worker's compensation acts are excluded from the "public liability" defined under the Price-Anderson Act.[452] Under the Japanese nuclear liability regime, damage suffered by workers is not excluded.[453] The compensation of workers' injuries comprises of two layers. Firstly, compensation should be made from the Workers' Accident Compensation Insurance System.[454] If the workers suffer damage in excess of the limit under the former system, they are entitled to recover the remainder from the liable operators.[455] Compensation can be made from the Workers' Accident Compensation Insurance System when the claimants are exposed to a dose in excess of 0.25 Sieverts of radiation, "enough to cause acute radiation poisoning."[456] In the case of the Tokai-mura accident, three workers were qualified to get compensation from this system.[457]

A second category of the claimants is the residents.[458] According to the Study Group's report, the residents nearby could claim for the costs of evacuation, medical examination expenses, and personal injuries.[459] But an interesting phenomenon in this case was that JCO paid a total of 20 million yen to people who lived up to 350 meters away from the plant, in the

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[448] *Id.* at 130.
[449] *Id.* at 131.
[450] Watabe, *supra* note 346, at 229.
[451] *See Tokai-Mura Accident*, *supra* note 349, at 131.
[452] 42 U.S.C. § 2014(w).
[453] *Tokai-Mura Accident*, *supra* note 349, at 131.
[454] *Id.*
[455] *See id.*
[456] *Id.* at 131.
[457] *Id.*
[458] *Id.*
[459] *Tokai-Mura Accident*, *supra* note 349, at 129–30.

form of "consolation payments."[460] JCO's payments are not obligatory, but followed a Japanese tradition to offer discretionary payments to accident victims.[461] Some people living in that zone believed that the amount of consolation payments was insufficient, and filed claims for the remainder.[462] The third category concerns industrial and agricultural activities.[463] Damage to reputations fell into this category, which composed the majority of claims in this accident.[464]

c. Lessons from Tokai-Mura

The Tokai-mura accident was the first application of the regulations concerning nuclear liability in Japan. Although these laws established the regime of nuclear liability and compensation, the details of this system still needed to be clarified via concrete cases. For example, the Act on Compensation requires nuclear operators to obtain financial security, which guarantees the availability of some assets in case of damage and a certain level of cost internalization.[465] However, what constitutes a nuclear damage is not clear, and needs examination in individual cases to be defined. The amount set by legislation at the time of the accident proved not to be enough, and was subsequently revised.[466] After the accident, the coverage required for a nuclear power plant was increased from 30 billion yen (383 million USD) to 60 billion (767 million USD); and the financial security for a facility like JCO's plant was increased from 1 billion yen (12.8 million USD) to 12 billion yen (153 million USD).[467]

In addition, alternatives to litigation played an important role in the compensation for nuclear damage in this particular case. In this case, a Dispute Reconciliation Committee for Nuclear Damage Compensation was established to mediate reconciliation.[468] Negotiations between local authorities, victims, the liable operator, and even its parent company took place to settle the claims. Nearly all the claims that resulted from the JCO

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[460] *Id.* at 131.
[461] *Id.* at 131–32.
[462] *Id.* at 132.
[463] *Id.*
[464] *See id.* at 131–33.
[465] Act on Compensation for Nuclear Damage § 6.
[466] Murakami, *supra* note 403, at 121.
[467] *See* Murakami, *supra* note 403, at 121.
[468] *Tokai-Mura Accident*, *supra* note 349, at 129.

accident have been settled.[469] Only two claims were appealed to the Dispute Reconciliation Committee for Nuclear Damage Compensation, and eleven cases have reached the court.[470]

The definition of compensable damage used by the Dispute Reconciliation Committee is comparatively broad, and it does not give hurdles as strict as the tort system.[471] Consolation payments were made; payments were also made for mental suffering—connected to personal injury—and damage to reputation.[472] However, in the cases which reach the courts, victims fare poorly. There are only a few cases in which the victims won the litigation, and even then the result was less than ideal. For example, a nearby food firm sued the JCO for its loss of business because consumers were scared of radioactivity.[473] The firm sued for 1.6 billion yen (20.5 million yen), but were awarded only 180 million yen (2.3 billion USD).[474] Because JCO had already paid 213 million yen (2.7 million USD) as temporary payment, the food firm was required to repay the difference.[475] More cases were dismissed because the claimants failed to prove damages. In those situations, victims were ordered to repay the entire amount of provisional payment originally awarded by JCO.[476]

In spite of the broad definition of compensable damage under the administrative procedure, the investigation process is criticized because of its lack of transparency.[477] Relevant information like the degree of causality and the related evidence on the estimated damage was rarely disclosed. This could lead to a negative influence on the claims of potential victims. Besides, although SMM decided to assume the liability because of reputational considerations, it tried to hasten the settlement in order to evade liability for latent damage.[478] Despite the desirability of a comprehensive administrative scheme to award broader compensation in the event of nuclear disasters, the procedure needs to be more transparent and more precedents need to be set to ensure sufficient and fair compensation.

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[469] *Id.*
[470] *Overview of Compensation for the JCO Criticality Accident*, *supra* note 420.
[471] *See* Ximena Vásquez-Maignan, *Liability and Compensation for Nuclear Damage*, OECD NUCLEAR ENERGY AGENCY 26 (2012), *available at* http://www.aec.gov.tw/www/info/files/energy_news_01-14-2.pdf.
[472] *Tokai-Mura Accident*, *supra* note 349, at 130–31.
[473] Ramseyer, *supra* note 408, at 15.
[474] *Id.*
[475] *Id.*
[476] *Id.*
[477] Watabe, *supra* note 346, at 229–32.
[478] *Id.*

2. The Fukushima Accident

a. The Fukushima Disaster: Natural and Man-Made

The Fukushima I Nuclear Power Plant consists of six boiling water reactors which are designed by General Electric ("GE") and maintained by the Tokyo Electric Power Company ("TEPCO").[479] After the 9.0 magnitude earthquake hit Japan on March 11, 2011, the reactors Units 1, 2, and 3 were automatically shut down.[480] The other three units had been shut down prior to the earthquake for planned maintenance.[481] After the shutdown of the nuclear reactors, there was still decay heat from the radioactive decay of the unstable isotopes.[482] Nuclear fuel rods require several years of water cooling in a spent fuel pool before decay heat production reduces to the point that they can be safely transferred to dry storage casks.[483] Cooling pumps can be powered by on-site generators, off-site through the normal power grid, by diesel generators, or by steam-turbine-driven emergency core cooling systems, to circulate cooling water when the reactor is shut down.[484] After the March 11th earthquake and the following tsunami, the plant stopped generating electricity, stopping the normal source of power.[485] The tsunami led to a flood in the basement of the turbine buildings and disabled the emergency diesel generators located there.[486] The failure of the

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[479] *See* Stephen Kurczy, *GE Defends Reactors in Japan Nuclear Crisis*, THE CHRISTIAN SCI. MONITOR (Mar. 18, 2011), http://www.csmonitor.com/World/Asia-Pacific/2011/0318/GE-defends-reactors-in-Japan-nuclear-crisis.

[480] *See Timeline for the Fukushima Daiichi Nuclear Power Plant Accident*, NUCLEAR ENERGY AGENCY, http://www.oecd-nea.org/press/2011/NEWS-04.html (last updated Mar. 7, 2012) [hereinafter *Accident Timeline*].

[481] *Id.*

[482] *See* U.S. DEP'T OF ENERGY, DOE FUNDAMENTALS HANDBOOK: NUCLEAR PHYSICS AND REACTOR THEORY 62 (1993), *available at* http://www.hss.doe.gov/nuclearsafety/techstds/docs/handbook/h1019v2.pdf.

[483] *See* Jay Friess & Andy Marso, *What If It Happened Here? Evacuation Zones Outlined in Case of Emergency at Calvert Cliffs*, SOMDNEWS.COM (Mar. 23, 2011), http://ww2.somdnews.com/stories/03232011/rectop133917_32384.shtml.

[484] Mike Soraghan, *Japan Disaster Raises Questions About Backup Power at U.S. Nuclear Plants*, N.Y. TIMES (Mar. 24, 2011), http://www.nytimes.com/gwire/2011/03/24/24greenwire-japan-disaster-raises-questions-about-backup-p-16451.html; *see also* W.S. RAUGHLEY, REGULATORY EFFECTIVENESS OF THE STATION BLACKOUT RULE, U.S. NUCLEAR REGULATORY COMMISSION 8 (Aug. 2003).

[485] *See* MARK HOLT ET AL., CONG. RESEARCH SERV., FUKUSHIMA NUCLEAR DISASTER 1 (Jan. 18, 2012), *available at* http://www.fas.org/sgp/crs/nuke/R41694.pdf.

[486] *Id.*

cooling system subsequently led to the full meltdown in reactors 1, 2, and 3.[487] A series of accidents was reported in the following weeks, including hydrogen explosions and leaking of cooling water.[488] GE has been criticized for designing a plant that is vulnerable to earthquake and flooding risks.[489] According to the design, the reactor's energy diesel generators and DC batteries were located in the basements of the reactor turbine buildings, which were flooded because of the tsunami.[490] It was reported that mid-level engineers working on the construction of the plant were concerned with the vulnerability of the back-up power systems to flooding.[491] It is also reported that GE was warned of the major design flaws in 1976 by three GE nuclear technicians who resigned from their positions out of concerns for the safety of the reactor they were designing.[492]

TEPCO chose to strictly follow GE's design in the construction. To comply with new regulatory requirements, three additional backup generators were placed in the building located on higher ground.[493] However, the switching stations that connect the generators and reactor cooling systems were still in poorly protected turbine buildings.[494] If the switching stations had been moved inside the reactor buildings, the failure of the cooling system would probably not have happened.[495] Fukushima is the most expensive catastrophe in modern Japanese history.[496] This not only refers to the nuclear incident, but also to the earthquake and tsunami of March 2011.[497]

This accident triggered the evacuation of a zone that extended up to fifty kilometers (thirty-one miles) from the plant in some places.[498] It

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[487] *See 3 Nuclear Reactors Melted Down After Quake, Japan Confirms*, CNNWORLD (Jun. 6, 2011), http://articles.cnn.com/2011-06-06/world/japan.nuclear.meltdown_1_nuclear-reactors-fuel-rods-tokyo-electric-power?_s=PM:WORLD.

[488] *See Accident Timeline*, *supra* note 480.

[489] *See* Reiji Yoshida, *GE Plan Followed with Inflexibility*, THE JAPAN TIMES (Jul. 14, 2011), http://www.japantimes.co.jp/text/nn20110714a2.html.

[490] *Id.*; *see also Accident Timeline*, *supra* note 480.

[491] Yoshida, *supra* note 489.

[492] *See* Matthew Mosk, *Fukushima: Mark 1 Nuclear Reactor Design Caused GE Scientist to Quit in Protest*, ABC WORLD NEWS (Mar. 15, 2011), http://abcnews.go.com/Blotter/fukushima-mark-nuclear-reactor-design-caused-ge-scientist/story?id=13141287#.UEft8Y2PWRE.

[493] *See* Norihiko Shirouzu & Chester Dawson, *Design Flaw Fueled Nuclear Disaster*, WALL ST. J. (Jun. 30, 2011), http://online.wsj.com/article/SB10001424052702304887904576395580035481822.html.

[494] *Id.*

[495] *Id.*

[496] *See* Weitzdörfer, *supra* note 317, at 63.

[497] *Id.*

[498] *See U.S. NRC Will Review Evacuation Zone Expansion, but Separate from Fukushima*

also caused concern about food and water supplies, and treatment of nuclear workers.[499] The events at units 1, 2, and 3 have been rated at level 7 on the INES, and those at unit 4 as level 3 events.[500] This means that widespread health and environmental effects are expected from the Fukushima Accident. How the nuclear damage resulting from this accident will be compensated raises serious concerns.

b. Basic Structure of the Compensation

The nuclear accident developed quickly in the early weeks after the earthquake and tsunami. The nuclear accident led to both substantial property damage and third party damage.[501] In Japan, as was explained above, nuclear property damage insurance is available from the commercial market.[502] Reports state, however, that TEPCO has not purchased coverage for property damage since September 2010.[503]

As for third party liability, according to the Act on Compensation, the nuclear operator faces unlimited strict liability and has the obligation to seek financial security up to 120 billion yen.[504] If the damage is caused by an earthquake or volcanic eruption, the government should indemnify losses up to the 120 billion yen minimum financial security requirement.[505] For damages exceeding this amount, the operator is still liable. However, if such a natural disaster is characterized as "a grave natural disaster of an exceptional character," the liable parties can be exonerated from liability.[506] To apply those liability rules to the Fukushima accident, TEPCO's potential

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Review, INDEP. NUCLEAR NEWS (May 4, 2012), http://www.i-nuclear.com/2012/05/04/us-nrc-will-review-evacuation-zone-expansion-but-separate-from-fukushima-review/.

[499] *See* Elaine Kurtenbach & Shino Yuasa, *Anxiety in Tokyo Over Radiation in Tap Water*, BUSINESSWEEK (Mar. 23, 2011), http://www.businessweek.com/ap/financialnews/D9M59PR00.htm.

[500] *See Fukushima Nuclear Accident Update Log: Updates of 12 April 2011*, INT'L ATOMIC ENERGY AGENCY (12 Apr. 2011), http://www.iaea.org/newscenter/news/2011/fukushima120411.html.

[501] *See* Jacopo Buongiorno, *Lesson Learned: The Fukushima Disaster Should Make Nuclear Energy Safer than Ever*, TECH. REV. (Aug. 2012), http://www.technologyreview.com/notebook/428209/lesson-learned/.

[502] *Supra* Part I.B.

[503] Crowhurst & Moore, *supra* note 114, at 27.

[504] Vásquez-Maignan, *supra* note 471, at 9.

[505] *See Fukushima—Compensation of Nuclear Damage After Great Earthquake in Japan*, ENFORMABLE NUCLEAR NEWS (Dec. 13, 2011), http://enformable.com/2011/12/fukushima-compensation-of-nuclear-damage-after-great-earthquake-in-japan/.

[506] Act on Compensation for Nuclear Damage § 3.

liability depends on whether the accident will be attributed to "a grave natural disaster of an exceptional character."[507]

The Japanese government did not admit the earthquake and tsunami to be disasters of an "exceptional character."[508] On the contrary, the government has required TEPCO to compensate the damage it caused.[509] Several provisional compensation payments have been made by TEPCO so far.[510] In April 2011, TEPCO decided to pay "Temporary Compensation" to the evacuated people.[511] The amount was set at 1 million yen (about 13,000 USD) per household with more than one person and 750,000 yen (about 10,000 USD) per individual.[512] This amount is considered by many victims to be insufficient.[513] To provide counseling and compensation for the losses, TEPCO established the Fukushima Nuclear Compensation Office in April 2011.[514] From the end of May of that year, TEPCO started to compensate business operators who engage in agriculture, forestry, and fisheries. The government had forced these businesses to suspend shipments, out of concern for health and safety.[515] A third compensation action taken

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[507] The issue of whether the Fukushima incident is considered such a grave natural disaster of an exceptional character is as yet undecided. *See* Weitzdörfer, *supra* note 317, at 76–77. Some hold that TEPCO was aware of the danger of an earthquake which could lead to a nuclear incident since several experts had provided warnings in that respect. Shirouzu & Dawson, *supra* note 493. This would be an argument to hold that the earthquake had no exceptional character; on the other hand, the earthquake with a magnitude of 9.0 was the strongest so far in Japan as a result of which the question could arise what would then still be necessary to qualify as "a grave natural disaster of an exceptional character." *Quake Jolts Eastern Japan, No Tsunami Warning Issued*, CHI. TRIB. (Jul. 2, 2012), http://articles.chicagotribune.com/2012-07-02/news/sns-rt-us-japan-quakebre862039-20120702_1_tsunami-worst-nuclear-crisis-japan-meteorological-agency; *see also* Vásquez-Maignan, *supra* note 471, at 10.

[508] *See* Vásquez-Maignan, *supra* note 471, at 10.

[509] *See Outline of the Bill of the Act to Establish Nuclear Damage Compensation Facilitation Corporation*, MINISTRY OF ECON., TRADE AND INDUSTRY, http://www.meti.go.jp/english/earthquake/nuclear/roadmap/pdf/20110614_damage_corporation_2.pdf (last visited Nov. 2, 2012) [hereinafter *Nuclear Damage Compensation Outline*].

[510] *Id.*

[511] CURRENT SITUATIONS UPDATE AFTER MARCH 11 EARTHQUAKE, TOKYO ELECTRIC POWER COMPANY, *available at* http://www.tepco.co.jp/en/corpinfo/ir/tool/presen/pdf/110426setsu-e.pdf.

[512] *Payment of Temporary Compensation for Evacuees*, TOKYO ELECTRIC POWER COMPANY, http://www.tepco.co.jp/cc/press/11041405-j.html (last visited Nov. 2, 2012); *see also* Weitzdörfer, *supra* note 317, at 62.

[513] Weitzdörfer, *supra* note 317, at 62.

[514] *It Is About Establishment of "Fukushima Atomic Energy Compensation Counselor's Office" as of April 28, 2011*, TOMISATO CITY (Mar. 22, 2012), http://www.city.tomisato.lg.jp.e.cs.hp.transer.com/0000001128.html; *see also Tepco Homepage*, TOKYO ELECTRIC POWER COMPANY, http://www.tepco.co.jp/en/index-e.html (last visited Nov. 2, 2012).

[515] *Nuclear Damage Compensation Outline*, *supra* note 509.

by TEPCO is to pay compensation to small- and medium-sized enterprises that have suffered business damage in the evacuation areas.[516]

After those temporary compensation actions, TEPCO published a plan on Permanent Compensation for Nuclear Damages on August 30, 2011,[517] and a plan on Permanent Indemnification for Nuclear Damages to Concerned Corporations and Sole Proprietors on September 21, 2011.[518] Under those plans, overviews of the compensable damage and standards are given in accordance with government guidance.[519] At this moment the total amount of the damage caused by the Fukushima incident can be considered as a moving target. Even now, the number increases every day, so it is not possible to make meaningful estimates yet.[520] However, as this Article will explain, the amounts mentioned to compensate the victims via a newly established corporation go in the trillions of yen.[521] This clearly shows that the limited amount of 120 billion yen on the basis of the Act on Compensation for Nuclear Damage will surely not be sufficient to compensate the victims.

c. Compensating Damage via the Dispute Reconciliation Committee

To investigate the impact of the Fukushima accident and ascertain the compensable damage, the Dispute Reconciliation Committee for Nuclear Damage Compensation has been established.[522] Eighteen panels were held between April 15th and December 6th.[523] According to the Reconciliation Committee, the Fukushima Accident has had a broad impact on

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[516] *Id.*

[517] *Press Release: Permanent Compensation for Nuclear Damages by the Accident at Fukushima Daiichi Nuclear Power Station and Fukushima Daini Nuclear Power Station*, TOKYO ELECTRIC POWER COMPANY (Aug. 30, 2011), http://www.tepco.co.jp/en/press/corp-com/release/11083007-e.html [hereinafter *Press Release on Permanent Compensation*].

[518] *Press Release: Permanent Indemnification for Nuclear Damages to Concerned Corporations and Sole Proprietors Due to the Accident at Fukushima Daiichi Nuclear Power Station and Fukushima Daini Nuclear Power Station*, TOKYO ELECTRIC POWER COMPANY (Sept. 21, 2011), *available at* http://www.tepco.co.jp/en/press/corp-com/release/11092109-e.html [hereinafter *Press Release on Permanent Indemnification*].

[519] *Id.*; *Press Release on Permanent Compensation*, *supra* note 517.

[520] *Id.*

[521] *Infra* Part II.D.2.e.

[522] *See* Vásquez-Maignan, *supra* note 471, at 9.

[523] *See* HANDOUTS—COMMITTEE MINUTES—SUMMARY PROCEEDINGS—PROCEEDINGS DAMAGES NUCLEAR DISPUTE, MINISTRY OF EDUCATION, CULTURE, SPORTS, SCIENCE AND TECHNOLOGY, http://www.mext.go.jp/b_menu/shingi/chousa/kaihatu/016/gigi_list/index.htm [hereinafter HANDOUTS].

the surrounding residents; agriculture, fishing, and related industries; real estate prices, and so on.[524] The Reconciliation Committee has published a preliminary guidance, secondary guidance with an added guidance, and interim guidance with an added guidance on the scope of compensable damage.[525] Their determination of compensable damage accounted for the compensation for the Tokai-mura accident and whether the compensable losses were similar in scope and character.[526] It also defined compensable damage according by territorial zones.[527] According to the Preliminary Guideline to Determine the Scope of Compensable Losses, those zones are divided into three categories.[528] The first category contains areas under the evacuation order, areas under a shelter-in-place order, and the planned and emergency evacuation areas which are determined pursuant to the Act on Special Measures Concerning Nuclear Emergency Preparedness.[529] The second category contains areas dangerous for navigation, as determined by the Coast Guard. The third category contains the areas determined as shipping restriction areas.[530]

For victims seeking recovery under the first category, compensable damage includes evacuation expenses, business damage, lost income, loss or reduced value of property, medical examination expenses, property inspection expenses, personal injuries, and mental suffering.[531] For areas falling into the second and third categories, business damage and loss income are compensable.[532] The scope is further broadened in the following

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[524] PROGRESS OF THE "ROADMAP FOR IMMEDIATE ACTIONS FOR THE ASSISTANCE OF RESIDENTS AFFECTED BY THE NUCLEAR INCIDENT," NUCLEAR EMERGENCY RESPONSE HEADQUARTERS 5–6 (Oct. 17, 2011), *available at* http://www.meti.go.jp/english/earthquake/nuclear/roadmap/pdf/111017_assistance_02.pdf.

[525] The preliminary guidance was issued on April 28; the secondary guidance was issued on May 31, and added guidance was issued on June 20, interim guidance was issued on August 5, and the added guidance on interim guidance on December 6. *See* HANDOUTS, *supra* note 523; *see also* McNeill, *supra* note 406.

[526] HANDOUTS, *supra* note 523.

[527] *Interim Guidance on the Determination of Compensation Scope for Fukushima Accident*, MINISTRY OF EDUC., CULTURE, SPORTS, SCI. AND TECH., http://www.mext.go.jp/b_menu/shingi/chousa/kaihatu/016/houkoku/_icsFiles/afieldfile/2011/08/17/1309452/_1_2.pdf [hereinafter *Interim Guidance*].

[528] *Id.*

[529] *Id.*

[530] *Id.*

[531] *Id.*

[532] *Preliminary Guidance on the Determination of Compensation Scope for Fukushima Accident*, MINISTRY OF EDUC., CULTURE, SPORTS, SCI. AND TECH., http://www.mext.go.jp/b_menu/shingi/chousa/kaihatu/016/houkoku/_icsfiles/afieldfile/2011/04/28/1305640_1.pdf [hereinafter *Preliminary Guidance*].

guidance. For example, damage due to governmental instructions—like shipping restrictions or mandatory property inspections—is also compensable.[533] Compensable damage also extends to economic damage to reputation, indirect damage, damage by radiation exposure, and others.[534] Under the category of damage to reputation, corporations and sole proprietors at specified areas or selling listed items in those areas and suffering damages from loss of sales because of the accident can claim for loss of revenue and reasonable additional costs.[535] For indirect damage, corporations and sole proprietors who have a relationship with the primary damaged party that is irreplaceable because of the nature of the business, can also claim for business damage.[536] Besides, the employees of those corporations and sole proprietors can also claim damage due to incapacity.[537] The added interim guidance further broadens the scope to allow for compensation for the damage caused by voluntary evacuations.[538] According to the government guidance, TEPCO also stipulates the standards for compensation for those different categories.[539]

It is worth noting that the compensable damage determined by the Dispute Reconciliation Committee is quite broad. It does not only allow compensation for personal damage and property damage, but also for some pure economic loss.[540] For example, under the title of business damage, physical damage is not a necessary requirement for awarding damages—damage due to rumors and indirect damage are sufficient.[541]

In response to the nuclear damage, Japan chose an administrative system rather than a judicial system as the primary compensation instrument.[542] Compensation is awarded according to categories of geographic areas and government orders. The standards to identify compensable losses

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[533] *Id.*
[534] *Id.*
[535] *Id.*
[536] *Id.*
[537] *See Interim Guidance*, *supra* note 527.
[538] *Id.*
[539] *See Overview of the Compensation Standards for the Major Categories of Damages*, TOKYO ELECTRIC POWER COMPANY, http://www.tepco.co.jp/en/press/corp-com/release/betu11_e/images/110830e19.pdf [hereinafter *Overview of Compensation*]; *Overview of the Indemnification Standards for the Major Categories of Damages in Corporations and Sole Proprietors*, TOKYO ELECTRIC POWER COMPANY, http://www.tepco.co.jp/en/press/corp-com/release/betu11_e/images/110921e13.pdf [hereinafter *Overview of Indemnification*].
[540] *Overview of Indemnification*, *supra* note 539.
[541] *Id.*
[542] *See generally* Act on Compensation for Nuclear Damage, *supra* note 330.

are also set by the administrative authority.[543] This approach can avoid the substantial hurdles in the tort system in awarding compensation for nuclear damage. In the Act on Compensation, no specific hurdles have been introduced in the establishment of nuclear liability, while general obstacles in the tort system can prevent sufficient compensation for nuclear victims. For example, in Japanese law, there is no general rule which bars the recovery of pure economic loss.[544] In practice however, the claim for pure economic loss is not easy either because of the difficulties in proving negligence or because of the remoteness of the economic loss.[545] Even for personal injury, causation is not always easy to establish because of evidentiary uncertainties. These hurdles may not be easy to overcome in the tort system, but can be more easily resolved in the administrative system.

In addition to personal injury, property damage and economic losses which often draw more attention in the case of a nuclear accident, serious environmental damage can also arise. The building, soil, and vegetation may be exposed to high radiation spread by the accident and create a further threat to human health.[546] The Fukushima accident is classified as an INES level 7, which means that it has had significant off-site impacts and environmental damage.[547] However, as shown above, the compensable damage determined by the Dispute Reconciliation Committee makes no direct reference to the concept of "environmental damage."[548]

d. Clean-Up of Environmental Damage

How the polluted environment will be cleaned up or compensated remains to be seen. Some temporary policies have been adopted by the Government Nuclear Emergency Response Headquarters ("GNER-HQs").[549]

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[543] *See Overview of Compensation*, *supra* note 539.
[544] *See* Yoshihisa Nomi, *Tort Liability for Pure Economic Loss in Japan*, *in* JAPANESE REPORTS FOR THE XVII INTERNATIONAL CONGRESS OF COMPARATIVE LAW (UTRECHT, 16–22 JULY 2006) 63–64.
[545] *See* Nomi, *supra* note 544, at 75–76.
[546] *See Frequently Asked Questions*, UNITED NATIONS SCIENTIFIC COMMITTEE ON THE EFFECTS OF ATOMIC RADIATION, http://www.unscear.org/unscear/en/faq.html (last visited Nov. 2, 2012).
[547] *See IAEA Briefing on Fukushima Nuclear Accident*, INT'L ATOMIC ENERGY AGENCY (Apr. 12, 2011), http://www.iaea.org/newscenter/news/2011/fukushima120411.html.
[548] *Supra* Part II.D.1.a.
[549] *See* INT'L ATOMIC ENERGY AGENCY, ADDITIONAL REPORT OF THE JAPANESE GOV'T TO THE IAEA: THE ACCIDENT AT TEPCO'S FUKUSHIMA NUCLEAR POWER STATION 18–24 (Sept. 2011),

The GNER-HQs published the "Basic Concept for Pushing Ahead with Decontamination" and the "Basic Policy for Emergency Response on Decontamination Works."[550] Those documents set the current goals and working guidelines for decontamination for the next two years.[551] The long-term decontamination work was prescribed under a law enacted on August 26, 2011, the Act on Special Measures concerning the Handling of Environmental Pollution by Radioactive Materials Discharged by NPS Associated with the Tohoku District—Off the Pacific Ocean Earthquake that Occurred on March 11, 2011.[552] The Act creates a framework for decontamination measures for the pollution caused by the Fukushima accident, and it involves the national government, local governments, and nuclear operators.[553] It is worth noting that rather than restoring and compensating for the damage to the environment itself, this Act focuses on reducing the influence of environmental pollution on human health and the living environment.[554] In the other words, this Act does not aim at providing compensation for the complete cleanup of the environment; only the measures related to reducing human impacts are covered.[555] The national government is responsible for setting decontamination policies.[556] Local governments shall cooperate with the national government and shall also take some initiatives themselves.[557] Nuclear operators shall dispose the radioactive wastes and cooperate with the government to decontaminate the polluted environment.[558]

The financial duty to decontaminate the polluted environment is formulated in the recent Act as an obligation of various stakeholders.[559] The Act provides that the national government and local public authorities shall take financial measures and other measures to promote the policies related with the handling of the environmental pollution by radioactive

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available at http://www.iaea.org/newscenter/focus/fukushima/japan-report2/japanreport120911.pdf.

[550] *Id.*

[551] *See id.*

[552] *See* Act on Special Measures Concerning the Handling of Environmental Pollution by Radioactive Materials Discharged by NPS Associated with the Tohoku District—Off the Pacific Ocean Earthquake that Occurred on March 11, 2011 (2011), *available at* http://www.mext.go.jp/b_menu/shingi/chousa/kaihatu/016/shiryo/__icsFiles/afieldfile/2011/09/21/1311103_13_2.pdf (original source in Japanese) [hereinafter Act on Environmental Pollution].

[553] *Id.* art. 1.

[554] *Id.*

[555] *See id.*

[556] *Id.*

[557] *Id.*

[558] Act on Environmental Pollution art. 43–44.

[559] *Id.* art. 43–45.

materials discharged by the accident.[560] However, the Act equally makes clear that the liable nuclear operators shall also compensate within their capacity.[561] Experts on nuclear law in Japan also confirm that on the basis of the new Act, financing decontamination is considered a joint responsibility of the operators, the national government, and local public authorities.[562]

e. Financing of the Losses via the Nuclear Damage Compensation Facilitation Corporation

Beyond simply defining the scope of compensable damage, the question exists how this compensation can be financed. As was indicated above, nuclear damage caused by a natural disaster is excluded from the insurance policy provided by JAEIP.[563] Thus, the insurance industry does not seem to be seriously impacted by this accident. The government may have to indemnify the losses up to 120 billion yen.[564] The remainder of the damage may still create a challenge to the financial capacity of TEPCO. According to the Act on Compensation, if the operator's liability exceeds the amount of financial security and the government deems it necessary in order to attain the objectives of the Act, the government shall give aid to the operator.[565] However, whether and to what extent aid will be given depends on the government's decision. Because of the significant impact of the Fukushima accident and the catastrophic nature of the damage, it will be difficult for TEPCO alone to provide full compensation.

To ensure a prompt compensation of the damage caused by the Fukushima accident, the government prepared a law to address compensation through the creation of a corporation in June 2011.[566] The Act to Establish the Nuclear Damage Compensation Facilitation Corporation was passed on August 3, 2011.[567] The Act has three aims: ensuring the prompt

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[560] *Id.* art. 43.
[561] *Id.* art. 44.
[562] Shimada Interview, *supra* note 67.
[563] *Supra* Part II.B.1.
[564] Act on Compensation for Nuclear Damage § 3.
[565] Act on Compensation for Nuclear Damage § 16.
[566] *Japan's Parliament Approves TEPCO Compensation Plan*, BBC NEWS (Aug. 3, 2011, 6:48 AM), http://www.bbc.co.uk/news/business-14383832; *Nuclear Damage Compensation Outline*, *supra* note 509.
[567] *See Outline of the Nuclear Damage Compensation Facilitation Corporation Act*, MINISTRY OF ECON., TRADE AND INDUSTRY 1 (Aug. 2011), *available at* http://www.meti.go.jp/english/earthquake/nuclear/roadmap/pdf/20111012_nuclear_damages_2.pdf [hereinafter METI Outline].

and proper nuclear damage compensation for affected people, stabilizing the nuclear power station to prevent adverse effects on life and commerce in the surrounding area, and maintaining a stable supply of electricity.[568] To realize those aims, the Act establishes a Nuclear Damage Compensation Facilitation Corporation ("the Corporation") and a system of financing the compensation for damage.[569] The Corporation will receive contributions from nuclear operators to cover the costs of operation, and reserve funds to prepare for compensation.[570] The victims still need to make a claim against the liable operator, and the liable operator needs to make the payment to the victims. However, the Corporation can facilitate the compensation and "provide . . . necessary information and advice" to the affected people.[571] If the liable operator needs assistance, the Corporation can provide two forms: ordinary financial assistance, which can be given after a resolution of the management committee of the Corporation; and special financial assistance, which needs to be approved by the competent minister.[572] To obtain the special financial assistance, the Corporation and the operator need to formulate a special business plan.[573] Under this plan, the government will issue government bonds to the Corporation and the Corporation will grant the necessary funds to the nuclear operator.[574] The Corporation can also get government-backed support from financial institutions. After getting this support, the liable nuclear operator pays special contributions to the Corporation.[575] Other non-affected nuclear operators also need to pay general contributions based on the principle of "mutual support."[576] From the contributions, the Corporation repays the national treasury and financial institutions.[577] One issue worth noting here is that the Corporation does not only provide assistance for the compensation of third-party damage, but also for the expenses of stabilizing the power plant and sustaining a stable supply of electricity.[578] The compensation under the new system can be summarized as follows:

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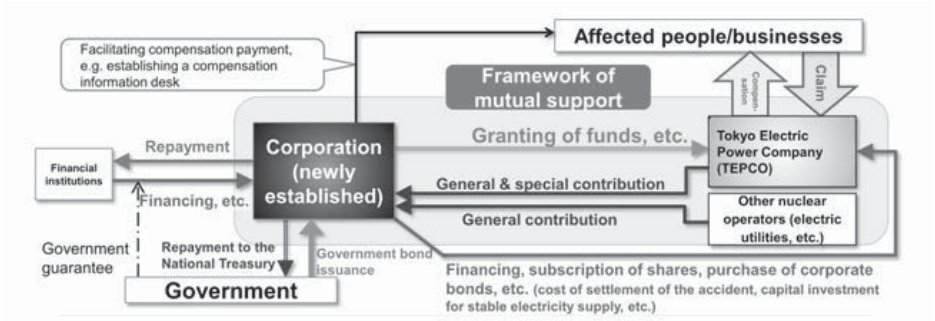
[568] *Id.*
[569] *Id.*
[570] *Id.*
[571] *Id.* at 3.
[572] *See* METI Outline, *supra* note 567, at 2.
[573] *Id.* at 2.
[574] *Id.* at 2–3.
[575] *Id.*
[576] *Id.* at 1.
[577] METI Outline, *supra* note 567, at 3.
[578] *Id.* at 1.

TABLE 9: COMPENSATION SUPPORT BY NUCLEAR DAMAGE COMPENSATION FACILITATION CORPORATION[579]



This Act established a mutual support "pooling system" to provide coverage for nuclear liability after the Fukushima accident.[580] Some scholars advocate pooling as a useful instrument to finance the compensation of catastrophic losses while preserving preventive incentives.[581] The mutual support system established in Japan has some characteristics different from the practice in other jurisdictions. In both Germany and the U.S., where resource pooling between nuclear operators has been established, pooling is done before accidents happen.[582] However, the *ex post* system established in Japan cannot create incentives among operators to monitor each other. Unlike the American and German regimes, under the Japanese system the Corporation is not only financed by nuclear operators, but also by government compensation bonds and government-guaranteed bonds.[583] If those funds are financed without a market price, this system will look more like a bailout of TEPCO than a pooling system to prevent and compensate for future damage.

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[579] *Compensation Support by Nuclear Damage Compensation Facilitation Corporation*, MINISTRY OF ECON., TRADE AND INDUSTRY, *available at* http://www.meti.go.jp/english/earthquake/nuclear/roadmap/pdf/20111012_nuclear_damages_1.pdf.
[580] *Nuclear Damage Compensation Outline*, *supra* note 509.
[581] *See* Michael G. Faure & Tom Vanden Borre, *Compensating Nuclear Damage: A Comparative Economic Analysis of the U.S. and International Liability Schemes*, 33 WM. & MARY ENVTL. L. & POL'Y REV. 219, 222 (2008); Norbert Pelzer, *International Pooling of Operators' Funds: An Option to Increase the Amount of Financial Security to Cover Nuclear Liability?*, 79 NUCLEAR L. BULLETIN 37, 51 (2007).
[582] *See* Pelzer, *supra* note 581, at 49.
[583] METI Outline, *supra* note 567, at 1–2.

TEPCO and the Corporation have submitted a special business plan to the government and the plan was approved on November 4, 2011.[584] According to this plan, the Corporation will deliver 1 billion yen (12.8 million USD), less the amount available through indemnity agreement to help TEPCO to compensate victims in the fiscal year 2011.[585] As a price, TEPCO needs to cut costs of 2.5 trillion yen (32 billion USD) over the following ten years.[586] As of today, TEPCO has spent 158 billion yen as "provisional compensation" to the nuclear victims, and the permanent compensation will be even higher.[587] To promote the compensation to victims, the Corporation transferred 560 billion yen (7.2 billion USD) to TEPCO on November 4, 2011 and another 120 billion yen (1.5 billion USD) pursuant to the indemnity agreement on November 22, 2011.[588] This financial assistance given under the special business plan does not contain the costs of decontamination and decommissioning of the nuclear reactors.[589]

The need for further assistance may be increased according to the progress of compensation payouts and a reasonable estimate of decontamination expenses. The approved special business plan is only intended to be an emergency measure; a more comprehensive special business plan is being prepared.[590] To ensure the full compensation, the Japanese government has decided to issue government bonds of 2 trillion yen (26 billion USD) to help TEPCO to pay compensation, and is considering approving a supplementary budget of 3 trillion yen (38 billion USD).[591] This plan has been heavily criticized. Some think that if the government support is not registered as a loan on TEPCO's balance sheet, the tax payers will ultimately bear the risk; there is also concern about nuclear safety, which may be compromised as a means for cutting costs for TEPCO in the following years.[592] Others doubt whether TEPCO should continue to exist at all.[593]

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[584] Vásquez-Maignan, *supra* note 471, at 11.
[585] TOKYO ELECTRIC POWER COMPANY, THE SPECIAL BUSINESS PLAN: "THE EMERGENCY SPECIAL BUSINESS PLAN" FOR "EMPATHY-BASED COMPENSATION PAYOUTS" 49 (Oct. 8, 2011), *available at* http://www.tepco.co.jp/en/press/corp-com/release/betu11_e/images/111104e3.pdf [hereinafter SPECIAL BUSINESS PLAN].
[586] *Id.* at 5.
[587] Vásquez-Maignan, *supra* note 471, at 10.
[588] *Id.* at 11.
[589] *See* SPECIAL BUSINESS PLAN, *supra* note 585, at 48–49.
[590] *Id.* at 48.
[591] *Id.* at 49.
[592] *See Japan's Nuclear Conundrum: The $64 Billion Question*, THE ECONOMIST (Nov. 5, 2011), *available at* http://www.economist.com/node/21536600.
[593] *See* Akihiro Sawa, *Should TEPCO Continue to Exist?*, JAPAN TODAY (Aug. 10, 2011, 11:14 PM), http://www.japantoday.com/category/commentary/view/should-tepco-continue-to-exist.

E. Evaluation

The Japanese system for compensation of nuclear damage has a few striking features which also result from the fact that Japan did not join any international conventions.[594] The imposition of a strict liability regime for nuclear accidents is certainly in line with suggestions in literature.[595] However, it is clear that the main goal of the Act on Compensation for Nuclear Damage was, as the Act states, to reconcile the interests of potential victims with the interests of the nuclear industry.[596] There is a long tradition of interconnections between industry and bureaucracy in Japan, and as a result the nuclear industry has been successful in implementing its wishes through the legislature.[597]

1. Learning from Fukushima: Unlimited Liability and Problems with Channeling

The unlimited liability of the nuclear power plant operator is undoubtedly a positive feature of the compensation system in Japan. International conventions and many national laws often have caps on the liability of operators, which functionally qualify as a type of subsidy.[598] However, the extent to which unlimited liability truly leads to a full externalization of nuclear accident costs is not clear. In a recent article, Mark Ramseyer is very critical, believing that earthquakes are so common in Japan that TEPCO decided to build its reactor at the site which is vulnerable to earthquake risks because it knew it "would not pay the full cost of a melt-down anyway."[599] He holds that a nuclear operator is, under the Japanese system, able to externalize liability since liability will reach a *de facto* cap at the value of its assets.[600]

One particular striking aspect of the Fukushima case is that TEPCO had apparently placed its back-up generators in the basement

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[594] *See* Vásquez-Maignan, *supra* note 471, at 9.
[595] *See Japan's Nuclear Conundrum: The $64 billion question*, *supra* note 592.
[596] Act on Compensation for Nuclear Damage § 1.
[597] On these relations between industry and bureaucracy, see William W. Grimes, *Reassessing Amakudari: What Do We Know and How Do We Know It?*, 31 J. OF JAPANESE STUD. 385, 388 (2005).
[598] On this subsidy, see generally Michael G. Faure & Karine Fiore, *An Economic Analysis of a Nuclear Liability Subsidy*, 26 PACE ENVTL. L. REV. 419, 427 (2009) [hereinafter Faure & Fiore, *An Economic Analysis*].
[599] Ramseyer, *supra* note 408, at 1.
[600] *Id.* at 1, 18, 23.

under the turbine building; as a result, the plant would be without a cooling system in case of a tsunami or flood.[601] It may not immediately be clear to what extent this can be blamed either on TEPCO itself as operator or on General Electric, who designed the Fukushima plant.[602] If the wrongful placement was due to negligence on the side of General Electric, a painful aspect of the nuclear liability regime in Japan, but also worldwide, becomes clear: the channeling of liability. According to the Japanese Act on Compensation, only the operator of the nuclear power plant can be held liable, thus excluding liability of other potential parties that contributed to the risk—in this particular case, perhaps General Electric.[603]

This channeling of liability has been largely criticized in the literature.[604] The economists argue that nuclear suppliers, transporters and other parties should also be responsible for nuclear damage.[605] Since some of these parties—transporters in particular—may have serious risks of insolvency, a proposal was made to make operators, suppliers, and transporters jointly and severally liable.[606] Under such a proposal, the insolvency problem would be alleviated and other parties would have incentives for mutual monitoring.[607]

2. Inefficiencies Resulting from Corporate Limited Liability and Private Interests

Examining the TEPCO case, one can argue that the non-capped liability in the Japanese system cannot guarantee efficient deterrence by itself. Though the Act on Compensation does not set a cap on the potential liability of nuclear operators, the corporate structure only exposes them to risk up to the value of their assets.[608] In this situation, a financial guarantee is important to ensure efficient deterrence. In Japan, the required financial security is set at 120 billion yen.[609] This amount is provided through a combination of liability insurance, for which the operator

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[601] *See id.* at 16.
[602] *See* Kurczy, *supra* note 479.
[603] Act on Compensation for Nuclear Damage § 4.
[604] *See, e.g.*, Tom Vanden Borre, *Channeling of Liability: A Few Juridical and Economic Views on an Inadequate Legal Construction*, *in* CONTEMPORARY DEVELOPMENTS IN NUCLEAR ENERGY LAW: HARMONIZING LEGISLATION IN CEEC/NIS 13, 22–23 (Nathalie L.J.T. Horbach ed., 1999).
[605] *See* Watabe, *supra* note 346, at 222–23.
[606] *See* Vanden Borre, *supra* note 604, at 20–21.
[607] *See* Watabe, *supra* note 346, at 225.
[608] *See* Ramseyer, *supra* note 408, at 3.
[609] *Id.* at 8.

will pay a premium, and an indemnity agreement with government, for which a fee will be paid as well.[610]

Compensation under this indemnity agreement is not a mere subsidy. However, the indemnity fee charged for government coverage is certainly not market-based. On the contrary, the fee is fixed, and therefore not risk-related.[611] Moreover, though the operator remains liable beyond the insured amount of 120 billion yen (except when the incident would be qualified as a natural disaster of an exceptional character) the exposure to liability of the operator is *de facto* limited to its assets.[612] Beyond that amount, Japanese law provides that government may use its discretionary powers to "take measures," meaning that it will intervene to compensate victims. In that case a lack of full internalization of the accident costs remains a problem.[613] This still raises the question to what extent a nuclear operator like TEPCO is fully liable for accident costs and to what extent liability rules do provide adequate incentives for taking preventive measures with a view to cost internalization.

A critical analysis of the development of the nuclear industry shows that poor safety controls in the nuclear industry in Japan can be explained from a private interest perspective. As discussed earlier, since nuclear operators are protected under the principle of limited liability in corporate law, they only have to pay for the potential losses up to their own assets.[614] Thus TEPCO has chosen to prioritize political considerations in siting reactors over geologic ones, and built their reactors at sites vulnerable to earthquake risks.[615]

The question can then be asked why government has allowed such a choice of site and failed to order a more tsunami-resistant construction and renovation. The bureaucrats and politicians are supposed to serve the public interest and guarantee better nuclear safety.[616] However, this is not always the case. Bureaucrats are self-interested. Nuclear regulation is an intangible good for the public, who need better nuclear controls for their own safety, but deregulation is a visible, targeted, and tangible private good for the nuclear industry. Thus the nuclear industry has more incentives than the public to lobby for lax oversight.[617] Considering the inefficiency of

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[610] *See* Act on Indemnity Agreements for Compensation of Nuclear Damage §§ 2–4, 6.
[611] *Id.* § 6.
[612] *See* Ramseyer, *supra* note 408, at 17–18.
[613] Act on Compensation for Nuclear Damage §§ 16–17.
[614] *See* Ramseyer, *supra* note 408, at 18.
[615] *Id.* at 21.
[616] *Cf. id.* at 19.
[617] Ramseyer, *supra* note 408, at 19.

limited liability under private ownership of nuclear installations, government ownership might be an alternative. However, literature also shows that government ownership may not be ideal for guaranteeing nuclear safety, as a result of the influence of regulated electricity prices, "Not In My Back Yard" attitudes and the progressive tax regime.[618]

Though government and bureaucrats failed to produce efficient regulation of the nuclear industry, one may still argue that the independent judges can play a role in barring construction projects at tectonic fault lines, or granting the victims sufficient compensation to create better deterrent incentives for nuclear operators. However, this has not been the case. For example, several challenges have been filed regarding a variety of activities involving the Fukushima nuclear plants since its construction.[619] In the 1970s, local challenges were made against a landfill license granted to fill in part of a nearby bay, and against the reactor license.[620] Area residents also petitioned to shut the reactor down in 1989 after the cooling system in one of the Daini reactors failed.[621] However, all the claims were dismissed for lack of standing or because the judges deemed the plant safe enough.[622] There are similar dismissals in cases involving other nuclear power plants in Japan.[623]

In addition to claims aimed at ending the operation of nuclear reactors, as discussed above, compensation claims are quite often, unsuccessful.[624] This failure may partly be explained by the difficulties presented by the tort system, like problems establishing causation due to scientific uncertainties or the remoteness between certain kinds of damage and the nuclear accident. However, a private interest analysis shows that like bureaucrats, judges also seek to protect and advance their own interests.[625] The cabinet can ensure favorable judgments for them through the nomination of corporate-friendly judges to the supreme court and through manipulation of the judicial promotion system.[626] This may be another explanation for the nuclear-friendly judgments in Japan.

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[618] *Id.* at 23.
[619] *Id.* at 9.
[620] *Id.*
[621] *Id.*
[622] *See* Ramseyer, *supra* note 408, at 10.
[623] *See, e.g.*, *id.* at 10–13.
[624] *Id.* at 15.
[625] *Id.* at 20.
[626] *Id.* For additional analysis about judicial independence and political influence on judges in Japan, see J. Mark Ramseyer & Eric Bennett Rasmusen, *Judicial Independence in Civil Law Regimes: The Evidence from Japan*, 13 J.L. ECON. & ORG. 259 (1997).

III. COMPARISON WITH OTHER COMPENSATION SYSTEMS

It may be useful to conclude this paper addressing the compensation for the victims of the tsunami of March 3, 2011 and the subsequent nuclear incident at Fukushima by briefly putting the Japanese compensation system in an international perspective. Of course time does not permit a full fledged comparative analysis,[627] but it may be interesting to briefly sketch to what extent the compensation system in Japan is in line with certain international trends or deviating from them. This may also provide an occasion to ask the question to what extent the compensation system in Japan may provide international lessons for other legal systems struggling with the financial compensation for victims of catastrophes or the compensation for victims of nuclear accidents.

A. Compensation for Victims of Natural Disasters

As far as the compensation of victims of natural disasters is concerned, four types of compensation systems can be loosely distinguished.[628] This brief survey considers insurance policies for terrorism as well. The low-frequency, high-magnitude nature of terrorist attacks demonstrates a risk level analogous to nuclear disasters for the purpose of comparing compensation systems.

1. A first possibility is to rely on liability and social security already in place and implement no further regulatory measures. Such an approach is largely followed in some European legal systems like Germany, Italy and Sweden.[629]
2. A second approach is to mandate that first party insurance coverage be extended to damages caused by a variety of natural disasters. This approach is used in France.[630] A similar system is being discussed in Belgium and the Netherlands.[631]

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[627] For a more thorough comparative analysis of financial compensation for victims of catastrophes see FINANCIAL COMPENSATION FOR VICTIMS OF CATASTROPHES: A COMPARATIVE LEGAL APPROACH (Michael Faure & Ton Hartlief eds., 2006).
[628] *See, e.g.*, TRANSBOUNDARY RISK MANAGEMENT (Joanne Linnerooth-Bayer et al. eds., 2001).
[629] *Introduction*, FINANCIAL COMPENSATION FOR VICTIMS OF CATASTROPHES: A COMPARATIVE LEGAL APPROACH 2 (Michael Faure & Ton Hartlief eds., 2006).
[630] *See* Olivier Moreteau & Fabien Lafay, *France: Liability for Acts of Terrorism Under French Law*, *in* TERRORISM, TORT AND INSURANCE: A COMPARATIVE SURVEY 29, 30 (Bernhard A. Koch ed., 2004).
[631] *See* Veronique Bruggeman et al., *Remodelling Reparation: Changes in the Compensation*

3. A third possibility is to create a compensation fund for victims that would provide partial compensation. A disaster fund like that exists in Austria to respond to terrorist attacks.[632]
4. A fourth option is to develop public-private partnerships, whereby the state intervenes to facilitate private insurance. These models are typically found in the U.S.; examples include the California Earthquake Authority ("CEA") and the National Flood Insurance Plan ("NFIP") for Flooding.[633]

Looking at international trends one could hold that the first system—liability law—is rarely used for natural catastrophes for the simple reason that there is usually no liable tortfeasor that can be easily identified and sued. The second model—an extension of mandatory disaster coverage in addition to first party insurance backed up with reinsurance by the state—is increasingly popular.[634] This model has substantial support in academic literature[635] and is becoming increasingly popular at the policy level in a number of countries, including the United States.[636] Mandatory disaster coverage is advocated since, as a result of a variety of behavioral biases, victims do not typically purchase disaster coverage even if it would increase their expected utility.[637] The role of government is also changing. In the past, governments would rather provide *ad hoc* compensation to victims of catastrophes.[638] This model is, however, increasingly

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of Victims of Natural Catastrophes in Belgium and the Netherlands, 35 DISASTERS 766, 771 (2011).

[632] *See* Dagmar Hinghofer-Szalkay & Bernhard A. Koch, *Austria: Liability for Acts of Terrorism under Austrian Law*, *in* TERRORISM, TORT LAW AND INSURANCE: A COMPARATIVE SURVEY 5, 7 (Bernhard A. Koch ed., 2004).

[633] *The National Flood Insurance Program*, FEMA, http://www.fema.gov/national-flood-insurance-program (last visited Nov. 2, 2012); CALIFORNIA EARTHQUAKE AUTHORITY, http://www.earthquakeauthority.com/ (last visited Nov. 2, 2012). For discussion of public-private partnerships and examples, see Veronique Bruggeman et al., *The Government as Reinsurer of Catastrophic Risks?*, 53 GENEVA PAPERS ON RISK & INS. 369 (2010).

[634] Howard Kunreuther, *The Case for Comprehensive Disaster Insurance*, 11 J. L. & ECON. 133, 151–52, 154 (1968).

[635] *See id.*; *see also* Reimund Schwarze & Gert Wagner, *In the Aftermath of Dresden: New Directions in German Flood Insurance*, 29 GENEVA PAPERS ON RISK & INS. 154, 154 (2004).

[636] *See* Kunreuther, *supra* note 634, at 162.

[637] *See* Michael Faure & Veronique Bruggeman, *Catastrophic Risks and First-Party Insurance*, 15 CONN. INS. L.J. 1, 14–16 (2008).

[638] Saul Levmore & Kyle D. Logue, *Insuring Against Terrorism—And Crime*, 102 MICH. L. REV. 268, 287 (2003).

criticized as it would lead to a so-called moral hazard, by providing perverse incentives to victims not to seek insurance coverage.[639]

How does the compensation for victims of earthquakes in Japan compare with these international tendencies? Japan seems to rely largely on insurance solutions, which allow substantial flexibility. Earthquake insurance can be obtained via traditional insurance companies, with reinsurance by JER.[640] There is also limited intervention by the government in the reinsurance of the earthquake risk.[641] In addition, earthquake insurance for households is also possible via Kyosai.[642]

As was made clear above while evaluating the compensation system for earthquakes[643] the compensation system in Japan has many strengths. Although there are doubts about the competitiveness of the market, earthquake insurance seems to be widely available in Japan. This is different than in some countries (like the Netherlands) where, as a result of a cartel agreement between insurers, particular natural disasters like flooding are simply not covered by insurance at all without endorsement.[644] Another positive is that apparently, to some extent (at least for private commercial insurance), risk-related premiums are charged. This means that the premiums charged are based not only on the earthquake risk at the location of the particular dwelling, but also related to the riskiness of the particular construction based on construction techniques.[645] The advantage of such a risk-based system is that risk differentiation can take place and according to which incentives for prevention can be provided: risk mitigation can be rewarded with lower premiums.

The intervention of government in the reinsurance scheme has been criticized in some economic literature as an inefficient subsidy which dilutes the development of marked-based solutions.[646] Others, however,

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[639] This is strongly advocated by Richard Epstein and Louis Kaplow. Richard Epstein, *Catastrophic Responses to Catastrophic Risks*, 12 J. RISK & UNCERTAINTY 287 (1996); Louis Kaplow, *Incentives and Government Relief for Risk*, 4 J. RISK & UNCERTAINTY 167 (1991); *see also* Raschky & Weck-Hanneman, *supra* note 299, at 321.

[640] ESTIMATING INSURED LOSSES FROM THE 2011 TOHOKU, JAPAN EARTHQUAKE AND TSUNAMI, RISK MANAGEMENT SOLUTIONS 6 (2011), *available at* http://www.rms.com/Publications/2011TohokuReport_041111.pdf.

[641] *See id.*

[642] *Id.*

[643] *See supra* Part I.E.

[644] *See* Michael G. Faure, *Financial Compensation for Victims of Catastrophes: A Law and Economics Perspective*, 29 J.L. & POL'Y 339, 347 (2007).

[645] *See supra* Part I.E.1.

[646] *See* Levmore & Logue, *supra* note 638, at 303; Anne Gron & Alan O. Sykes, *A Role for Government?*, REGULATION, Winter 2002–2003, at 48.

argue that such an intervention is advantageous since the government "has the capacity to diversify the risk over the entire population and to spread past losses to future generations."[647] The intervention of the government as a reinsurer of last resort also has the advantage that it stimulates the functioning of insurance markets and avoids the moral hazard which results from government-awarded compensation.

Indeed, there are still programs of government support,[648] but this support is relatively limited to condolence grants or to limited support for rebuilding the lives of disaster victims. Government support seems to focus specifically on immediate relief after the disaster, and only to a limited extent on compensation.[649] However, the various government relief programs seem to come on top of the insurance schemes and could to some extent create a moral hazard, meaning that incentives for investing in risk-reducing measures or incentives to take out insurance coverage may be diluted.

The most problematic aspect of the compensation system is that insurance is not mandatory but voluntary.[650] As we indicated above, insurance coverage for earthquake risk is, in Japan, relatively limited.[651] The perverse incentives resulting from the voluntary insurance scheme may play a role in Japan as well, causing a larger need for victims to call on other types of government support.

However, even though the voluntary character of the earthquake insurance could be criticized, Japan is surely not the only legal system which does not have mandatory coverage for this type of natural disaster.[652] In the U.S., where many insurance systems have been developed with generous government support (such as the California Earthquake Authority and the National Flood Insurance Plan), insurance coverage is still voluntary, leading to serious problems of underinsurance.[653] This is why,

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[647] Howard Kunreuther & Erwann Michel-Kerjan, *Policy Watch: Challenges for Terrorism Risk Insurance in the United States* 16 (Nat'l Bureau of Econ. Research, Working Paper No. 10870, 2004).
[648] *See supra* Part I.D.
[649] *See supra* Part I.E.3.
[650] *See supra* Part I.E.4.
[651] Erik Holm, *Insurers Face Steep Losses, Though Not Heaviest Share*, WALL ST. J. (Mar. 11, 2011, 6:20 PM), http://online.wsj.com/article/SB10001424052748703597804576194382648935082.html.
[652] George Zanjani, *Public versus Private Underwriting of Catastrophe Risk: Lessons from the California Earthquake Authority*, *in* RISKING HOUSE AND HOME: DISASTERS, CITIES, PUBLIC POLICY 5 (John M. Quigley & Larry A. Rosenthal eds., 2008), *available at* http://irm.wharton.upenn.edu/S07-Zanjani.pdf (describing optional earthquake insurance in California).
[653] *See id.* at 19–20.

also in the U.S., at least one scholar has repeatedly pleaded in favor of comprehensive disaster insurance, as a particular response to disasters like Hurricane Katrina.[654] Even though the voluntary character of the insurance scheme in Japan could be criticized, Japan is certainly not out of line in the international context, as many more legal systems are reluctant to introduce mandatory insurance.

B. Nuclear Accidents

1. Criticisms of the International Regime

Two international treaty regimes regulate the civil liability for damage caused by nuclear accidents.[655] The first treaty regime was established under the auspices of the Organization for Economic Co-operation and Development, and consisted of the Paris Convention on Third Party Liability in the Field of Nuclear Energy, adopted in July 1960 (the "Paris Convention") and the Brussels Convention Supplementary to the Paris Convention, adopted in January 1963 (the "Brussels Supplementary Convention").[656] The second nuclear liability treaty regime was developed under the auspices of the International Atomic Energy Agency ("IAEA") in the Vienna Convention on Civil Liability for Nuclear Damage, enacted in May 1963 (the "Vienna Convention" or "IAEA Convention").[657] These international regimes have been commented on in detail in legal literature and have also been the subject of much criticism.[658]

Criticism has coalesced around several main points. One aspect is the exclusive civil liability of the operator of the nuclear power plant, often referred to as the channeling of liability.[659] The channeling of liability

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[654] *See generally* Howard Kunreuther & Mark Pauly, *Rules Rather than Discretion: Lessons from Hurricane Katrina*, 33 J. RISK & UNCERTAINTY 101 (2006).

[655] *See* NUCLEAR ENERGY AGENCY, ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, LIABILITY AND COMPENSATION FOR NUCLEAR DAMAGE: AN INTERNATIONAL OVERVIEW 43 (1994).

[656] *Id.* The OECD was then known as the Organization for European Economic Cooperation ("OEEC").

[657] *Id.*

[658] Tom Vanden Borre, *Shifts in Governance in Compensation for Nuclear Damage: 20 Years After Chernobyl*, *in* SHIFTS IN COMPENSATION FOR ENVIRONMENTAL DAMAGE 261, 303, 305 (Michael Faure & Albert Verheij eds., 2007).

[659] Michael Faure & Karine Fiore, *The civil liability of European nuclear operators: which coverage for the new 2004 protocols? Evidence from France*, 8 INT'L ENVTL. AGREEMENTS 227, 229–30 (2008) [hereinafter Faure & Fiore, *The Civil Liability*].

means that only the operator of the nuclear power plant can be held liable to compensate for a nuclear accident.[660] This rule is debatable from an economic perspective, since channeling excludes liability of others who could have contributed to the risk as well.[661]

A second aspect highly criticized in the literature is the financial cap on liability.[662] Pursuant to the conventions, the nuclear operator can be held liable in case of an accident only up to a certain amount. "The amount was first fixed by the Paris Convention in 1960, and has been modified many times since."[663] For example, before the last modification protocol of the Paris and Brussels Conventions, the operator's liability limit in a country like France was fixed at € 91 million (116 million USD).[664] The cap was recently set at € 700 million (893 million USD), but this change, dating from 2004, has not entered into force yet.[665] The criticism is that the amount may still be largely insufficient to cover the victims of an accident.

However, and here lies the source of the third criticism, "the Brussels Convention provides a complementary mechanism of compensation based on public funds" for damage exceeding these caps.[666] This mechanism applies in cases where the amounts fixed by the Paris Convention would be too low.[667] The Brussels Convention adds two layers of risk insulation, one consisting of aid by the national state and a next layer consisting of aid by all parties to the convention.[668] Since the precise amount depends upon national implementation, the amount of available compensation also differs. For example in France the total amount available for victims under the Paris and Brussels Conventions consisted of € 381 million.[669] After the modification protocol (when it would enter into force) the total amount of coverage would be € 1.5 billion.[670] This government intervention has been criticized in the literature for providing a subsidy to the nuclear operator.[671]

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[660] *Id.*
[661] *See id.*; Michael Faure & Ton Hartlief, *Remedies for Expanding Liability*, 18 OXFORD J. LEGAL STUD. 681, 692 (1998).
[662] *See* Faure & Fiore, *An Economic Analysis*, *supra* note 598, at 445.
[663] *Id.* at 427.
[664] *Id.*
[665] *Id.*
[666] *Id.* at 428.
[667] *See* Faure & Fiore, *An Economic Analysis*, *supra* note 598, at 428.
[668] *Id.*
[669] € 91 million based on the operator's liability cap, € 140 million based on the state's intervention, and € 150 million consisting of the contracting parties' coverage. *Id.* at 430.
[670] Consisting of € 700 million for the operator's liability, € 500 million of state's intervention, and € 300 million of all contracting parties. *Id.*
[671] *See, e.g.*, Faure & Fiore, *The Civil Liberty*, *supra* note 659, at 227–48.

These criticisms apply to a lesser extent to the U.S. regime. The U.S. did not join the international conventions, but adopted its own Price-Anderson Act in 1957.[672] Under the Price-Anderson Act, there is no longer (since 1975) government compensation: a first layer of operator's liability of $60 million is supplemented with a regime of retrospective premiums to which all operators contribute.[673] Now the individual liability of a nuclear operator in the United States is $375 million supplemented with a second layer (consisting of retrospective premiums) of $11.86 billion, leading to a total amount of $12.2 billion, without any government intervention beyond an operator contribution from the Department of Energy to insure its own nuclear activities.[674] In comparison to the international regimes the Price-Anderson Act has fewer inefficiencies because there is, in principle, no government intervention.[675]

2. The Japanese Model: Strengths and Weaknesses

Japan adopted some principles similar to those of the international regimes of nuclear liability, such as strict liability, channeling of liability to operators, and compulsory financial security. But there are many differences as well. The first difference lies in the definition of nuclear damage and the use of the administrative system. The international regime gives a more detailed definition of nuclear damage. For example, under the second generation of nuclear liability conventions, nuclear damage covers "loss of life or personal injury; loss of or damage to property"; consequential economic loss from personal injury and property damage; costs of environment reinstatement, loss of income from use or enjoyment of the environment and the costs of preventive measures.[676] However, in Japan, the definition of nuclear damage is quite simple and is silent on what type of damage is compensable.[677] Thus what composes "nuclear damage" depends on the general tort rules and the application in practice. In Japan, the judicial system is not favorable to nuclear victims because of the difficulties in

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[672] Price-Anderson Act, Pub. L. No. 85-256, 71 Stat. 576 (1957) (amending the Atomic Energy Act of 1954).
[673] Faure & Vanden Borre, *supra* note 581, at 243.
[674] *Liability for Nuclear Damage*, *supra* note 320.
[675] This of course depends to the extent that the amount of $12.2 billion will be sufficient to cover the costs of an average nuclear incident. For a more detailed comparison between the international regime and the U.S. Price-Anderson Act, see generally Faure & Vanden Borre, *supra* note 581, at 226–48.
[676] 2004 Paris Convention, Article I (vii).
[677] Act on Compensation for Nuclear Damage § 2.

proving causation and the judges' favorable attitude towards the nuclear industry, as discussed above.[678] On the contrary, most disputes are solved through negotiations and settlements under guidance of the administrative system. The Dispute Reconciliation Committee plays an important role in determining the scope of compensable damage.[679] The question can be asked whether compensating victims via such an administrative system takes place on the basis of specific criteria and hence leads to predictability of the compensation. When looking at the compensation experiences for nuclear damage in Japan, one can find consistency in the determinations by the Dispute Reconciliation Committee.[680] During the compensation for damage for the JCO and Fukushima accidents, the Committee adopted similar standards in awarding the compensation.[681] The scope of compensable damage in the Fukushima accident is broader, but this is understandable since this accident had a much more significant off-site impact, and experience is still aggregated during the evolution of the compensation process.[682] If the administrative system keeps operating consistently and develops predictable and clear standards for determining the compensable damage, the administrative system can even ensure more efficient and complete compensation for nuclear victims and give the nuclear industry more incentives to internalize their full costs than the tort system.

A predictable administrative compensation system is possible in Japan. Japan has a long history in compensating pollution victims through an administrative system.[683] Admittedly, the administrative scheme may not always guarantee efficient compensation. The investigation procedure needs to be more transparent and the standards used to identify compensable damage need to be consistent. Hence, some combined use of the administrative system and the tort system in Japan may be desirable, as the tort system provides some external accountability and review of the compensation scheme.

Japan also channeled the liability to the operator of the nuclear power plant. This channeling takes place under the Act on Compensation for Nuclear Damage of 1961.[684] However, unlike the international regime

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[678] *See supra* Part II.E.2.
[679] *See supra* Part II.D.2.c.
[680] *Tokai-Mura Accident*, *supra* note 349, at 129–30.
[681] *Id*.
[682] *See supra* notes 5–6 and accompanying text.
[683] For the introduction of the administrative compensation scheme for pollution victims in Japan, see A. Morishima, *Environmental Liability in Japan*, *in* MODERN TRENDS IN TORT LAW: DUTCH AND JAPANESE LAW COMPARED 183, 191–93 (Ewoud Hondius ed., 1999).
[684] Act on Compensation for Nuclear Damage § 3.

there may still be other possibilities in Japanese law which could lead to liability of either the operator or other liable parties beyond the liability based on the Act on Compensation for Nuclear Damage.[685] Moreover, the Fukushima case provides an excellent example of the problematic nature of channeling liability. The first reports on the Fukushima case made clear that the meltdown of the nuclear reactors may have been caused by the simple fact that the generators for the cooling system were located in the basement of the turbine buildings, which of course made them very vulnerable to a tsunami.[686] The question could be asked whether this is the result of negligent action by the operator TEPCO, or rather the result of bad design or engineering by General Electric. In the latter case a channeling of the liability to the operator TEPCO would be particularly problematic since channeling would lead to an exclusion of liability of all other parties who contributed to the risk, in this particular case (at least potentially) General Electric. Channeling may thus negatively affect incentives of other parties involved in the risk. In that sense the Fukushima case can once more provide an important back up for the general criticism formulated on channeling.

As to the second aspect, the amount of compensation, the Japanese regime set the required financial security at 120 billion yen.[687] Remember that under the international regime the total amount available (including state aid) was € 381 million under the old conventions and will merely be € 1.5 billion when the modification protocol of the Paris and Brussels Convention of 2004 would enter into force.[688] The amount in Japan is set substantially higher than the first generation of the international regime, but is similar to the second generation of the international regime and lower than the U.S. regime. As discussed above, though no preset cap on liability exists in the Act on Compensation, limited liability under corporate law may prevent the nuclear industry from internalizing the full cost of injuries they cause. Under this situation, sufficient financial security is necessary to guarantee efficient cost internalization. However, the amount of 120 billion yen set in the Japanese system is completely insufficient to cover the huge damage caused by the Fukushima accident.[689] Analysis

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[685] For a detailed analysis of other potential sources of liability under Japanese law, see Weitzdörfer, *supra* note 317, at 87–101. There may, for example, still be claims possible on the basis of property law, but also under labor law or social security law. State liability can still be examined, according to Weitzdörfer.

[686] *See* Yoshida, *supra* note 489.

[687] Vásquez-Maignan, *supra* note 471, at 9.

[688] *See supra* notes 669–70 and accompanying text.

[689] *Supra* Part II.E.

based on a private interest approach to compensation shows that government and judges may not have incentives to impose strict nuclear liability on operators under the tort system.[690] Nevertheless, the Fukushima accident shows that it remains important to set financial security at a sufficiently high level to cover the total accident costs.

Thirdly, as far as the financing is concerned, Japan's program seems to do better than the international regime at compensating victims. Currently, for example, of the total amount available under the international regime in France of € 381 million (486 million USD), only € 91 million would consist of operator's liability whereas the remaining € 290 million (370 million USD) would consist of state aid.[691] In Japan this amount of 120 billion yen is in principle paid by the operator, either (in the general case) via liability insurance or, in case of uninsurable risks (more particularly damage resulting from earthquakes, tsunamis or volcanoes) via an indemnity agreement with government.[692] But the indemnity agreement is, unlike state aid in the international regime, not a subsidy since the operator has to pay a fee for the coverage provided by government via the indemnity agreement.

Of course one could question whether the fee paid by the operator for the indemnity agreement is comparable to commercially risk dependent premiums that would be charged on a commercial insurance market. One report shows that in 1998, the premium rate was set at an average of 7.9 percent of the total amount of coverage,[693] which is substantially higher than the rate of indemnity fee (0.03% or 0.015%).[694] However, it should be born in mind that given the lack of actuarial data for nuclear accidents, commercial premiums are usually set higher than the actuarial premium. Thus the difference between the rate of indemnity fee and actuarial premium—a more accurate measure of risk—may not be that large. On the positive side, at least in Japan, some money is asked from the operator for the government indemnity, whereas in the international regime the state aid is provided for free—functionally, a complete subsidy. Therefore less subsidy is given under the Japanese system. Moreover, unlike the international regime there is in Japan in principle unlimited liability of the

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[690] *Supra* Part II.E.2.

[691] Even after the entry into force of the modification protocol of 2004, only € 700 million of the total amount of € 1.5 billion would be operator's liability and a remaining € 800 million would still be state aid. *See supra* note 295 and accompanying text.

[692] *See supra* notes 609–10 and accompanying text.

[693] Watabe, *supra* note 346, at 222.

[694] Order for the Execution of the Act on Indemnity Agreements for Compensation of Nuclear Damage § 3.

operator beyond the amount of 120 billion yen,[695] for which the operator must seek either liability insurance or an indemnity agreement. Hence, the Japanese system has less of a subsidy effect than the international regime, and thus better prospects of cost internalization by the operator.

It is worth noting that the advantages of the Japanese system compared to the international regimes do not mean that there is no subsidy to the nuclear industry at all. The above discussion of the newly founded Nuclear Damage Compensation Facilitation Corporation shows that an *ex post* risk sharing agreement is established in Japan.[696] In such a system, both TEPCO and other nuclear operators are asked to contribute to the Corporation, which helps and promotes compensation for nuclear victims.[697] This seems similar to the U.S. system where retrospective premiums are asked from operators.[698] It is held that this system can give operators incentives to monitor each other and improve nuclear safety. At this stage it is not clear yet how the various nuclear operators will contribute to the Corporation. The system is, moreover, only established after the Fukushima incident took place.[699] Thus, such an *ex post* system may fail to create incentives for nuclear operators for mutual monitoring. Besides, the government also helps the compensation through the issuance of government bonds and government guarantee bonds. Those instruments can lead to a subsidy as well.

CONCLUSION

On March 11, 2011, the world was shocked by the story of a 9.0 on the Richter scale earthquake and the following spectacular tsunami, which together killed over 15,000 people.[700] When a few days afterwards the devastating results of the tsunami were assessed, it became clear that the worst was probably still to come. The tsunami also led to the failure of the emergency diesel generators for the cooling systems in the nuclear power plant at Fukushima, causing a meltdown in various reactors.[701] This led to a unique combination of natural and technological disasters, leading to a

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[695] Weitzdörfer, *supra* note 317, at 70–71.
[696] *See supra* Part II.D.2.e.
[697] *See supra* Part II.D.2.e.
[698] Faure & Vanden Borre, *supra* note 581, at 243.
[699] *See* METI Outline, *supra* note 567.
[700] *See Damage Situation and Police Countermeasures*, *supra* note 4.
[701] CNNWORLD, *supra* note 487.

spectacularly high amount of damage and giving rise to many new questions concerning the legal duty to compensate.

The Japanese nuclear compensation laws make clear that different rules are needed for damage caused by a natural disaster, like an earthquake or a tsunami, where no injurer can be identified and held liable, and damage caused by nuclear accidents which qualify as technological disasters where liability rules can be applied to an identifiable party.

Carefully examining the way compensation is provided to the victims of both the earthquake/tsunami and the nuclear incident is important, not only to understand to what extent victims can be adequately compensated, but also to see what lessons can be learned from the Japanese experience. One interesting aspect of Japan's earthquake compensation model is that it, as is increasingly the case in many legal systems, largely relies on private insurance.[702] As in the U.S. (which has programs like the CEA and NFIP) insurance is not mandatory, but is supplemented with state-provided reinsurance to promote the insurability of the earthquake risk. Still the use of insurance solutions, as compared to outright state aid, has the advantage that premiums can be differentiated according to risk, which is also the case in Japanese earthquake insurance.[703] Hence, the insurance system can provide adequate incentives to reduce the earthquake risk by rewarding those that installed risk-reducing measures with lower premiums.

The compensation model for nuclear accidents also provides interesting lessons for the international community. The operator's duty to seek financial guarantees up to a certain amount—a coverage floor—is supplemented with unlimited potential liability. Moreover, the indemnity agreement with the government involves the payment of a fee by the operator for the compensation that will be provided by government. This provides an important lesson that state intervention in the compensation of catastrophes should not (as is often the case) be provided for free. Charging a price for government intervention has the major advantage that a subsidy effect is avoided, guaranteeing provision of financial incentives and disincentives for risk-reducing behavior by operators and victims.

Of course questions still arise as to whether either the earthquake insurance regime or the compensation system for nuclear liability will be able to provide full compensation to the victims. It may be too early for such a final assessment, since the damage has not yet been completely assessed.

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[702] *See supra* Part I.A.
[703] *See* Table 2, *supra* Part I.A.1.b.

But the Fukushima case again shows that a careful design of the compensation regime of catastrophic risks is important, not only in the light of providing adequate compensation to victims, but also as an instrument to provide incentives for prevention. The mere fact that the Fukushima incident may have been caused, not only by operator's wrongful behavior, but probably by a design failure again shows the problematic nature of an exclusive channeling of liability to the operator.[704]

Studying the compensation for victims of the March 11, 2011, tsunami and the subsequent nuclear incident at Fukushima in Japan is therefore undoubtedly not only interesting for those directly involved in the compensation of the victims, but can provide yet another alert to the international community that the inefficient design of some international conventions need to be seriously reexamined.

[704] *See supra* Part II.d.2.a.