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Title: Potential of taxonomy to preserve and disseminate Fukushima accident information implemented by JAEA Library

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Abstract: Regarding Fukushima Accident, it would be true that the concerned information has not been provided good enough for the affected people in and over Japan, for instance, as often being mixed, confused, too many to access or disappearing through the internet or websites. In this regard, necessary be to terminologically well line up ways to access such affected information, like a taxonomy, composed of semantically controlled terms on the related events forming lineage-like hierarchical structures. To come up with potential of the taxonomy to preserve and disseminate the affected information, described are preliminary view on its terminological aspects and availability of IAEA/INIS for the information implemented by JAEA Library. Remarks are that necessary be to make ever-new inexperienced aspects and terms derived from the affected information such as 'beyond design basis' further detailed, scrutinised and involved in the both schemes, terminological aspects and IAEA/INIS, attributed to the taxonomical potential higher.

Keywords: information preservation; information dissemination; Fukushima accident; terminology aspects; taxonomy; Japan Atomic Energy Agency; JAEA; library; International Nuclear Information System; INIS; multilingualism ; Japanese; internet; websites; nuclear knowledge management

Biographical Notes: Katsuhiko Kunii was granted a doctor's degree of engineering at the Toyohashi University of Technology, Japan in 1992. He has been working for provision of INIS input data since 2005 at the Library of the Japan Atomic Energy Agency (in its department of Intellectual Resources), encouraged by his engineering background of fluid mechanics for the sake of heat removal on nuclear reactor system. Since the occurrence of Fukushima Accident he has been working as well for provision of the affected information with his hope that it will be devoted to a part of knowledge base of nuclear accident in future. His

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interest has been in knowledge management in nuclear field, in particular since his participation in the School of Nuclear Knowledge Management, Italy, 2010 held by IAEA.

Keizo Itabashi does kindly request not to mention about his biographical note.

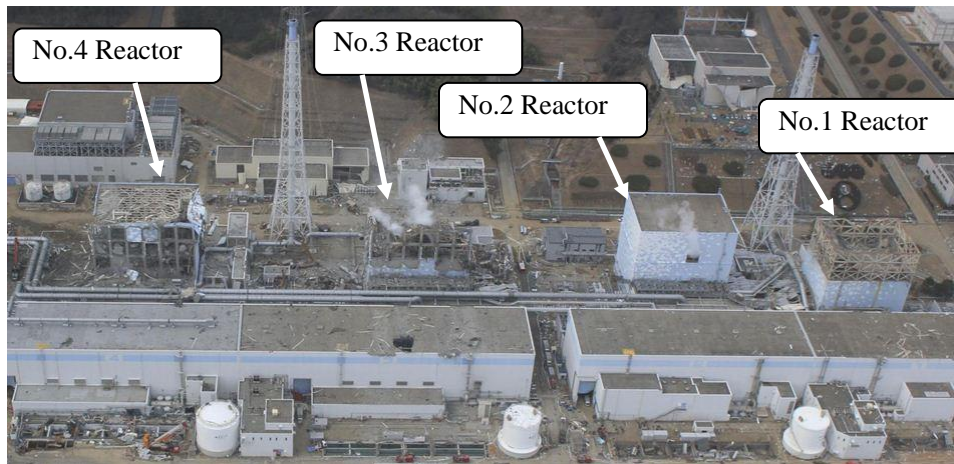
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## 1. Introduction

The Fukushima Daiichi Nuclear Power Plants Accident (Fukushima Accident) has remained very severe [e.g., 1] since its occurrence in March 2011, as shown in Fig.1, and still ongoing with reactors' cores melted down, environmental contamination by radioactive substances, disruption of living of communities around it. In the meanwhile, it would be true that the concerned information has not been provided good enough for the affected people in and over Japan, as often being inaccessible to the concerned information, which would be only a few involved in too many but helpful to find out facts of the events, or disappearing, through the internet or websites, for instance, the one of daily or monthly radiation monitoring data in the air, water, soils, plants, fish, animals onsite and offsite [e.g., 2], then the one of records or documents of countermeasures against the nuclear accidental crisis in the early phase of Fukushima Accident taken by and amongst Japanese regulatory body and Cabinet, and onsite office and headquarters of Tokyo Electric Power Company. In addition, it should be aware that in the early accidental phase such information had been provided and shared in Japanese only, which is one of unique languages worldwide. Furthermore, it might be occasionally true that the phenomena concerning the affected information would look mixed, diverse or confused. Hence it seems that necessary be to take some measures to terminologically well arrange such affected information, a useful way of which is called 'taxonomy' composed of semantically controlled terms on the related events forming lineage-like hierarchical structures [e.g., 3,4], in particular towards the coming future for decades, post-Fukushima era.

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Figure 1 An aerial photocopy of crippled Fukushima Daiichi Nuclear Power Plants as of 2011



Source: IAEA (2011) 'Mission report: The great east Japan earthquake expert mission, IAEA international fact finding expert mission of the Fukushima dai-ich npp accident following the great east Japan earthquake and tsunami', [http://www-pub.iaea.org/MTCD/Meetings/PDFplus/2011/cn200/documentation/cn200\\_Final-Fukushima-Mission\\_Report.pdf](http://www-pub.iaea.org/MTCD/Meetings/PDFplus/2011/cn200/documentation/cn200_Final-Fukushima-Mission_Report.pdf), retrieved 30 May 2013

In order to come with up such taxonomy, this article mentions first about preliminary terminological aspects of Fukushima Accident and next about availability of IAEA/INIS, which applies its own terminology, called INIS Thesaurus, implemented by JAEA Library regarding such affected information, then at the end summarises about its taxonomical potential on preservation and dissemination of the information.

## 2. Preliminary terminological aspects of information related to Fukushima Accident

Fukushima Accident remains still in out-of-control or partly ongoing and then lets you know how much and/or many accident-related problems, which have not experienced ever, must be solved, for instance, likely to be featured by accidental events such as 'beyond design basis', 'extreme correlated natural hazards (external events)', 'expanded severe damages at a multi-units site at once', 'undertaken by social media fairly developed'. This would be one of reasons why there has not been a good enough terminology in regard to the affected information of Fukushima Accident, yet. Hence it would be accounted for briefly viewing the affected information one after another delivered through websites, literature, reports etc from a technical viewpoint, to take account of its

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terminological aspects as a first step. Some of the examples are described below first, which have been bothering the affected people yet, seemed not to be well informed:

For example:

- a) Regarding concerns in health effects of exposure to ionising radiation, there have been remarkably many sorts and much of information or knowledge, in particular, in the case of low dose ionising radiation exposure, although one of the reasons might be the fact that the effects themselves have not been solved articulately from viewpoints of science so far [e. g., 5,6,7,8,9,10].
- b) In Japan respective four reports were issued summarising the results of the investigation of Fukushima Accident, by i)parliament panel, ii)government panel, iii)private (non-governmental) panel and iv)Tokyo Electric Company's panel [11,12,13,14,15], through which it has found that some of the findings in between are different or opposite while the others are the same.
- c) Lately more and more information socio-economical or psycho-social regarding the living of the residents or evacuees has emerged, occasionally associated with actions taken for risk perception or communication [e.g., 16,17,18].
- d) Likelihood of lesser accessibility to some of important information or knowledge via websites has been increasing, with concerns of missing potential of the web-based necessary for expectant ways in future to do remediation or restoration such as defueling, decontamination, decommissioning over decades, associated with a viewpoint of chronology [e.g., 2].

Helped by the assistance of the examples mentioned above, as well references [2,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26], which are available to date, the following views on terminological aspects and its sub-aspects for the affected information from technical, administrative etc viewpoints seem to be one of potential ways accountable to fairly share it:

- 1) Scientific, technological aspects;
  - radiation monitoring, dosimetry; data measured and/or simulated; offsite, onsite,
  - health effects of exposure to ionising radiation; offsite, onsite,
  - to map radiation contamination in air, soils, water; offsite, onsite,
  - biological radiation protection, radionuclide concentration and migration on plants, animals, fish etc; offsite, onsite,
  - procedures engineered on decontamination, remediation, rehabilitation ;

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offsite (buildings, houses, roofs, garden, gutters, fields, meadows, orchards, paddies, public squares, roads, forests etc); sludge treatment (finding nuclide composition and its characteristics, heat, chemical, dilution, absorption, adsorption, etc), ploughing, stripping topsoil, weeds, gravel etc, interchanging topsoil with subsoil, removing litter layer, tilling, pruning, water-jet washing, shot blasting, brushing, wiping, phytoremediation, dose reduction, volume reduction, etc,

onsite (re-circulation system of cooling water for reactor cores and spent fuel pools, mitigation of release of radioactive materials, etc); multi-nuclides removal, desalination, sludge and liquid radioactive waste treatment, prevention of groundwater flowing in, cover over reactor building, agents to inhibit radioactive dust,

- standards to deal with deposit of generated radioactive materials of contaminated water, soil, plants, debris etc; offsite, onsite,
  - crisis or severe accident management measures; defence-in-depth, beyond design basis, extreme natural hazards', expanded multi-severe damages at a multi-units site, probabilistic risk assessment,
  - to figure out severe accident ; station blackout, loss of ultimate heat sink, failure of reactor core cooling, emergency core cooling system (isolation condenser, high-pressure coolant injection system, reactor core isolation cooling system, depressurisation valve system etc), fuel cladding-water/vapour reaction, hydrogen generation, meltdown, melt-through, corium, debris, hydrogen explosion, source term, scenarios, human factors, release of fission products,
  - potential of defueling or decommissioning the crippled reactors onsite; remote accessible apparatuses, radiochemical characterisation of debris etc, volume reduction, economical options,
  - safety standards, seismic resistance, protection against tsunamis or floods,
  - implications of comments, advice, recommendation by nuclear scientists, medical doctors, regulators, reactors' owners, vendors, practitioners,
  - safety culture, knowledge incorporating, best practice,
- 2) Administrative, legislative, legal aspects;
- evacuation criteria and exclusive zoning,
  - nuclear regulation; nuclear safety standard, emergency responses, precautionary preparedness and its measures, public responses, stakeholders' involvement and obligation, compliance with regulation,
  - national action and procedure on mental or monetary

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- compensation for affected people and communities,
  - implications of reports' comments on accident investigation panels,
  - nuclear policy; nuclear phase-out, nuclear fuel cycle, cases of re-starting nuclear power plants' operation, governance,
  - information transparency, risk-informed decision, victims' standpoints,
- 3) Sociological, economical, psychological, psychiatric aspects;
- socio-economical disruption of local communities,
  - financial loss caused by harmful rumors or misinformation,
  - nationwide socio-economical revival programs or action for municipalities and its effectiveness; re-establishment of employment, enterprises, entrepreneurs, attraction of young generation,
  - psychiatric, mental health effects; anxiety, trauma, stigma of evacuees deprived of usual life, radiophobia
  - informing transparently, risk perception, emergency communication, availability of social media,
- 4) Monolingual aspects derived from Japanese;
- preliminary communication, its documents in Japanese via twitter, websites, prints etc on accident events, experiences, lessons etc; offsite by evacuees, medical doctors, nuclear experts, practitioners, residents in affected areas, onsite by electric utilities, regulators, administrators, vendors,
  - potential of ambiguous interpretation on Japanese information as in other languages,
  - international responses, aids.

Taking account of terminological aspects mentioned above, it seems that in order to make the terminology comprehensive regarding the events of Fukushima Accident it would be necessary in addition to make ever-new aspects and/or terms further detailed and scrutinised, which account for the accidental events not experienced ever such as 'beyond design basis', 'extreme correlated natural hazards (external events)', 'expanded severe damages at a multi-units site at once', 'even in time of social media fairly developed', as well as an aspect derived from 'a unique language of Japanese'.

Then should you focus further on an informative terminological aspect [e.g., 2] the following would be necessary as well on a basis:

- 5) Informative aspects of access, retrieval, communication;
- electronic networks' sources or tools; websites, twitter, links, emails, internet,
  - printed or hard-copied documents; reports, articles of newspapers and journals, books, essays,

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- private-, group-, local-communities' communication, meetings, conferences, conventions,
- respective, perspectives or concerned fields; well-selected, -collected, -categorised, -comprehended, -bilingual-, multilingual-corresponded with monolingual of Japanese,
- website-, network-accessibility: well-preserved, no missing, with being well-arranged in timeline, retrospect, prospect, chronological, as legacies,
- quality; assured, liable, reliable, authenticated, transparent.

Concerning such terminological aspects above, in particular the informative one, described in the next is implementation of JAEA Library together with IAEA/INIS to contribute to preservation and dissemination of Fukushima Accident information.

### 3. Preservation and dissemination of Fukushima Accident information through IAEA/INIS as an implementation of JAEA Library

The Japan Atomic Energy Agency (JAEA, established in 2005 as the successors both of the former Japan Nuclear Cycle Development Institute (JNC) and the Japan Atomic Energy Research Institute (JAERI)) is the sole organization responsible for comprehensive research and technology development in nuclear field in Japan. Engaged in JAEA, its Library has been responsible for preparation of documents useful for such activities over 50 years since the commencement of the former JAERI.

In regard to information related to Fukushima Accident, JAEA Library has been in effort to preserve and disseminate such affected information so far. Described is the implementation of JAEA Library as well as its expansion towards IAEA/INIS (the International Nuclear Information System [27], a database of nuclear field).

#### 3.1 preliminary findings related to Fukushima Accident

JAEA Library has been disseminating information related to Fukushima Accident via its website [28] since April 2011 after the occurrence of Fukushima Accident. Fig. 2 shows the one, in which Fukushima Accident related information is referred to [29], consisting of the following, although being partly in Japanese:

- Lists of JAEA research and development results,
- Useful bibliographies (radiocesium dispersion simulation, health effects, contamination countermeasures etc),
- Technical Reports,



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- References in "STI/PUB/1239 : Environmental consequences of the Chernobyl accident and their remediation : twenty years of experience / report of the Chernobyl Forum Expert Group 'Environment' ",

In particular the 'Useful bibliographies' provides thousands of bibliographic data related to Fukushima Accident, composed of: Three Mile Island accident, Chernobyl accident, radioactive liquid waste processing, radionuclide migration, decontamination, defueling, decommissioning, low-dose radiation exposure etc. For example, in the case of radionuclide migration and decontamination listed up are bibliographic data such as 35 from JAEA technical reports, 42 from journals, 139 from IAEA/INIS.

Figure 2 Website of JAEA Library related to Fukushima Accident



Source: Japan Atomic Energy Agency's Library, <http://jolifukyu.tokai-sc.jaea.go.jp/ird/english/index.html>, retrieved 30 June 2013

Also, 'Twitter' has been available at JAEA Library website although being in Japanese. Via the Twitter the latest information related to Fukushima Accident such as radiation monitoring data around the Accident site, interim report of the Accident investigation in earlier time has been disseminated. Additionally, for example, a website, IEEE (the

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Institute of Electrical and Electronics Engineers) spectrum conducts the streamline since the beginning of catastrophe: earthquakes, tsunamis, explosions at nuclear power plants etc, has been accessible via the Twitter.

As of June 2013, there have been around over 20,000 accesses per month to the JAEA Library website of Fukushima Accident related information. The Library will continue to provide information and update it regularly.

In addition, the effort to collect, index and preserve data-based information with regard to Fukushima Accident has been planning as an archival activity to date, hoping that such an archive would be used to analyse the catastrophe further precisely applying the data or information, then consequently to share in effect lessons learnt from Fukushima Accident.

### 3.2 Preservation and dissemination of bibliographic data related to Fukushima Accident on regular work basis

#### 1) Derived from JAEA's research and development activities

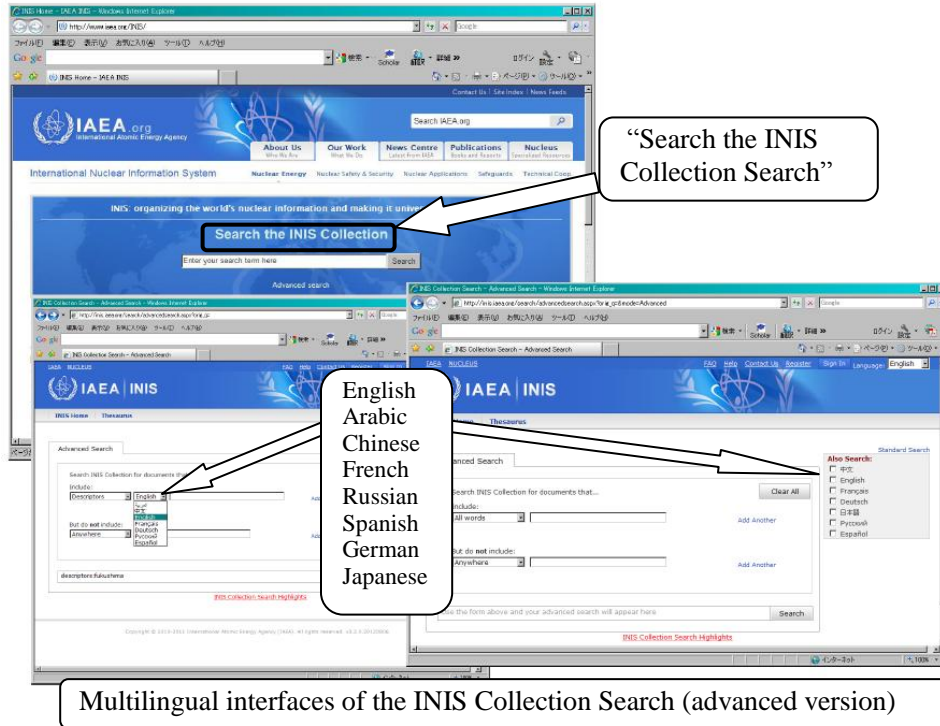
JAEA Library has preserved and disseminated bibliographic data of JAEA research and development activities in nuclear field over 50 years via its website as of today, shown in Fig. 2. Containing titles, author names, publishing information etc well arranged consistently, the bibliographic data are of journals' articles, technical reports etc in nuclear field, which include the ones related to Fukushima Accident as the outcomes of JAEA activities. In particular, JAEA technical reports have been made downloadable in full text documents freely as of today via the website.

#### 2) Via IAEA/INIS

An IAEA's database, the International Nuclear Information System (INIS) [27], provides over 3.5 million bibliographic data, including full text documents, in full coverage of nuclear field for peaceful use of nuclear science and technology. Then INIS is to date freely available via the website, shown in Fig.3a.

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Figure 3a IAEA/International Nuclear Information System (INIS)



Included among 128 member states (countries) and 24 international organizations as of June 2013, IAEA Library has over 30 years consistently provided bibliographic input data for INIS of major nuclear research and technological activities in Japan since the commencement of IAEA/INIS Programme. It should be emphasised that IAEA Library has had an advantage to be able to provide information or knowledge derived from Japan as being shared worldwide, taking the fact into account that INIS has been acknowledged as one of the worldwide useful nuclear information or knowledge bases, thus in particular afterwards, hoped to be the ones regarding Fukushima Accident.

### 3.3 Progress towards multilingual perspectives assisted with IAEA/INIS

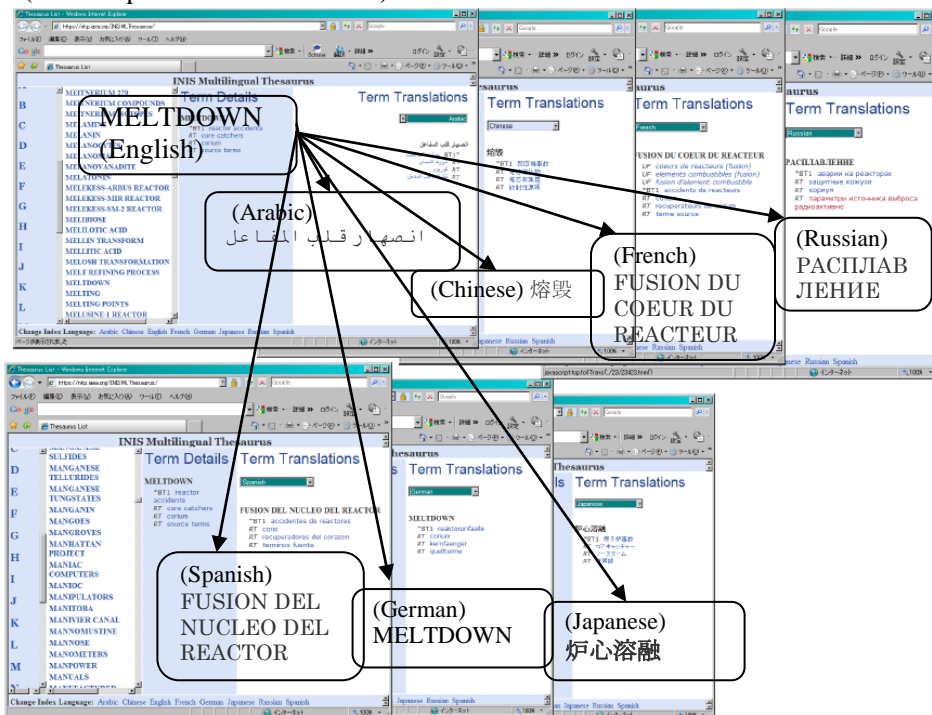
‘Being worldwide multilaterally’ would be one of the key perspectives whenever taking account of preservation and/or dissemination of information or knowledge derived from a unique language, Japanese, in particular of the ones with regarded to Fukushima Accident. This is because much and many kinds of information related to the Accident have been quite often provided in Japanese first of all, which could include the indispensable lessons learnt from the Accident. The monolingual would

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not be good enough to be shared worldwide multilaterally.

INIS has been made itself available on multilingual interfaces for information retrieval, i.e., in Arabic, Chinese, French, German, Russian, Spanish and Japanese, respectively, corresponded to English as a base, as well as in the same way for its semantically controlled multilingual sets of keywords (called “multilingual thesaurus”), as shown in Fig. 3a and 3b. Such multilingualism of INIS would deserve to contribute to preservation and dissemination of information or knowledge of Fukushima Accident.

Figure 3b IAEA/INIS Multilingual Thesaurus (an example of ‘MELTDOWN’)



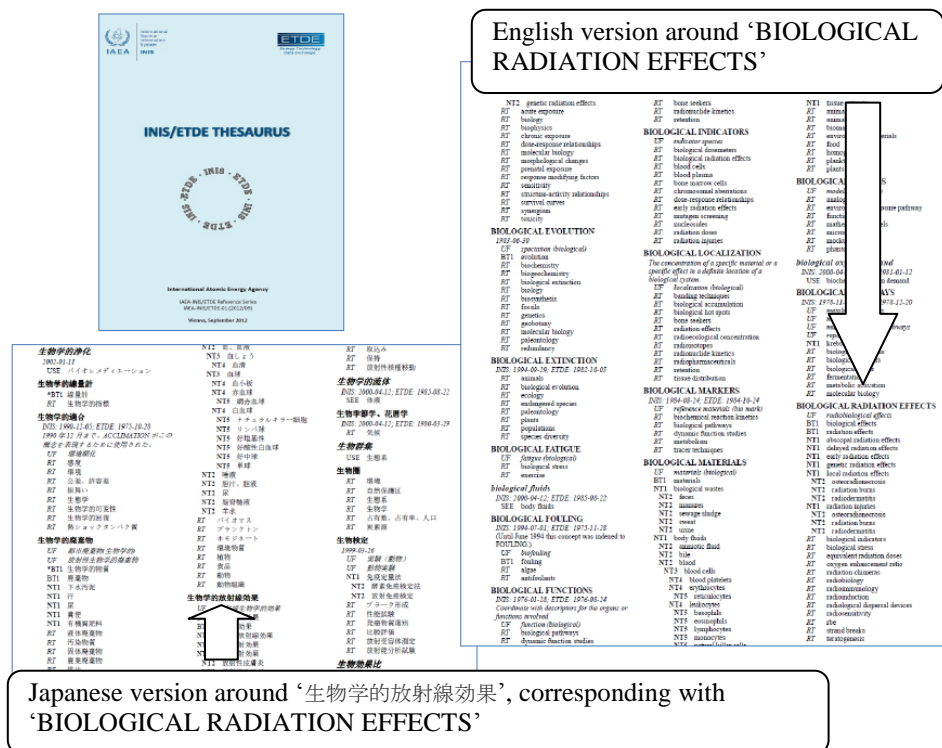
### 3.4 IAEA/INIS keywords' dictionary, thesaurus, and the multilingual including Japanese

The INIS's 'keywords' dictionary', called 'thesaurus', is the one composed of a controlled vocabulary in generic and semantic ways, in the form of blocks of keywords related one another, thus making up in many of hierarchical structures with the blocks throughout, as shown in Fig. 4. The thesaurus is applied not only to index information in the bibliographic forms but to retrieve bibliographic data from INIS with higher relevance rates. Then the thesauri in multilingual ways provided between English as its base and Arabic, Chinese, French, German, Russian, Spanish and

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Japanese, respectively, as shown in Fig. 3b, have been enhancing such functions by bridging the gap between the languages, consequently contributing to making the bibliographic data retrieved from INIS fairly ‘Being worldwide multilaterally’.

Figure 4 IAEA/INIS’s keywords’ dictionary, INIS Thesaurus, with hierarchical structures composed of blocks of keywords



Since August in 2012, the Japanese version of INIS thesaurus, shown in Fig. 4, which was developed by JAEA Library, has been available on the IAEA/INIS website [30]. The translation of keywords from English to Japanese, taking account of the features of technically grouped keywords’ blocks, had been completed often struggling on difficulty, which occurred due to the difference of linguistic systems between the two languages, e.g., ambiguous correspondence between English and Japanese, unfortunately matching one English word to two or more Japanese words etc.

Table 1 is an example of the keywords from INIS multilingual thesaurus related to Fukushima Accident.

*Title*

Table 1 keywords of INIS multilingual thesaurus related to Fukushima Accident as an example

English	ACCIDENT MANAGEMENT	EMERGENCY PLANS	RADIATION PROTECTION	TSUNAMIS	OUTAGES(#1)
Arabic	إدارة الحوادث	خطة طوارئ	وقاية من الإشعاع	موجات مذيبة (تسونامي)	انقطاعات الكهرباء
Chinese	事故管理	应急计划	辐射防护	海啸	断供
French	GESTION D'ACCIDENT	PLANS D'URGENCE	RADIOPROTECTIO N	TSUNAMIS	COUPURES D'ELECTRICITE
Russian	.... (non)	ПЛАНЫ ЛИКВИДАЦИИ АВАРИЙ	РАДИАЦИОННАЯ ЗАЩИТА	ЦУНАМИ	ПРОСТОИ ОБОРУДОВАНИЯ
Spanish	GESTION DE ACCIDENTES	PLAN DE EMERGENCIA	PROTECCION CONTRA LAS RADIACIONES	TSUNAMIS	CORTES DE ELECTRICIDAD
German	SCHADENMANAG EMENT	NOTSTANDSPL AENE	STRAHLENSCHUTZ	TSUNAMI-WELLEN	AUSFAELLE
Japanese	アクシデントマネジ メント	緊急時対応計画	放射線防護	津波	電力供給停止

English	AFTER-HEAT(#2)	MELTDOWN	FISSION PRODUCT RELEASE	FALLOUT	CONTAMINATION
Arabic	حرارة متبقية	انصهار قلب المفاعل	إطلاق نواتج الانشطار	سقط	تلوث
Chinese	余热	熔毁	裂变产物释放	放射性沉降物	放射性污染
French	CHALEUR RESIDUELLE	FUSION DU COEUR DU REACTEUR	RELACHEMENT DES PRODUITS DE FISSION	RETOMBEES RADIOACTIVES	CONTAMINATION
Russian	ОСТАТОЧНОЕ ТЕПЛОЫДЕЛЕН ИЕ	РАСПЛАВЛЕНИЕ	УТЕЧКА ПРОДУКТОВ ДЕЛЕНИЯ	РАДИОАКТИВН ЫЕ ВЫПАДЕНИЯ	РАДИОАКТИВНОЕ ЗАГРЯЗНЕНИЕ
Spanish	CALOR RESIDUAL	FUSION DEL NUCLEO DEL REACTOR	LIBERACION PRODUCTOS FISION	LLUVIA RADIATIVA	CONTAMINACION
German	NACHWAERME	MELTDOWN	SPALTPRODUKTFREIS ETZUNG	FALLOUT	KONTAMINATION
Japanese	残留発熱	炉心溶融	核分裂生成物放出	放射性降下物	汚染

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English	EXTERNAL ZONES	BIOLOGICAL EFFECTS	RADIATION	PUBLIC ANXIETY	DECONTAMINATION
Arabic	مناطق خارجية	تأثيرات شعاعية بيولوجية		قلق عام	إزالة تلوث
Chinese	外周区	辐射生物效应		公众忧虑	去污
French	ZONES D'INTERVENTION	EFFETS BIOLOGIQUES DES RAYONNEMENTS		INQUIETUDE DU PUBLIC	DECONTAMINATION
Russian	ВНЕШНИЕ ЗОНЫ	БИОЛОГИЧЕСКИЕ РАДИАЦИОННЫЕ ЭФФЕКТЫ		ОБЩЕСТВЕННАЯ ОБЕСПОКОЕННОСТЬ	ДЕЗАКТИВАЦИЯ
Spanish	ZONAS EXTERNAS	EFFECTOS BIOLÓGICOS DE LAS RADIACIONES		ANSIEDAD PÚBLICA	DESCONTAMINACIÓN
German	AUSSENBEREICHE	BIOLOGISCHE STRAHLENEFFEKTE		BEFÜRCHTUNGEN DER BEVÖLKERUNG	DEKONTAMINIERUNG
Japanese	周辺地域	生物学的放射線効果		一般人の不安	除染
English	REMEDIAL ACTION	POPULATION RELOCATION	DECOMMISSIONING	NUCLEAR POWER PHASEOUT	
Arabic	فعل إصلاحي	ترحيل السكان	إيقاف نهائي للتشغيل	تطبيق برنامج الطاقة النووية	
Chinese	补救措施	种群迁移	退役	核电逐步停产	
French	CONTRE-MESURES	DEPLACEMENT DES POPULATIONS	DECLASSEMENT	RALENTISSEMENT DU PROGRAMME NUCLEAIRE	
Russian	ЗАЩИТНЫЕ МЕРЫ	ПЕРЕСЕЛЕНИЕ	СНЯТИЕ С ЭКСПЛУАТАЦИИ	СВЕРТЫВАНИЕ ЯДЕРНОЙ ЭНЕРГЕТИКИ	
Spanish	ACCION REPARADORA	DESPLAZAMIENTO DE LA POBLACION	CLAUSURA	DEFASE DE LA ENERGIA NUCLEAR	
German	SCHUTZMASSNAHMEN	UMSIEDLUNG	STILLEGUNG	KERNENERGIEAUSSTIEG	
Japanese	改善措置	住民移住	デコミッショニング	原子力段階的撤去	

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#1 “OUTAGES”; for accidental or planned shutdowns or significant reductions of all or part of an electrical or thermal power system.

#2 “AFTER-HEAT”; for heat derived from residual radioactivity after a reactor has been shut down.

It is hoped that provision of keywords like Table 1 could be one step to lead to progress of preserving, disseminating or sharing information or knowledge related to Fukushima Accident from the viewpoint of multilingualism.

As mentioned in section 1, the information regarding Fukushima Accident delivered so far would have not been provided good enough for the affected people in and over Japan like disappeared, mixed, confused, in particular via the internet. Hence some ways are necessary helpful to struggle for it to make its accessibility and retrieval better.

In order to try to do it, e.g., with advanced relevance ratio, JAEA Library has been applied the INIS thesaurus, controlled keywords, for



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web-based programming via a social tagging and a JavaScript library: by means of the controlled keywords, tagging bookmark in case of the former [31], meanwhile making up partly then facilitating a JavaScript library (naming “covo.js”) in case of the latter [32], where the JavaScript library is the one that supports provision of controlled metadata such as authority files, subject headings, thesauruses of different sources like the Library of Congress, Wikipedia, INIS.

Although being noticed that it would be very difficult to keep its high-quality regarding the controlled keywords of INIS thesaurus [e.g., 32], it has been made based on cumulative experiences or knowledge over 40 years through IAEA, thus to date together with the Japanese version. It is therefore hoped that against an adverse informative condition with too many free keywords emerged via websites, then often derived from Japanese only, such two kinds of application mentioned above could be on the ways as well to help share or preserve or disseminate information related to Fukushima Accident.

#### 4. Concluding remarks

In regard to Fukushima Accident, it would be true that the concerned information has not been provided good enough for the affected people in and over Japan, for instance, as often being mixed, confused, too many to access or disappearing through the internet or websites. In this regard, it seems that necessary be to take some measures to terminologically well arrange such affected information, likely to form a taxonomy on the related events, in particular towards the coming future for decades, post-Fukushima era.

In order to come up with the taxonomy against the affected information, this article mentioned about preliminary terminological aspects of Fukushima Accident and about availability of IAEA/INIS implemented by JAEA Library.

Preliminary view on terminological aspects on the affected information, which follows the technically related features of Fukushima Accident being found out until now, indicates that in order to make the terminology comprehensive regarding the events of Fukushima Accident it would be necessary in addition to make ever-new aspects and/or terms further detailed and scrutinised, which account for the accidental events inexperienced ever such as ‘beyond design basis’, ‘extreme correlated natural hazards (external events)’, ‘expanded multi-severe damages at a multi-units site at once’, ‘even in time of social media fairly developed’, as well as an aspect derived from ‘a unique language of Japanese’.



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In regard to IAEA/INIS with its English-based multilingual interface and keywords' dictionaries corresponding with Japanese, it seems that it would be fairly available and good to preserve and disseminate the affected information. Thus, to enhance its ways advanced further regarding IAEA/INIS it would be required as well to involve the affected information and terminology that contain the ones derived from the accidental events not experienced ever often originally logged in Japanese.

Hence, undertaken as well by informative importance such as well-categorised, -lesser missing, -guaranteed for the long time, it seems that taxonomical potential to preserve and disseminate the affected information would be able to be higher following the aforementioned as well sharing it between the affected parties.

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### References

1. Government of Japan (2012) 'Side Event by Government of Japan at the 56<sup>th</sup> IAEA General Conference, Sep 17, 2012: Briefing on TEPCO's Fukushima Dai-ichi NPS accident', [http://www.nsr.go.jp/archive/nisa/english/files/Sideevent\\_handout.html](http://www.nsr.go.jp/archive/nisa/english/files/Sideevent_handout.html), retrieved 30 June 2013.
2. Nakajima, H., Ikeda, K., Yonezawa, M., Itabashi, K., Kiriya, E. and Iwata, S. (2012) 'Study for development of the Fukushima Dai-ichi nuclear power station accident archive', *Journal of Japan Society of Information and Knowledge*, Vol.22, No.4, pp.344-353 (in Japanese), [https://www.jstage.jst.go.jp/article/jsik/22/4/22\\_22\\_344/\\_pdf](https://www.jstage.jst.go.jp/article/jsik/22/4/22_22_344/_pdf), retrieved 30 June 2013.
3. National Center for Biotechnology Information, U. S. Library of Medicine (2013) 'Taxonomy', <http://www.ncbi.nlm.nih.gov/guide/taxonomy/>, retrieved 30 June 2013.
4. Braga, F., Ebecken, F. F. N., (2013) 'A semi-automatic method for extracting a taxonomy for nuclear knowledge using hierarchical document clustering based on concept sets', *International Journal of Nuclear Knowledge Management*, Vol.6, No.2, pp.155-169.

*Title*

5. International Commission on Radiation Protection (2012), 'Report of ICRP Task Group 84 on Initial Lessons learned from the Nuclear Power Plant Accident in Japan vis-a-vis the ICRP System of Radiological Protection', <http://www.icrp.org/docs/ICRP%20TG84%20Summary%20Report.pdf>, retrieved 30 June 2013.
6. International Commission on Radiation Protection (2007) 'Annals of the ICRP, ICRP Publication 103, The 2007 Recommendations of the International Commission on Radiation Protection', <http://www.icrp.org/publication.asp?id=ICRP%20Publication%20103>, retrieved 30 June 2013.
7. Wrixon, A. D., (2008) 'New ICRP Recommendations', Journal of radiological protection, 28, pp.161-168, <http://iopscience.iop.org/0952-4746/28/2/R02>, retrieved 30 June 2013.
8. United Nations (2011) 'Report of the United Nations Scientific Committee on the Effects of Atomic Radiation', [http://www.unscear.org/docs/reports/2010/UNSCEAR\\_2010\\_Report\\_M.pdf](http://www.unscear.org/docs/reports/2010/UNSCEAR_2010_Report_M.pdf), retrieved 30 June 2013.
9. US National Research Council (2006), 'Report in brief: BEIR VII, Health Risks from Exposure to Low Levels of Ionizing Radiation, National Academies Press', [http://dels.nas.edu/resources/static-assets/materials-based-on-reports/reports-in-brief/beir\\_vii\\_final.pdf](http://dels.nas.edu/resources/static-assets/materials-based-on-reports/reports-in-brief/beir_vii_final.pdf), retrieved 30 June 2013.
10. Kodama, S. (2012) 'Tei senryo, tei senryo ritsu hosyasen no kenko eikyo wo kangaeru', Kemikaru enjiniyaringu (in Eng: 'Consideration on health effects of ionising radiation at low dose level and low dose rate', Chemical engineering, translated by author, K.Kunii)', Vol.57, No.6, pp.431- 436 (in Japanese).
11. The National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission (2012) 'Reports of the National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission', <http://warp.da.ndl.go.jp/info:ndljp/pid/3856371/naiic.go.jp/en/index.html>, retrieved 30 June 2013.
12. Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company (2012) 'Final report of Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power company', <http://www.cas.go.jp/jp/seisaku/icanps/eng/final-report.html>, retrieved 30 June 2013.
13. Fukushima Genpatsu Jiko Dokuritsu Kensyo Inkai (2012) 'Fukushima Genpatsu Jiko Dokuritsu Kensyo Inkai Chosa Kensyo Hokokusyo' (in Eng: Investigation Report on Fukushima Daiich

*Author*

- Nuclear Power Plants Accident by Independent Investigation Panel for Fukushima Daiich Nuclear Power Plants Accident, translated by author, K.Kunii), Rebuild Japan Initiative Foundation (in Japanese).
14. Tokyo Electric Power Company (2012) 'Fukushima Nuclear Accident Investigation Report', [http://www.tepco.co.jp/en/press/corp-com/release/2012/1205638\\_1870.html](http://www.tepco.co.jp/en/press/corp-com/release/2012/1205638_1870.html), retrieved 30 June 2013.
  15. National Diet Library – Japan (2012), Issue brief: 'Fukushima daiich genpatsu jiko to 4 tu no jiko chosa iinkai (in Eng: Fukushima daiichi nuclear power plants accident and four accident investigation panels, translated by author, K.Kunii)', No.756 (in Japanese).
  16. Kanda, K (2011) 'Report from risk communication practice', *Igaku no Ayumi* (in Eng: Steps of medicine, translated by author, K.Kunii), Vol.239, No.10, pp.1043-1049 (in Japanese).
  17. Bromet E. J., (2012) 'Reflections on the Mental Health Consequences of Nuclear Power Plants Disasters and Implications for Epidemiologic Research in Northeast Japan', *Japanese Bulletin for Social Psychiatry*, Vol.21, pp.222-234.
  18. IAEA(2012) 'IAEA Report on Enhancing Transparency and Communication Effectiveness in the Events of a Nuclear or Radiological Emergency, International Experts' Meeting', <http://www.iaea.org/newscenter/focus/actionplan/reports/enhancetransparency180612.pdf>, retrieved 30 June 2013.
  19. Japan Nuclear Technology Institute (2011), 'Review of Accident at Tokyo Electric Power Company Incorporated's Fukushima Daiichi Nuclear Power Station and Proposed Countermeasures (Summary)', [http://www.gengikyo.jp/english/shokai/Tohoku\\_Jishin/summary.pdf](http://www.gengikyo.jp/english/shokai/Tohoku_Jishin/summary.pdf), retrieved 30 June 2013.
  20. Nuclear Regulation Authority – Japan (2013) 'Monitoring information of environmental radioactivity level', <http://radioactivity.nsr.go.jp/en/>, retrieved 30 June 2013.
  21. Japan Atomic Energy Agency (2012), 'Report of the Results of the Decontamination Model Project', [http://www.jaea.go.jp/fukushima/decon04/decon04-ke\\_e.html](http://www.jaea.go.jp/fukushima/decon04/decon04-ke_e.html), retrieved 30 June 2013.
  22. Sato, H. (2012) 'The Role of Radiologists in the Event of Nuclear Disaster: Experience in Widespread Contamination', *Japanisch-Deutsche Medizinisch Beriche*, Vol.57, No.1, pp.89-102 (in Japanese).
  23. Takada, C. (2012) 'Issues on Personal Monitoring and Dosimetry', *Japanese Journal of Health Physics*, No.47, No.1, pp.34-36 (in Japanese).
  24. US Department Of Energy (2012) 'Hanford', <http://www.hanford.gov/>, retrieved 30 June 2013.
  25. World health Organization (2012) 'Assessing and mitigating health

*Title*

- effects of Chernobyl’,  
[http://www.who.int/ionizing\\_radiation/chernobyl/assessment\\_mitigation/en/](http://www.who.int/ionizing_radiation/chernobyl/assessment_mitigation/en/), retrieved 30 June 2013.
26. IAEA(2013) ‘International Experts’ Meeting on Decommissioning and Remediation after a Nuclear Accident’,  
<http://www-pub.iaea.org:80/iaeameetings/IEM4.aspx>, retrieved 30 June 2013.
  27. IAEA/INIS (2013), ‘Search the INIS Collection’,  
<http://www.iaea.org/INIS/index.html>, retrieved 30 June 2013.
  28. Library of the Japan Atomic Energy Agency (2013) ‘Reference information about the Fukushima Daiichi nuclear power station accident’,  
[http://jolifukyu.tokai-sc.jaea.go.jp/ird/english/sanko/fukushima\\_sanko-top-en.html](http://jolifukyu.tokai-sc.jaea.go.jp/ird/english/sanko/fukushima_sanko-top-en.html),  
retrieved 30 June 2013.
  29. Ikeda, K., Nakajima, H. and Yonezawa, M. (2012) ‘Introduction of Useful Bibliographies and Resources related to the Fukushima Daiichi Nuclear Power Station Accident through the JAEA Library’, ATOMOSU (ATOMO-sigma, Journal of the Atomic Energy Society of Japan), Vol.54, No.8, pp.549-553 (in Japanese).
  30. IAEA/INIS (2013), ‘Publications: IAEA-INIS/ETDE Thesaurus’,  
<http://www.iaea.org/inis/products-services/publications/index.html>,  
retrieved 30 June 2013.
  31. Nagaya, S. and Itabashi, K. (2011) ‘Prototype of the browser function using controlled words for Social Bookmark services’, Proc. 73th National Convention of IPSJ, Tokyo, Japan, pp 521-522 (in Japanese),  
<http://ci.nii.ac.jp/naid/110008600903>, retrieved 30 June 2013.
  32. Nagaya, S., Hayashi, Y., Otani, S. and Itabashi, K. (2011) ‘Controlled Terms or Free Terms? A JavaScript Library to Utilize Subject Headings and Thesauri on the Web’, code[4]lib JOURNAL,  
<http://journal.code4lib.org/articles/5994>, retrieved 30 June 2013.