

RADIATION AND REGULATION IN A POST-FUKUSHIMA WORLD

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REMAINING CHALLENGES TO THE GLOBAL NUCLEAR SAFETY REGIME

- Accidents can affect large swaths of land – and other countries
 - No international body sets safety standards for all countries
 - How to protect against radiation contamination domestically and internationally?
 - How much accident prevention can be practically done?
 - Is it possible to really “eliminate” offsite releases of radiation in the case of an accident?
 - How to best communicate during and after an accident in an instant-communication world?
 - Was public trust gained or lost because of the accident – and what were public reactions?
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NUCLEAR POWER CHANGES POST-FUKUSHIMA

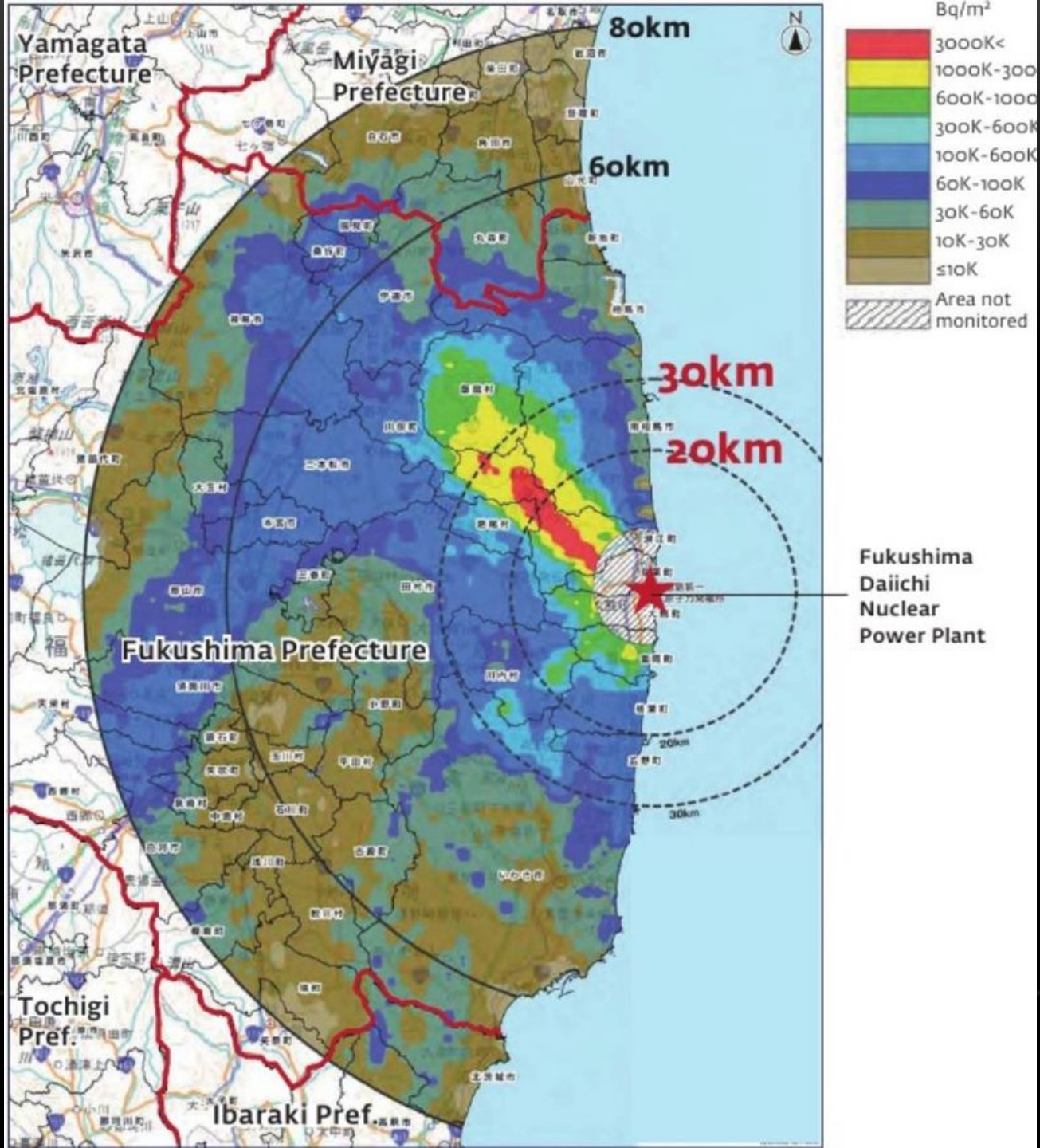
- Japan – all reactors shut down 4 years later, some may reopen
- Germany opted out of nuclear power
- Switzerland followed suit, Italy decided not to develop (again), Belgium confirmed phase-out
- No changes in other parts of the world:
 - China, India, Pakistan still developing
 - Vietnam, UAE, Jordan, Turkey, still enthusiastic

...Differences in reaction...and actions...



REACTIONS TO FUKUSHIMA: EVACUATE?

- **US:** those citizens within 80 km of plant should evacuate
- **Canada:** 80 km
- **France:** 240 km (those in Tokyo should leave)
- **Japan:** immediately after accident, within 3 km
 - March 12, 2011: within 20 km
 - March 15, 2011: 20-30 km, shelter in place
 - At 64 km is Fukushima City with population of 300,000



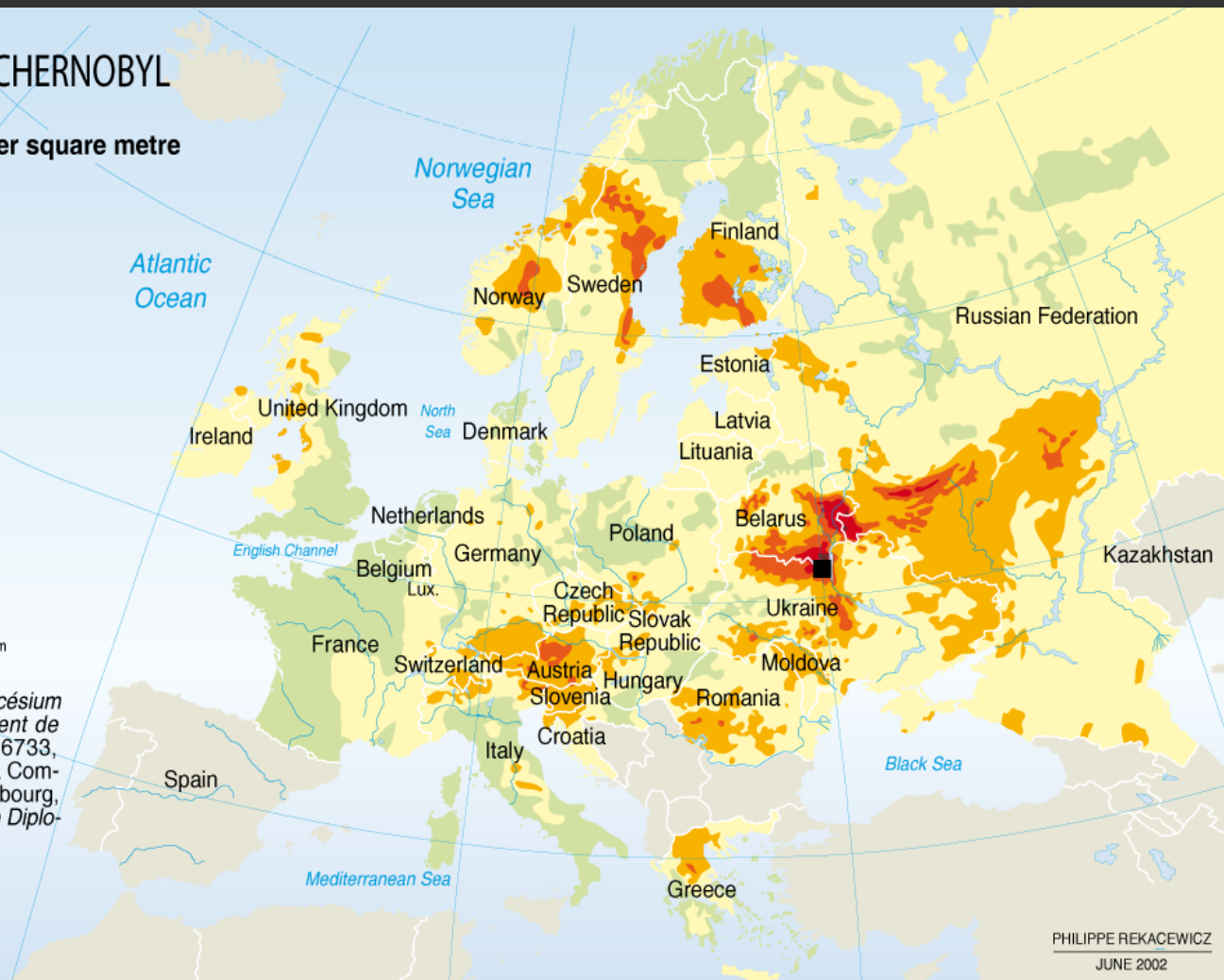
RADIATION FROM CHERNOBYL

KiloBecquerels (KBq) per square metre

- more than 1,480
- 185 to 1,480
- 40 to 185
- 10 to 40
- 2 to 10
- less than 2
- No data
- Chernobyl plant

0 500 1 000 km

Sources: *Atlas des dépôts de césium 137 en Europe après l'accident de Tchernobyl*, rapport EUR 16733, Bureau des publications de la Communauté européenne, Luxembourg, 1996. Adapted from *Le Monde Diplomatique*, July 2000.



PHILIPPE REKACEWICZ
JUNE 2002

Sources: UNEP/GRID-Arendal, European Environment Agency; *AMAP Assessment Report : Arctic Pollution Issues*, Arctic Monitoring and Assessment Programme (AMAP), 1998, Oslo; European Monitoring and Evaluation Programme (EMEP); Co-operative programme for monitoring and evaluation of the long range transmission of air pollutants in Europe, 1999. Adapted from *Le Monde Diplomatique*, July 2000.

Significant contamination >1,000 km away

EMERGENCY PLANNING IN DIFFERENT NATIONS

Country	EPZ	Dose basis
Belgium	10 km – evacuation/shelter 20 km - KI	
Finland	20 km – rescue service plan	
France	5 km - evacuation is pre-planned and prepared 10 km – sheltering pre-planned	Evacuation: > 50 mSv Sheltering: >10 mSv
Japan	Pre-Fukushima: 8-10 km Post-Fukushima: 5 km – precautionary action zone 5-30 km: urgent protective action zone	10 mSv, whole body, 100 mSv, thyroid 500 μ Sv/hr Relocation: 20 mSv/yr
South Africa	16 km	
US	16 km	Shelter/Evacuate: 10-50 mSv in 1-4 days Relocation: 20 mSv/1 st yr, 5mSv/yr afterwards

GLOBAL REACTION TO FUKUSHIMA ACCIDENT

- “Stress tests” by many regulators
- Regulators initiate changes at reactors
 - More safety equipment
 - Spent fuel pool instrumentation
 - Filtered vents
 - Better emergency procedures
 - Better communication processes



EUROPEAN NUCLEAR SAFETY DIRECTIVE (2014)

- Updated directive because of Fukushima
 - Strengthens independence of regulators and encourages close interactions among nations
 - Increases transparency and public interaction
 - Requires peer reviews after 10-year periodic safety reviews of design basis
 - Requires member states to enact laws, regulations, provisions to enforce the directive
 - Goal to eliminate occurrence of "all accident sequences which would lead to early or large releases"
-

Convention on Nuclear Safety



- Adopted 1994 in response to Chernobyl accident
- IAEA: Secretariat for the Convention
- Goal: legally commit nations with nuclear energy to high safety level
 - An “incentive instrument” – no teeth
 - Done through peer review at meetings every 3 years
- In response to Fukushima, there was an Extraordinary meeting in August 2012, adopting revisions to the guidance documents
- But this was not enough...

CNS: CONTROVERSY

- The 6th Review meeting, March 2014 sought to ensure changes in safety levels from Fukushima
- Some wanted explicit changes that would be codified in law by Contracting Parties
- Swiss proposed amending the Convention
 - 2/3 of CPs voted to have a Diplomatic Conference to decide whether to adopt new language in February 2015

Swiss Proposal for Art. 18:
“Nuclear power plants shall be designed and constructed with the objectives of preventing accidents and, **should an accident occur, mitigating its effects and avoiding releases of radionuclides** causing long-term off-site contamination. In order to identify and implement appropriate safety improvements, **these objectives shall also be applied at existing plants.**”

CNS: FROM DESIRE TO REALITY

- US did not want to open the Convention
- Other European countries wanted to amend Swiss language
- Russia refused to consider alternative language
- To save face, at last month's Diplomatic Conference, a "Declaration" was agreed to, no changes in the Convention

From the **Vienna Declaration of the Convention on Nuclear Safety**, February, 2015:

(iii) recalling the observations of the Contracting Parties of the CNS at the 2nd Extraordinary Meeting in 2012, confirmed at the 6th Review Meeting in 2014, **that the displacement of people and the land contamination after a nuclear accident call for all national regulators to identify provisions to prevent and mitigate the potential for severe accidents with off-site consequences;**

ACCIDENT COMMUNICATION/INFORMATION

- Fukushima accident characterized by lack of information
 - To Japanese government
 - To Japanese public
 - To international community, including regulators



Japanese angered over lack of nuclear plant information

SONIA VERMA

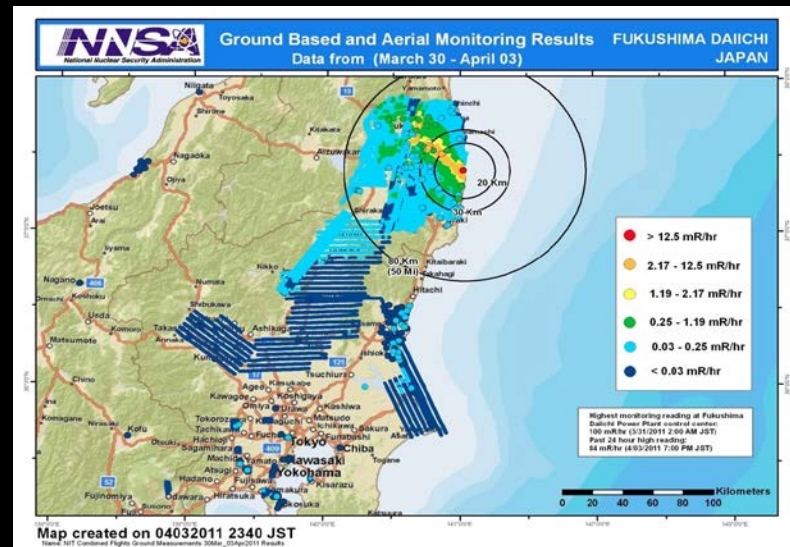
The Globe and Mail

Published Tuesday, Mar. 15 2011, 9:36 PM EDT

Last updated Thursday, Aug. 23 2012, 4:55 PM EDT

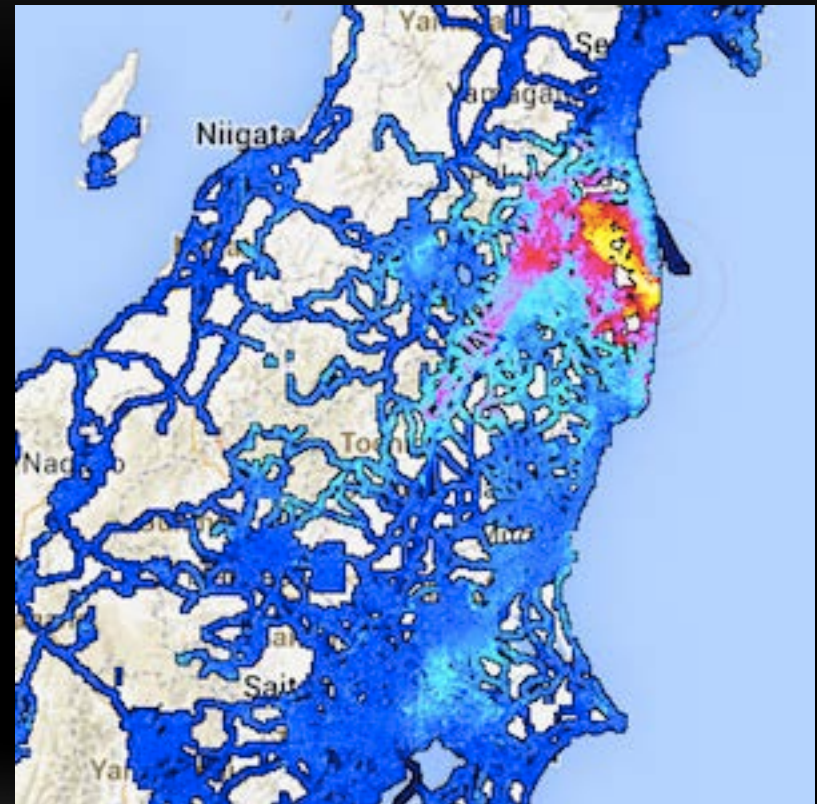
JAPAN GOVERNMENT/PUBLIC INTERACTIONS

- Lack of information
- Changes in the allowed dose
 - Nuclear workers went from 100 mSv to 250 mSv
 - Children at school went from 1 mSv to 20 mSv
- Potential food contamination
- Discovery of Hotspots



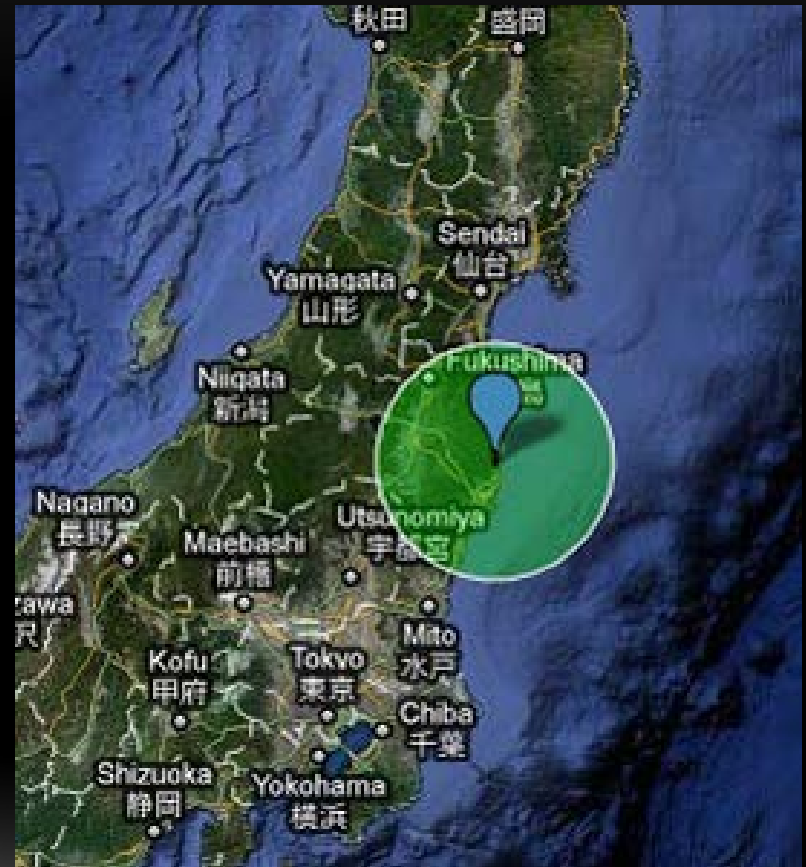
FUKUSHIMA RESPONSE: CITIZEN SCIENTISTS

- Citizen-powered data collection
- SAFECAST geiger counters and maps
- Data collection for Pacific seawater




US EXPERIENCE

- NRC had little information
 - 80 km radius evacuation kerfluffle
 - Did not disseminate info adequately to states
- Many government agencies involved in information control
 - NRC, DOE, DoD, EPA, NIH



From NRC Blog

Available Information Points to No Radiation Risk to U.S. From Damaged Japanese Plants

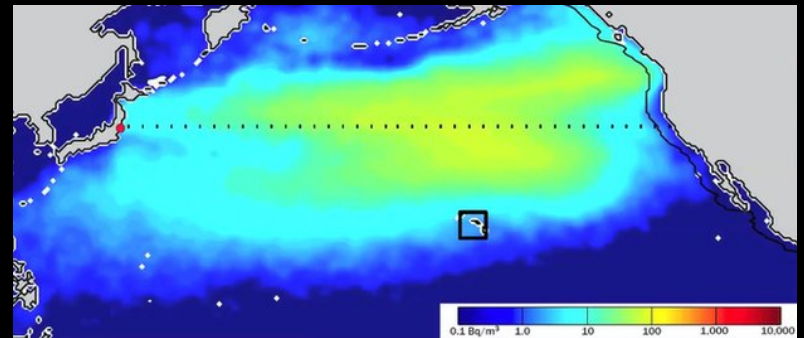
 Posted by Moderator on March 13, 2011

 27 Comments

We are working with other U.S. government agencies to monitor the situation in Japan — and to monitor for radioactive releases and to be prepared to predict their path. Fortunately, all the available information at this time indicates weather conditions have taken the small releases from the Fukushima reactors out to sea away from the population.

US EXPERIENCE IN COMMUNICATION

- Radiation plume in Pacific
- Little data collection
 - Again, lack of information
- Late coordination among government entities
- Public/media asking questions of all
 - Many of you – in state offices, NRC, EPA, NIH, received questions
- Much misinformation



MISINFORMATION ON PACIFIC PLUME

Natural News Natural Health News & Self-Reliance

ARTICLES BLOGS LABS SCIENCE REFERENCE REPORTS VIDEOS RADIO INFOGRAPHICS MUSIC CARTOONS LIBRARY RSS STORE

EXCLUSIVES: Vaccine culture war being waged against Americans Vaccine World Summit - listen now GMO science fraud deconstructed



Fukushima update - North American food supply poisoned along Pacific Coast

Sunday, July 14, 2013 by: Carolanne Wright
Tags: Fukushima, radiation poisoning, contaminated food

Share 20 Like 4K

US: West Coast Fried by Nuclear Radiation from Fukushima

Thursday, 24 October 2013, 5:32 pm
Article: [Michael Snyder](#)

28 Signs That the West Coast Is Being Absolutely Fried with Nuclear Radiation from Fukushima

By *Michael Snyder*
October 23, 2013

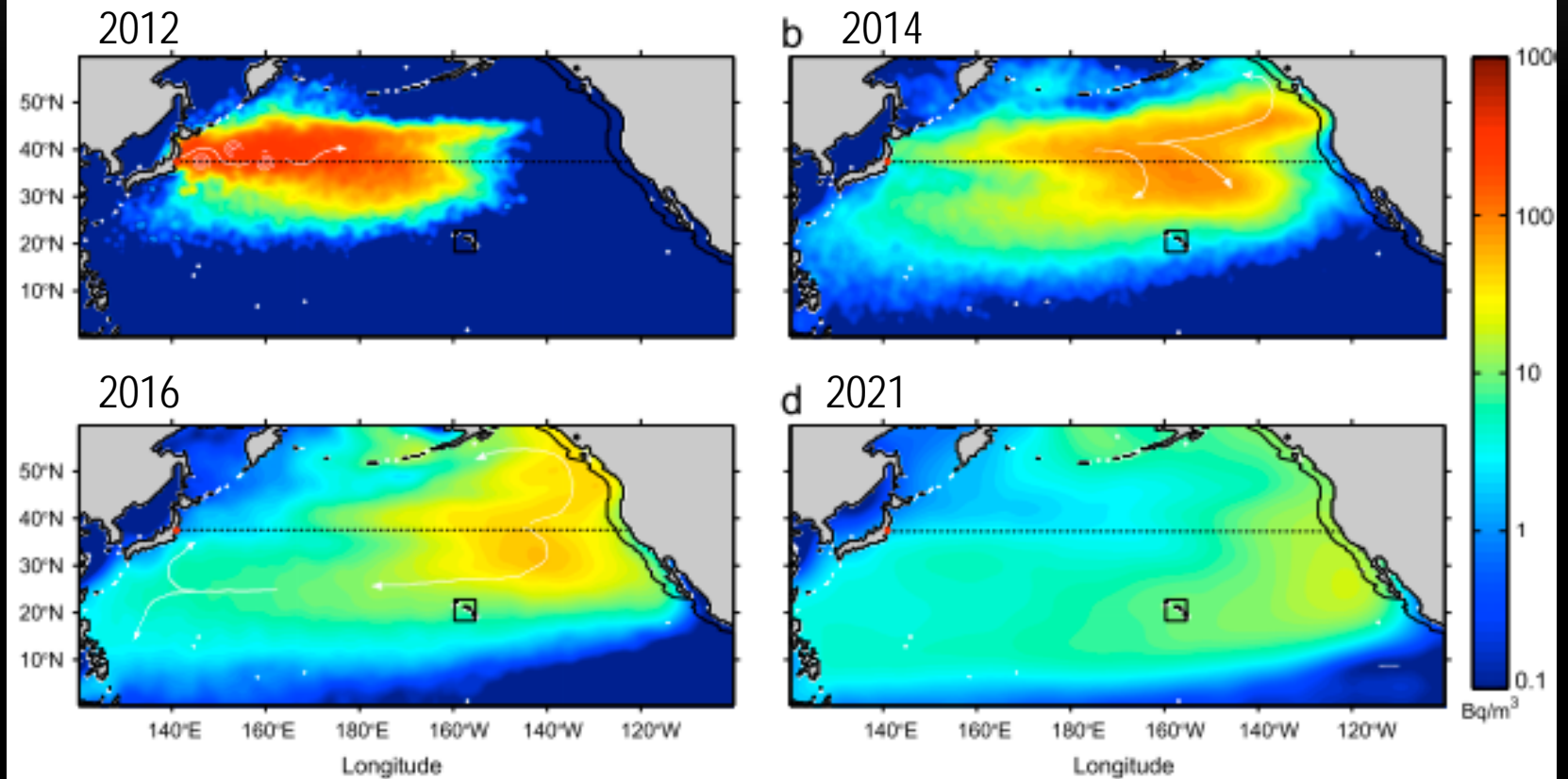
The map below comes from the [Nuclear Emergency Tracking Center](#). It shows that radiation levels at radiation monitoring stations all over the country are elevated. As you will notice, this is particularly true along the west coast of the United States. Every single day, 300 tons of radioactive water from

Fukushima radiation hits San Francisco? (Dec 2013)

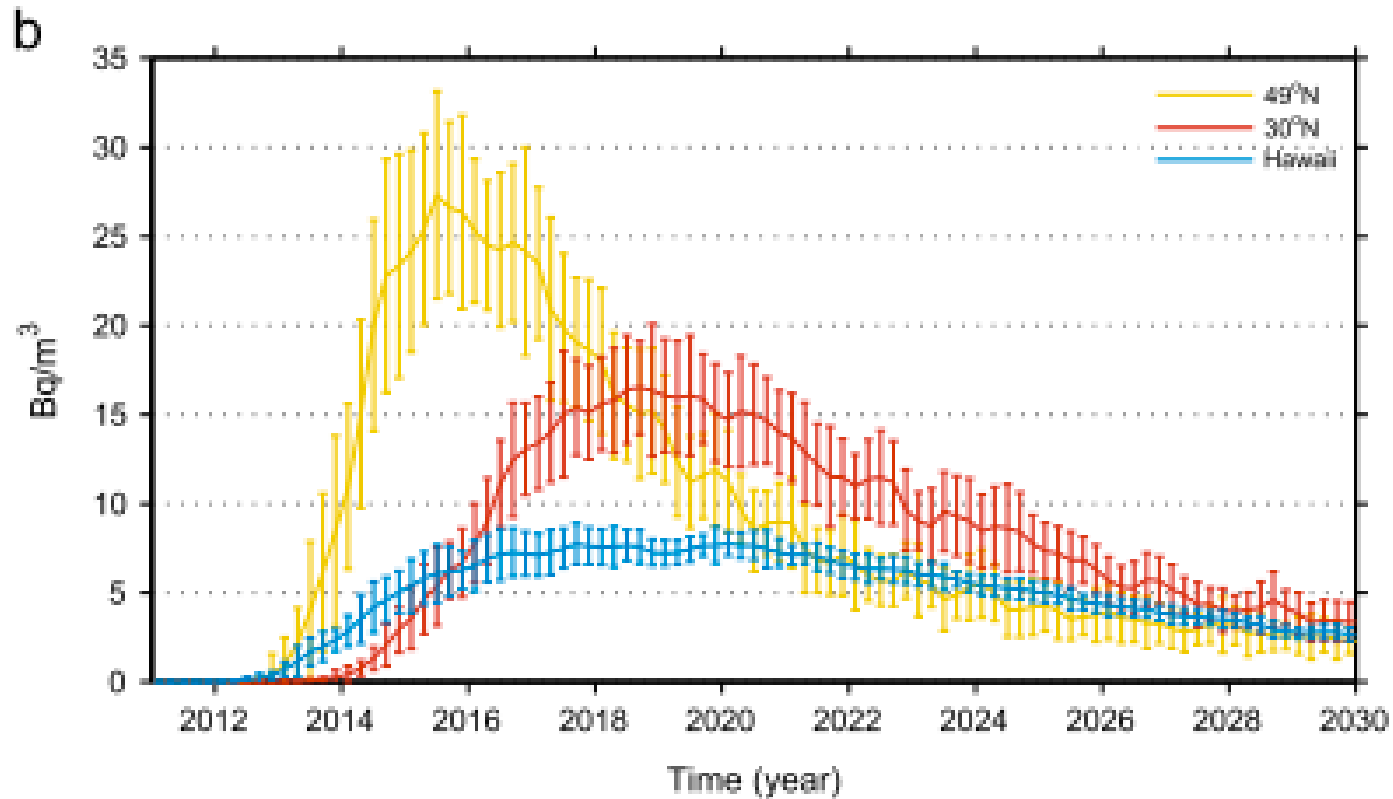


3:22 / 7:39

ROSSI ET AL, 2013



ROSSI ET AL, 2013



US Cs-137 drinking water standard: 7430 Bq/m^3

RESPONSE: CITIZEN SCIENCE

- Ken Buesseler of WHOI
- Radiation coming to US shores 2 orders of magnitude less than drinking water standard
- Still lacked confirmatory data
- Buesseler sought help from citizens to fund his work and collect data

**HOW
RADIOACTIVE
IS OUR OCEAN?**

The release of radioactive contaminants from Fukushima remains an unprecedented event for the people of Japan and the Pacific Ocean. Help scientists at the Woods Hole Oceanographic Institution reveal the ongoing spread of radiation across the Pacific and its evolving impacts on the ocean.

HELP FUND A LOCATION

PROPOSE A LOCATION

VIEW CURRENT RESULTS

LEARN ABOUT RADIATION

[Our Radioactive Ocean](#)

Citizen science campaign aims to collect ocean samples and fund radiation analysis.

CLOSE

CONCLUSIONS

- Event characterized by
 - confusion
 - lack of information
 - multiple interpretations
 - Differing governmental decision-making and actions
 - as it went on, *misinformation*
 - rapidly changing government policies
 - In internet age, information voids are filled...with whatever, and immediately
 - All of this leads to a loss of public trust in government, industry
 - Not just Japan, but many countries
-

SOLUTIONS?

- Internationally,
 - Not enough to say accidents in the future should not cause off-site contamination
 - The next accident will most likely not be like the last
 - “Normal” accidents are expected: Charles Perrow (1984)
 - Complex systems, tight coupling, “high consequence” event
 - Because these are potentially high consequence systems, use all lessons from previous events
 - Work towards internationally accepted, uniform standards
 - “An accident anywhere is an accident everywhere”
 - Lends credibility to safety regime
 - Not, “why is it done differently over there?”

SOLUTIONS?

- Communication
 - Tell the truth – not something candy coated
 - “there’s no need to worry...” - patronizing
 - Provide info as soon as you have it
 - Communicate often, even if you don’t have significantly new info
 - Don’t get caught making false claims!
 - It weakens your authority and contributes to loss of trust
 - “We know how to stop Ebola.” Thomas Frieden, CDC Director, before nurse was infected in TX
 - If you are wrong, say so soon

