Global Transport, Fate & Exposure to Various Ecological Pollutants

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Document Information

This document provides various resources on a variety of toxic chemical releases around the world over many decades. It is hoped that this document is helpful for people seeking more information about the transport, fate, and exposure associated with toxic releases.

This PDF document, created by Irucka Embry, can be found on the following Web page:

https://www.ecoccs.com/media.html
EcoC^{2}S Media

If you wish to view this page as an HTML Web page, then please go to https://www.ecoccs.com/global_fate-transport-exposures.html

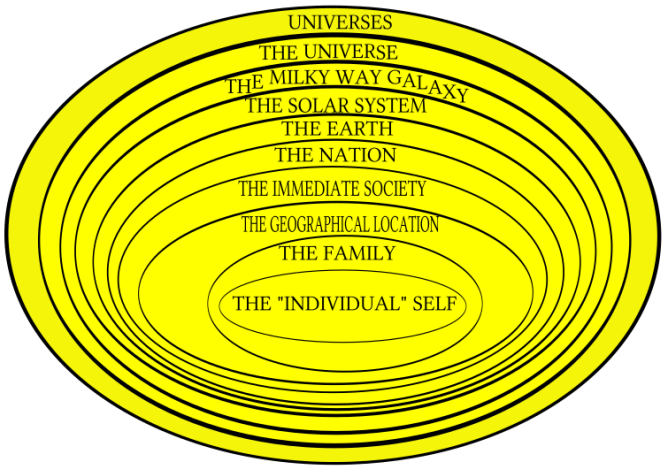
Notes

NOTE: Please consider using a Free Software PDF reader to view the PDFs on this page. Thank you.

NOTE: This document was created using the rmarkdown package [https://rmarkdown.rstudio.com/] version 2.25 in R [https://www.r-project.org/] version 4.3.2 on the Trisquel [https://trisquel.info/] version 9.0 GNU/Linux [https://www.gnu.org/gnu/why-gnu-linux.html] distribution. You can find Irucka's contributions to the R Community at https://gitlab.com/iembry [GitLab projects] & https://www.ecoccs.com/rtraining.html {R Trainings and Resources provided by EcoC^{2}S (Irucka Embry, EIT)].

A Greater View of Our Health

Figure 1) Levels of Influence in the Universal Reality Impacting the Health of the "Individual" Self



Source: Drawing created by Irucka Embry and is based on the discussion of environmental influences acting on the defense mechanism in *The Science of Homeopathy* by George Vithoulkas; **License:** Copyright © 2010 by Irucka Embry, Principal of EcoC²S; Some Rights Reserved

Source: Towards a New Model of Medicine by Irucka Embry, https://www.ecoccs.com/New_Vision_HealthLO.pdf

For more information about the energetic fields of the Human Being, refer to the following resources:

- https://www.innersource.net/em/66-handout-bank1/hbbasicprinciples/291-the-nine-primary-energy-systems.html Energy Medicine with Donna Eden: The Nine Primary Energy Systems {Reference: *Energy Medicine* [https://edenenergymedicine.com/product/energy-medicine-10th-anniversary-edition-award-winning-book/] and *Energy Medicine for Women* [https://edenenergymedicine.com/product/energy-medicine-for-women-award-winning-book/] by Donna Eden & David Feinstein, Ph.D. (Tarcher/Penguin Putnam, 2008).}
- Richard Gerber, M.D., *Vibrational Medicine: The #1 Handbook of Subtle-Energy Therapies*, Third Edition, Page 420, Bear & Company, 2001, ISBN# 978-1-879181-58-8
- George Vithoulkas, *The Science of Homeopathy*, Grove Press, 1980, ISBN# 9780394175607 [https://www.vithoulkas.com/learning-tools/books-gv/science-homeopathy]

Relevant Quotes

> "There are so many unseen negative influences on human health that are missed by conventional medical practitioners that many sources of human suffering remain undetected. It is recognized that sulfur dioxide and carbon monoxide are airborne pollutants which are harmful to human health. These chemicals place abnormal stresses on the body's physiology and lead to the manifestation of illness in certain susceptible individuals. *Disease susceptibility as a consequence of exposure to environmental pollutants is partly a function of the strength of the body's immunologic, physiologic, and energetic defense mechanisms.*

"The production of environmental illness is not strictly related to exposure to levels of harmful substances that are higher than FDA safety limits. *Conventional safety limits of exposure do not take into account the subtle vibrational effects of toxic substances*. Because of their inability to comprehend vibrational levels of toxicity, the orthodox scientific community is more lenient in defining safe levels of exposure to many harmful substances. The inadequacy of conventional scientific testing to measure subtle negative disturbances to human physiology also limits the FDA's ability to define exactly which substances are really harmful to human beings, let alone the concentration necessary for toxic effects."

–Richard Gerber, M.D., *Vibrational Medicine: The #1 Handbook of Subtle-Energy Therapies*, Third Edition, Page 451, Bear & Company, 2001, ISBN# 978-1-879181-58-8

"Some biological effects are indeed associated with electromagnetic fields so weak that the energies in those fields are below the energy of random thermal fluctuations, and thus, according to classical physics, cannot possibly have any effect.

"The big fallacy is to assume that living systems are at thermodynamic equilibrium, which they are *not*. Systems at thermodynamic equilibrium are devoid of organised activities or structures, such as the mixture of gases in a closed airtight container that one finds only in textbooks.

"Organisms, in contrast, are open systems maintained *far away* from thermodynamic equilibrium by virtue of their ability to capture and *store* energy.

"Systems full of non-equilibrium energy are *excitable*, ie, they need only the slightest provocation to give, at times, disproportionately large effects. Unlike typical mechanical processes where effects are proportional to, and determined by the magnitude of the force, living processes are highly non-linear and unpredictable.

…

"Non-linear chaotic dynamics is not the only reason why weak electromagnetic fields should affect living systems.

"Robert Becker, Marino's supervisor, had done a series of experiments beginning in the 1950s showing that the body of all organisms has a Direct Current (DC) field, and that electric currents produced all over the body are involved in controlling growth and regeneration. By the 1960s, Becker had already proposed that an electrical communication system exists within all living things, and demonstrated that externally applied fields could influence the processes of growth and regeneration.

"The fields and currents identified by Becker were actually found much earlier by another US biologist Harold Saxton Burr. He had proposed in the 1930s that all living things, from men to mice, from trees to seeds, are moulded and controlled by electro-dynamical fields, which he had measured and mapped extensively.

"These fields are in addition to the now well-known and accepted electrical activities of the brain that can be measured as electroencephalograms (EEG) and in the pace-maker of the heart as electrocardiograms (ECG).

"Electrical activities and ionic currents have also been measured in cultured cells and tissues. And the weak magnetic fields generated by current flows *all over the body* can now be measured non-invasively with the extremely sensitive Super Quantum Interference Device (SQUID) magnetometer. The evidence is overwhelming that electro-dynamical fields and currents are involved in intercommunication within the body. These fields and currents are connected to and correlated with the EEG and ECG that are a routine part of conventional biomedicine.

"The body uses electromagnetic signals of different frequencies and extents to intercommunicate. Hence it would be surprising if external electromagnetic fields did not have an effect. As Gerard Hyland points out, electromagnetic radiation from mobile phones and computers are well known to interfere with electronic medical

devices such as pace-makers and telecommunication systems of airplanes. To deny that these radiation could influence the body's own electro-dynamical intercommunication system is irrational to say the least. He is particularly worried about the similarity of mobile phone frequencies to the major EEG frequencies such as alpha and delta waves, and frequencies that could trigger epileptic fits in people suffering from epilepsy.

"Ten years ago in my laboratory, we found we could dramatically transform the global body pattern of the fruitfly larva simply by exposing the embryos within the first three hours of development for 30 min to very weak static magnetic fields. The transformation is unique and striking: the normal segmental pattern became twisted towards a helical pattern. In one instance, a completely helical larva was obtained.

"These experiments were significant for the following reasons. First, they involved *static* magnetic fields, so only moving charges or liquid crystals in a high degree of dynamic order could have been affected. Second, the energy in the fields were well below the threshold of random thermal fluctuations, and the only way they could have an effect is if the embryos were in an excitable, non-equilibrium state. Third, the *global* transformations indicate that the embryos must be *coherent* to a high degree. It means that *all* the molecules in the body of the embryo must be moving together in a correlated way, which incidentally also increased its sensitivity to weak fields.

"We have repeated and extended these experiments, which suggested that the effects of weak electromagnetic fields on body pattern formation is non-classical. In other words, it suggested that the embryo is *quantum* coherent.

"We have since obtained further evidence of the global coherence that exists in living organisms. The molecules are moving together so perfectly that the entire body appears liquid crystalline (see "What Barrier?" I-SIS Report November 2002 — https://www.i-sis.org.uk/whatbarrier.php).

"This new biology that I have sketched out, that enables us to understand, not only the sensitivity of organisms to weak electromagnetic fields, but also the holistic health practices of many cultural traditions, is being systematically ignored and excluded from mainstream discourse, while we continue to be poisoned with a range of environmental pollutants and by the 'side-effects' of drugs from conventional reductionist mechanistic medicine."

–Dr. Mae-Wan Ho, The Excluded Biology: Successive reports have confirmed that electromagnetic fields too weak to cause burns and heating are linked to cancers and other illnesses. But these are still dismissed because of the presumed absence of "possible biological mechanisms" that could account for the effects. Dr. Mae-Wan Ho reveals a biology that can explain the effects, but has been ignored and excluded from mainstream discourse. 14/12/02, I-SIS miniseries "Fields of Influence", https://www.i-sis.org.uk/FOI4.php

Collection of Irucka Embry's Relevant Links

https://www.ecoccs.com/read_the_labels.html#fate
EcoC^{2}S [Irucka Embry): Read the Labels Campaign Resources: **Transport, Fate, & Exposure**

https://www.ecoccs.com/read_the_labels.html#interact
EcoC^{2}S [Irucka Embry): Read the Labels Campaign Resources: **Electromagnetic Radiation (EMR)/Fields (EMF) & (Multiple) Chemical Interactions**

https://www.questionuniverse.com/oldway/electromagnetic_air_pollution.html
Questioning the Universe Publishing (QUP) {Irucka Embry]: Electromagnetic Waves as an Indoor Air Pollutant
By Irucka Embry, E.I.T.

https://www.questionuniverse.com/oldway/electromagnetic_air_pollutions.pdf
Questioning the Universe Publishing (QUP) {Irucka Embry]: Electromagnetic Waves as an Indoor Air Pollutant
By Irucka Embry, E.I.T.

https://www.ecoccs.com/resources_links.html#5G
EcoC^{2}S [Irucka Embry): EcoC^{2}S Online Resources: **1G-8G**

https://www.ecoccs.com/read_the_labels.html#msds
EcoC^{2}S [Irucka Embry): Read the Labels Campaign Resources: **Safety Data Sheets (SDS)** {formerly called Material Safety Data Sheets (MSDS)]

https://www.questionuniverse.com/rethink.html#nuclear
Questioning the Universe Publishing (QUP) {Irucka Embry]: Resources to help us rethink, reimagine, & reFeel our world: **Nuclear**

https://www.ecoccs.com/Decentralizing-the-Food-System.pdf
EcoC^{2}S [Irucka Embry): Decentralizing the Food System @ Tennessee Local Food Summit 2022

Environmental Modeling (Air, Soil & Water)

https://zoom.earth/
Zoom Earth: Weather Maps & Live Hurricane Tracker

https://openaq.org/
OpenAQ is a nonprofit organization providing universal access to air quality data to empower a global community of change-makers to solve air inequality—the unequal access to clean air.

https://air.plumelabs.com/
World Air Map: Mapping out pollution across the globe is our very first step towards making the air more transparent for everyone.

https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/models-pesticide-risk-assessment
US Environmental Protection Agency (EPA): Models for Pesticide Risk Assessment

The following require the use of The **R** Project for Statistical Computing (https://www.r-project.org/):

https://CRAN.R-project.org/view=Environmetrics
CRAN Task View: Analysis of Ecological and Environmental Data

https://cloud.r-project.org/web/views/Hydrology.html
CRAN Task View: Hydrological Data and Modeling

Toxicology

https://CRAN.R-project.org/package=httk
httk: High-Throughput Toxicokinetics

https://CRAN.R-project.org/package=mixtox
mixtox: Dose Response Curve Fitting and Mixture Toxicity Assessment

https://CRAN.R-project.org/package=rbioacc
rbioacc: Inference and Prediction of ToxicoKinetic (TK) Models

https://CRAN.R-project.org/package=NMTox
NMTox: Dose-Response Relationship Analysis of Nanomaterial Toxicity

https://CRAN.R-project.org/package=ECOTOXr
ECOTOXr: Download and Extract Data from US EPA's ECOTOX Database

https://CRAN.R-project.org/package=standartox
standartox: Ecotoxicological Information from the Standartox Database

https://CRAN.R-project.org/package=ecotox
ecotox: Analysis of Ecotoxicology

https://CRAN.R-project.org/package=ecotoxicology
ecotoxicology: Methods for Ecotoxicology

https://CRAN.R-project.org/package=morse
morse: Modelling Reproduction and Survival Data in Ecotoxicology

https://CRAN.R-project.org/package=HelpersMG
HelpersMG: Tools for Environmental Analyses, Ecotoxicology and Various R Functions

Air

https://CRAN.R-project.org/package=EEAaq
EEAaq: Handle Air Quality Data from the European Environment Agency Data Portal

https://CRAN.R-project.org/package=aiRly
aiRly: R Wrapper for 'Airly' API

https://CRAN.R-project.org/package=kehra
kehra: Collect, Assemble and Model Air Pollution, Weather and Health Data

https://CRAN.R-project.org/package=airqualityES
airqualityES: Air Quality Measurements in Spain from 2011 to 2018

https://CRAN.R-project.org/package=con2lki
con2lki: Calculate the Dutch Air Quality Index (LKI)

https://CRAN.R-project.org/package=SwissAir
SwissAir: Air Quality Data of Switzerland for One Year in 30 Min Resolution

https://CRAN.R-project.org/package=ARPALData
ARPALData: Retrieving and Analyzing Air Quality and Weather Data from ARPA Lombardia

https://CRAN.R-project.org/package=rsinaica
rsinaica: Download Data from Mexico's Air Quality Information System

https://CRAN.R-project.org/package=AtmChile
AtmChile: Download Air Quality and Meteorological Information of Chile

https://CRAN.R-project.org/package=RAQSAPI
RAQSAPI: A Simple Interface to the US EPA Air Quality System Data Mart API

https://CRAN.R-project.org/package=raqs
raqs: Interface to the US EPA Air Quality System (AQS) API

https://CRAN.R-project.org/package=openair
openair: Tools for the Analysis of Air Pollution Data

https://CRAN.R-project.org/package=openairmaps
openairmaps: Create Maps of Air Pollution Data

https://CRAN.R-project.org/package=mmaqshiny
mmaqshiny: Explore Air-Quality Mobile-Monitoring Data

https://CRAN.R-project.org/package=saqgetr
saqgetr: Import Air Quality Monitoring Data in a Fast and Easy Way

https://CRAN.R-project.org/package=AirMonitor
AirMonitor: Air Quality Data Analysis

https://CRAN.R-project.org/package=EmissV
EmissV: Tools for Create Emissions for Air Quality Models

https://CRAN.R-project.org/package=PWFSLSmoke
PWFSLSmoke: Utilities for Working with Air Quality Monitoring Data

https://CRAN.R-project.org/package=airnow
airnow: Retrieve 'AirNow' Air Quality Observations and Forecasts

https://CRAN.R-project.org/package=rmweather
rmweather: Tools to Conduct Meteorological Normalisation on Air Quality Data

https://CRAN.R-project.org/package=simulariatools
simulariatools: Simularia Tools for the Analysis of Air Pollution Data

https://CRAN.R-project.org/package=wildviz
wildviz: Compiles and Visualizes Wildfire, Climate, and Air Quality Data

https://CRAN.R-project.org/package=AQEval
AQEval: Air Quality Evaluation

https://CRAN.R-project.org/package=foqat
foqat: Field Observation Quick Analysis Toolkit

https://CRAN.R-project.org/package=eixport
eixport: Export Emissions to Atmospheric Models

https://cran.r-project.org/package=pems.utils
pems.utils: Portable Emissions (and Other Mobile) Measurement System Utilities

https://CRAN.R-project.org/package=TreeDep
TreeDep: Air Pollution Removal by Dry Deposition on Trees

https://CRAN.R-project.org/package=tsModel
tsModel: Time Series Modeling for Air Pollution and Health

https://CRAN.R-project.org/package=psychrolib
psychrolib: Psychrometric Properties of Moist and Dry Air

Soil

https://CRAN.R-project.org/package=PoolDilutionR
PoolDilutionR: Calculate Gross Biogeochemical Flux Rates from Isotope Pool Dilution Data

https://CRAN.R-project.org/package=phreeqc
phreeqc: R Interface to Geochemical Modeling Software

https://CRAN.R-project.org/package=RPhosFate
RPhosFate: Soil and Chemical Substance Emission and Transport Model

https://CRAN.R-project.org/package=sharpshootR
sharpshootR: A Soil Survey Toolkit

https://CRAN.R-project.org/package=smapr
smapr: Acquisition and Processing of NASA Soil Moisture Active-Passive (SMAP) Data

https://CRAN.R-project.org/package=smosr
smosr: Acquire and Explore BEC-SMOS L4 Soil Moisture Data in R

https://CRAN.R-project.org/package=soilDB
soilDB: Soil Database Interface

https://CRAN.R-project.org/package=SoilTaxonomy
SoilTaxonomy: A System of Soil Classification for Making and Interpreting Soil Surveys

https://CRAN.R-project.org/package=soiltexture
soiltexture: Functions for Soil Texture Plot, Classification and Transformation

https://CRAN.R-project.org/package=ISRaD
ISRaD: Tools and Data for the International Soil Radiocarbon Database

https://CRAN.R-project.org/package=DMMF
DMMF: Daily Based Morgan-Morgan-Finney (DMMF) Soil Erosion Model

https://CRAN.R-project.org/package=LWFBrook90R
LWFBrook90R: Simulate Evapotranspiration and Soil Moisture with the SVAT Model LWF-Brook90

https://CRAN.R-project.org/package=soilphysics
soilphysics: Soil Physical Analysis

https://CRAN.R-project.org/package=mpspline2
mpspline2: Mass-Preserving Spline Functions for Soil Data

https://CRAN.R-project.org/package=spsh
spsh: Estimation and Prediction of Parameters of Various Soil Hydraulic Property Models

https://CRAN.R-project.org/package=soilwater
soilwater: Implementation of Parametric Formulas for Soil Water Retention or Conductivity Curve

https://CRAN.R-project.org/package=SoilHyP
SoilHyP: Soil Hydraulic Properties

https://CRAN.R-project.org/package=soilhypfit
soilhypfit: Modelling of Soil Water Retention and Hydraulic Conductivity Data

https://CRAN.R-project.org/package=SQI
SQI: Soil Quality Index

https://CRAN.R-project.org/package=soilfoodwebs
soilfoodwebs: Soil Food Web Analysis

https://CRAN.R-project.org/package=soilchemistry
soilchemistry: Computation of Properties Related to Soil Chemical Environment and Nutrient Availability

https://CRAN.R-project.org/package=SoilTesting
SoilTesting: Organic Carbon and Plant Available Nutrient Contents in Soil

https://CRAN.R-project.org/package=SoilR
SoilR: Models of Soil Organic Matter Decomposition

https://CRAN.R-project.org/package=sorcering
sorcering: Soil Organic Carbon and CN Ratio Driven Nitrogen Modelling Framework

https://CRAN.R-project.org/package=QI
QI: Quantity-Intensity Relationship of Soil Potassium

Water

https://CRAN.R-project.org/package=EnvStats
EnvStats: Package for Environmental Statistics, Including US EPA Guidance

https://CRAN.R-project.org/package=dataRetrieval
dataRetrieval: Retrieval Functions for USGS and EPA Hydrology and Water Quality Data

https://CRAN.R-project.org/package=epanet2toolkit
epanet2toolkit: Call 'EPANET' Functions to Simulate Pipe Networks

https://CRAN.R-project.org/package=epanetReader
epanetReader: Read Epanet Files into R

https://CRAN.R-project.org/package=echor
echor: Access EPA 'ECHO' Data

https://CRAN.R-project.org/package=rATTAINS
rATTAINS: Access EPA 'ATTAINS' Data

https://CRAN.R-project.org/package=reasonabletools
reasonabletools: Clean Water Quality Data for NPDES Reasonable Potential Analyses

https://CRAN.R-project.org/package=wqtrends
wqtrends: Assess Water Quality Trends with Generalized Additive Models

https://CRAN.R-project.org/package=dbhydroR
dbhydroR: 'DBHYDRO' Hydrologic and Water Quality Data

https://CRAN.R-project.org/package=metrix
metrix: Water Quality Metrics Calculator

https://CRAN.R-project.org/package=wql
wql: Exploring Water Quality Monitoring Data

https://CRAN.R-project.org/package=baytrends
baytrends: Long Term Water Quality Trend Analysis

https://CRAN.R-project.org/package=WRTDStidal
WRTDStidal: Weighted Regression for Water Quality Evaluation in Tidal Waters

https://CRAN.R-project.org/package=waterquality
waterquality: Satellite Derived Water Quality Detection Algorithms

https://CRAN.R-project.org/package=BDAlgo
BDAlgo: Bloom Detecting Algorithm

https://CRAN.R-project.org/package=MacroZooBenthosWaterA
MacroZooBenthosWaterA: Fresh Water Quality Analysis Based on Macrozoobenthos

https://CRAN.R-project.org/package=StreamMetabolism
StreamMetabolism: Calculate Single Station Metabolism from Diurnal Oxygen Curves

https://CRAN.R-project.org/package=MassWateR
MassWateR: Quality Control and Analysis of Massachusetts Water Quality Data

https://CRAN.R-project.org/package=SanFranBeachWater
SanFranBeachWater: Downloads and Tidies the San Francisco Public Utilities Commission Beach Water Quality Monitoring Program Data

Air, Soil & Water Pollution Cycling

https://www.researchgate.net/publication/51110671_From_Endocrine_Disruptors_To_Nanomaterials_Advancing_Our_Understanding_Of_Environmental_Health_To_Protect_Public_Health
ResearchGate: From Endocrine Disruptors To Nanomaterials: Advancing Our Understanding Of Environmental Health To Protect Public Health
By Linda S. Birnbaum and Paul Jung, *Health Affairs* Vol. 30, NO. 5: Environmental Challenges For Health, May 2011

https://labs.waterdata.usgs.gov/visualizations/water-cycle/index.html#/
U.S. Geological Survey (USGS): The Water Cycle

https://earthobservatory.nasa.gov/images/1368/continuing-dust-storms
Earth Observatory is part of the EOS Project Science Office at NASA Goddard Space Flight Center: Continuing Dust Storms

https://www.tandfonline.com/doi/pdf/10.1080/16742834.2010.11446858
The Northern Path of Asian Dust Transport from the Gobi Desert to North America
By Chen Ke-Yi, *Atmospheric and Oceanic Science Letters*, Volume 3, 2010 - Issue 3

https://www.canada.ca/en/environment-climate-change/services/air-pollution/quality-environment-economy/ecosystem.html
Government of Canada: Air pollution and the ecosystem

https://www.usgs.gov/special-topics/water-science-school/science/atmosphere-and-water-cycle
U.S. Geological Survey (USGS): The Atmosphere and the Water Cycle Completed
By Water Science School, June 8, 2019

https://environment-review.yale.edu/does-air-pollution-increase-fresh-water-availability-0
Yale Environment Review: Does air pollution increase fresh water availability?: Why recent improvements in air pollution may have shrunk river flows in the northern hemisphere.
By Sam Cohen, December 1, 2014

https://www.newscientist.com/article/dn11335-smog-is-changing-the-face-of-earths-water-cycle/
New Scientist: Smog is changing the face of Earth's water cycle
By Catherine Brahic, 8 March 2007

https://www.pugetsoundinstitute.org/2020/01/how-air-pollution-becomes-water-pollution-with-long-term-effects-on-puget-sound/
University of Washington Puget Sound Institute: How air pollution becomes water pollution with long-term effects on Puget Sound
By Christopher Dunagan, January 29, 2020

https://research.umd.edu/articles/humans-are-disrupting-natural-salt-cycle-global-scale-new-study-shows
University of Maryland Division of Research: Humans Are Disrupting Natural 'Salt Cycle' on a Global Scale, New Study Shows: The influx of salt in streams and rivers is an 'existential threat,' according to a research team led by a UMD geologist.
October 31, 2023

https://www.epa.gov/reducing-pesticide-drift/introduction-pesticide-drift
US Environmental Protection Agency (EPA): Introduction to Pesticide Drift

https://www.sciencedirect.com/science/article/pii/S0048969721061805
Are spray drift losses to agricultural roads more important for surface water contamination than direct drift to surface waters?
By Urs T. Schönenberger, Janine Simon, and Christian Stamm, *Science of The Total Environment*, Volume 809, 2022

https://efsa.onlinelibrary.wiley.com/doi/abs/10.2903/sp.efsa.2017.EN-1185
Human biomonitoring data collection from occupational exposure to pesticides
By Ruth Bevan, Terry Brown, Franziska Matthies, Craig Sams, Kate Jones, James Hanlon, and Max La Vedrine, *EFSA Supporting Publications*, Volume 14, Issue 3, March 2017, 1185E

US Environmental Protection Agency (EPA) Nationwide Responses

https://response.epa.gov/Default.aspx
US Environmental Protection Agency (EPA) On-Scene Coordinator (OSC) Response

https://response.epa.gov/site/region_list.aspx?region=0
US Environmental Protection Agency (EPA) On-Scene Coordinator (OSC) Response All Response Sites

US Emergency Planning and Community Right-to-Know Act (EPCRA)

https://www.epa.gov/epcra
US Environmental Protection Agency (EPA): Emergency Planning and Community Right-to-Know Act (EPCRA)

https://www.epa.gov/toxics-release-inventory-tri-program
The Toxics Release Inventory (TRI) is a resource for learning about toxic chemical releases and pollution prevention activities reported by industrial and federal facilities. TRI data support informed decision-making by communities, government agencies, companies, and others. Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) created the TRI.

Hazardous Materials Incidence Management

https://www.atsdr.cdc.gov/MHMI/index.html
US Department of Health and Human Services (DHHS) Centers for Disease Control and Prevention (CDC)/Agency for Toxic Substances and Disease Registry (ATSDR): Managing Hazardous Materials Incidents (MHMIs) – Version 2001

East Palestine, Ohio Train Derailment & Aftermath Information

https://www.ntsb.gov/news/press-releases/Pages/NR20230214.aspx
US (National Transportation Safety Board) NTSB Issues Investigative Update on Ohio Train Derailment, 2/14/2023. Also archived at https://archive.vn/xIhQK

https://htv-prod-media.s3.amazonaws.com/files/ntsb-prelim-report-east-palestine-1677167554.pdf
US National Transportation Safety Board (NTSB): Norfolk Southern Railway Train Derailment with Subsequent Hazardous Material Release and Fires: Preliminary Report RRD23MR005, Issued: February 22, 2023

https://www.atsdr.cdc.gov/sites/east-palestine-train-derailment/index.html
US Department of Health and Human Services (DHHS) Centers for Disease Control and Prevention (CDC)/Agency for Toxic Substances and Disease Registry (ATSDR): East Palestine Train Derailment

https://response.epa.gov/site/site_profile.aspx?site_id=15933
US Environmental Protection Agency (EPA) On-Scene Coordinator (OSC) Response: East Palestine Train Derailment. Also archived at https://archive.vn/L7x1o

https://web.archive.org/web/20230307033641/https://www.epaosc.org/sites/15933/files/Norfolk%20Southern%20East%20Palestine%20Train%20Derailment%20General%20Notice%20Letter%202.10.2023.pdf
US Environmental Protection Agency (EPA) Letter to Norfolk Southern Railway Company, February 10, 2023 [Internet Archive: Wayback Machine]

https://www.epa.gov/east-palestine-oh-train-derailment
US Environmental Protection Agency (EPA): East Palestine, Ohio Train Derailment

https://www.epa.gov/east-palestine-oh-train-derailment/background
US Environmental Protection Agency (EPA): East Palestine, Ohio Train Derailment: Background

https://www.epa.gov/east-palestine-oh-train-derailment/legal-and-other-documents
US Environmental Protection Agency (EPA): East Palestine, Ohio Train Derailment: Legal and other documents

https://www.epa.gov/oh/water-sampling-data-east-palestine-ohio-train-derailment
US Environmental Protection Agency (EPA): East Palestine, Ohio Train Derailment: Water Sampling Data

https://www.epa.gov/east-palestine-oh-train-derailment/air-sampling-data
US Environmental Protection Agency (EPA): East Palestine, Ohio Train Derailment: Air Sampling Data

https://www.epa.gov/east-palestine-oh-train-derailment/soil-and-sediment-sampling-data
US Environmental Protection Agency (EPA): East Palestine, Ohio Train Derailment: Soil and Sediment Sampling Data

https://www.epa.gov/newsreleases/epa-requires-norfolk-southern-sample-dioxins-east-palestine
US Environmental Protection Agency (EPA) News Release: EPA Requires Norfolk Southern to Sample for Dioxins in East Palestine: EPA will direct immediate cleanup as appropriate if contaminants from the derailment pose any unacceptable risk to human health, March 2, 2023

https://epa.ohio.gov/monitor-pollution/pollution-issues/east-palestine
Ohio Environmental Protection Agency (EPA): East Palestine Train Derailment Information

https://governor.ohio.gov/media/news-and-media/east-palestine-update-3-16-23-03162023
Governor Mike DeWine (Ohio): East Palestine Update - 3/16/23

https://ema.ohio.gov/media-publications/east-palestine-derailment-info
Ohio Emergency Management Agency (EMA): East Palestine Train Derailment

https://ema.ohio.gov/media-publications/news/east-palestine-water-quality-update
Ohio Emergency Management Agency (EMA) News: East Palestine Water Quality Update, February 15, 2023

https://ohiodnr.gov/discover-and-learn/safety-conservation/about-ODNR/news/Train-Derailment
(Ohio Department of Natural Resources) ODNR Update on East Palestine Train Derailment Impact to Wildlife, February 23, 2023

https://odh.ohio.gov/media-center/feature-stories/odh-to-open-east-palestine-health-assessment-clinic
Ohio Department of Health: Ohio Department of Health to open East Palestine Health Assessment Clinic, February 21, 2023

https://www.dep.pa.gov/About/Regional/SouthwestRegion/Community%20Information/Pages/Ohio-Train-Derailment.aspx
Commonwealth of Pennsylvania Department of Environmental Protection (DEP): East Palestine Train Derailment: What DEP is Doing

https://toledolaw.com/east-palestine-train-derailment-and-toxic-chemical-exposure/
Zoll & Kranz, LLC | Product Liability Attorneys | Mass Tort Lawyers | Toledo Ohio OH: East Palestine Train Derailment & Toxic Chemical Exposure: If you live or work near East Palestine, or if you or your loved ones have been affected by the Toxic Train Derailment Accident that occurred on February 3, 2023, you may have a legal claim.

https://topclassactions.com/legal-industry/norfolk-southern-faces-conductor-death-another-train-derailment-both-in-ohio/
Top Class Actions: Norfolk Southern faces conductor death, another train derailment, both in Ohio
By Abraham Jewett, March 13, 2023

https://chej.org/why-are-we-unprepared-for-environmental-disasters
The Center for Health, Environment & Justice (CHEJ): Why Are We Unprepared for Environmental Disasters?, March 15, 2023

https://www.cantonrep.com/story/news/2023/02/23/east-palestine-train-derailment-wildlife-impact/69935455007/
Canton Repository: ODNR: East Palestine train derailment killed roughly 40,000 fish
By Paige Bennett, Updated Feb. 23, 2023

https://www.americaoutloud.news/for-the-people-of-east-palestine-detoxing-dioxins/
America Out Loud: For The People Of East Palestine – Detoxing Dioxins
by Dr. Henry Ealy, Feb 28, 2023

https://rightsfreedoms.wordpress.com/2023/03/02/anyone-living-near-or-east-of-the-ohio-train-derailment-will-want-to-hear-this-how-to-detox-from-americas-toxic-ecocide/
Rights and Freedoms – Covid-19: Anyone Living Near or East of the Ohio Train Derailment Will Want to Hear This; How to Detox From America's Toxic Ecocide: In this special interview, Dr. Henry Ealy lays out the necessary protocols to keep yourself healthy during America's rising ecocide insanity.
By Reinette Senum

https://thetruthaboutcancer.com/unpacking-ohio-train-derailment/
The Truth About Cancer: Unpacking the Ohio Train Derailment: A Public Health Emergency?

By Ty & Charlene Bollinger, February 16, 2023

https://www.cincinnati.com/story/news/2023/02/13/east-palestine-ohio-train-derailment-timeline-what-happened-when-norfolk-southern/69899621007/
Cincinnati Enquirer: East Palestine train derailment: A timeline of what happened when
By Victoria Moorwood, Updated Feb. 20, 2023

https://abcnews.go.com/US/new-body-camera-footage-shows-east-palestine-toxic/story?id=103426867
ABC News: New body camera footage shows East Palestine toxic train derailment evacuation efforts: An Ohio State Highway Patrol officer went door to door after the fiery crash.
By Jared Kofsky and Sasha Pezenik, September 23, 2023. Also archived at https://archive.vn/YlF3L

https://www.cnn.com/2023/09/20/politics/biden-federal-coordinator-train-derailment-recovery/index.html
CNN: Biden appointing federal coordinator to oversee long-term recovery in East Palestine following train derailment
By Donald Judd, September 20, 2023

https://www.npr.org/2023/06/24/1184152227/a-federal-hearing-on-the-train-derailment-in-east-palestine-ohio-revealed-new-de
NPR (National Public Radio): Heard on Weekend Edition Saturday: A federal hearing on the train derailment in East Palestine, Ohio, reveals new details
By Reid Frazier, June 24, 2023

https://www.npr.org/2023/02/16/1157333630/east-palestine-ohio-train-derailment
NPR (National Public Radio): What to know about the train derailment in East Palestine, Ohio
By Becky Sullivan, Updated February 16, 2023. Also archived at https://archive.ph/4b5k0

https://www.npr.org/2023/02/06/1154760911/ohio-train-derailment
NPR (National Public Radio): Ohio crews conduct a 'controlled release' of toxic chemicals from derailed train cars
By Juliana Kim, Updated February 6, 2023

https://www.npr.org/2023/02/22/1158827319/east-palestine-ohio-train-norfolk-southern-health-doctor-chemicals
NPR (National Public Radio): Main Character of the Day: A doctor near East Palestine, Ohio, details the main thing he's watching for now
By Lauren Hodges, February 22, 2023

https://www.epa.gov/system/files/documents/2023-02/TRAIN%2032N%20-%20EAST%20PALESTINE%20-%20derail%20list%20Norfolk%20Southern%20document.pdf
TRAIN 32N cargo list from the US Environmental Protection Agency (EPA)

If you have access to R, you can use the following R code to view the data in the Train 32N Cargo List yourSelf:

```
# Check to see if install.load, iemiscdata, data.table, and pander are already
# installed. If not, then install install.load, iemiscdata, data.table, and
# pander.
if (!requireNamespace(c("install.load", "iemiscdata", "data.table", "pander"))) {
    install.packages(c("install.load", "iemiscdata", "data.table", "pander"))
    # install the required R packages
}

install.load::load_package("iemiscdata", "data.table", "pander")
# load the required R packages
```

```r
# set the pander options
panderOptions("table.continues", "")
panderOptions("table.caption.prefix", "")
panderOptions("missing", "")


data(norfolk_southern_epoh)
# from iemiscdata package

pander(norfolk_southern_epoh)
```

Line #	Train Car ID	Load/Empty	Car Type	Commodity
23	ARSX 4145	LOADED	HOPPER	POLYPROPYLENE
24	BRKX 66738	LOADED	HOPPER	POLYPROPYLENE
25	GPLX 75465	LOADED	HOPPER	POLYETHYLENE
26	ECUX 860375	LOADED	HOPPER	POLYETHYLENE
27	UTLX 684543	EMPTY	TANK CAR	residue lube oil
28	TILX 402025	LOADED	TANK CAR	VINYL CHLORIDE, STABILIZED
29	OCPX 80235	LOADED	TANK CAR	VINYL CHLORIDE, STABILIZED
30	OCPX 80179	LOADED	TANK CAR	VINYL CHLORIDE, STABILIZED
31	GATX 95098	LOADED	TANK CAR	VINYL CHLORIDE, STABILIZED
32	RACX 51629	LOADED	TANK CAR	DIPROPYLENE GLLYCOL
33	LYBX 5191	LOADED	TANK CAR	PROPYLENE GLYCOL
34	RACX 51435	LOADED	TANK CAR	PROPYLENE GLYCOL
35	UTLX 671772	LOADED	TANK CAR	DIETHYLENE GLYCOL
36	SHPX 211226	LOADED	TANK CAR	COMBUSTIBLE LIQ., NOS (ETHYLENE GLYCOL MONOBUTYL ETHER)
37	TILX 331319	LOADED	HOPPER	SEMOLINA
38	DOWX 73168	LOADED	TANK CAR	COMBUSTIBLE LIQ., NOS (ETHYLHEXYL ACRYLATE)
39	ROIX 57036	LOADED	HOPPER	POLYVINYL
40	NCUX 40057	LOADED	HOPPER	POLYVINYL
41	UTLX 100055	LOADED	TANK CAR	PETROLEUM LUBE OIL
42	XOMX 110664	LOADED	TANK CAR	PETROLEUM LUBE OIL
43	UTLX 684798	LOADED	TANK CAR	PETROLEUM LUBE OIL
44	UTLX 671310	LOADED	TANK CAR	PETROLEUM LUBE OIL
45	CERX 30072	LOADED	TANK CAR	POLYPROPYL GLYCOL
46	SHPX 211106	LOADED	TANK CAR	PROPYLENE GLYCOL
47	NATX 231335	LOADED	TANK CAR	DIETHYLENE GLYCOL
48	UTLX 671913	LOADED	TANK CAR	DIETHYLENE GLYCOL
49	NATX 35844	LOADED	TANK CAR	ISOBUTYLENE
50	UTLX 205907	LOADED	TANK CAR	BUTYL ACRYLATES, STABILIZED
51	UTLX 661296	LOADED	TANK CAR	PETRO OIL, NEC
52	COCX 287059	LOADED	TANK CAR	ADDITIVES, FUEL
53	ROIX 59396	LOADED	HOPPER	POLYVINYL
54	ROIX 57782	LOADED	HOPPER	POLYVINYL
55	OCPX 80370	LOADED	TANK CAR	VINYL CHLORIDE, STABILIZED
56	TBOX 640019	LOADED	BOX CAR	BALLS,CTN,MEDCL

Line #	Train Car ID	Load/Empty	Car Type	Commodity
57	BKTY 152621	LOADED	BOX CAR	SHEET STEEL
58	LINX 7278	LOADED	BOX CAR	VEGTABLE, FROZEN
59	DPRX 259013	EMPTY	TANK CAR	BENZENE
60	DPRX 258671	EMPTY	TANK CAR	BENZENE
61	XOMX 110236	LOADED	TANK CAR	PARAFFIN WAX
62	ELTX 7458	LOADED	HOPPER	FLAKES, POWDER
63	ELTX 3421	LOADED	HOPPER	FLAKES, POWDER
64	NDYX 892049	LOADED	HOPPER	HYDRAULIC CEMENT
65	TTGX 953815	LOADED	AUTORACK	AUTOS PASSENGER
66	TBOX 889334	LOADED	BOX CAR	MALT LIQUORS
67	NOKL 603412	LOADED	BOX CAR	MALT LIQUORS
68	NS 472751	LOADED	BOX CAR	MALT LIQUORS
69	TBOX 676291	LOADED	BOX CAR	MALT LIQUORS
70	TBOX 670331	LOADED	BOX CAR	MALT LIQUORS
71	TBOX 662599	LOADED	BOX CAR	MALT LIQUORS
72	KCS 112405	LOADED	BOX CAR	MALT LIQUORS
73	TBOX 666771	LOADED	BOX CAR	MALT LIQUORS
74	TBOX 664264	LOADED	BOX CAR	MALT LIQUORS

Tank Car Specification	UN ID	Hazardous Class
DOT 117J100W		
DOT 105J300W	UN1086	2.1 (FLAMMABLE GAS)
DOT 105J300W	UN1086	2.1 (FLAMMABLE GAS)
DOT 105J300W	UN1086	2.1 (FLAMMABLE GAS)
DOT 105J300W	UN1086	2.1 (FLAMMABLE GAS)
DOT 111A100W1		
DOT 117J100W		
DOT 111A100W1		
DOT 111A100W1		
DOT 111S100W1	NA1993	COMBUSTIBE LIQUID
DOT 111S100W1	NA1993	COMBUSTIBE LIQUID

DOT 111A100W1

211A100W1

DOT 117J100W

DOT 111A100W1

DOT 111A100W1

DOT 111S100W1

DOT 111A100W1

DOT 111A100W1

DOT 105J300W UN1055 2.1 (FLAMMABLE GAS)

DOT 111A100W1 UN 2348 3 (FLAMMABLE LIQUID)

DOT 111A100W1

DOT 111A100W1

DOT 105J300W UN 1086 2.1 (FLAMMABLE GAS)

DOT 111A100W1 UN 1114 3 (FLAMMABLE LIQUID)

DOT 111A100W1 UN 1114 3 (FLAMMABLE LIQUID)

DOT 211A100W1

b

Status of Car
Not in derailment pile
Not in derailment pile
lading destroyed by fire
lading destroyed by fire
scrap pending C&P
car did not leak/cars vent product through the PRD and ignited/vent and burn performed
car did not leak/cars vent product through the PRD and ignited/vent and burn performed
car did not leak/cars vent product through the PRD and ignited/vent and burn performed
vent product through the PRD and ignited/vent and burn
fire impingement/no signs of tank breach
flame impingement, no tank breach found
tank breached/lost most of load
had small leak from BOV, unknown amount of product in car
unknown status
in pile, destroyed by fire
Car breached on head end/amount of product still in car pending
burned
actively burning
double comp car/both breached/entire load lost
tank breached/lost most of load
flame impinged, may have had a small leak/will be determined when car is off loaded
flame impinged, small leak from top fittings, unknown amount left in tank
flame impinged, tank breached/ most of load lost
flame impinged, no signs of breach
flame impinged, tank breached/ load lost
flame impinged, lost unknown amount at this time from damaged BOV
some flame impingement/no signs of breach
Head breach/lost entire load (spill& fire)
flame impinged, small leak from VRV stopped, car still loaded
flame impinged, no sign of breach
involved in fire
involved in fire
car did not leak/cars vent product through the PRD and ignited/vent and burn performed
burning or has burned
burning or has burned
burning or has burned
damaged, fire impinged/ no breach

Status of Car
damaged, fire impinged/ no breach
flame impingement/no signs of breach
burned, extinguished
in line, upright, impinged

```
# View the data in a table
```

The following vignette from Irucka's `iemiscdata` R package provides some basic chemical information about some of the chemicals aboard the train:

https://CRAN.R-project.org/package=iemiscdata/vignettes/East-Palestine-Ohio_Norfolk-Southern-Train-32N-Cargo_Chemical-Databases.pdf
iemiscdata: USEPA East Palestine, Ohio Norfolk Southern Train 32N Cargo List – Chemical Databases Match
By Irucka Embry, E.I.T. (EcoC^{2}S)

Information on Some of the Toxic Chemicals Released from the East Palestine, Ohio Train Derailment & Aftermath

https://www.foodandwaterwatch.org/2023/03/02/east-palestine-derailment/
Food & Water Watch: The Toxic Chemicals and Toxic Greed Behind the East Palestine Disaster
By Mia DiFelice, Published Mar 2, 2023

https://www.who.int/news-room/fact-sheets/detail/dioxins-and-their-effects-on-human-health
World Health Organization (WHO): Dioxins and their effects on human health, 4 October 2016

https://www.epa.gov/dioxin
US Environmental Protection Agency (EPA): Dioxin

https://www.federalregister.gov/documents/2010/01/07/2010-16/draft-recommended-interim-preliminary-remediation-goals-for-dioxin-in-soil-at-cercla-and-rcra-sites
Federal Register: Draft Recommended Interim Preliminary Remediation Goals for Dioxin in Soil at CERCLA and RCRA Sites: A Notice by the Environmental Protection Agency on 01/07/2010

https://www.theguardian.com/commentisfree/2023/mar/02/epa-toxins-test-east-palestine-ohio-train-derailment-dioxins
The Guardian: Here's the real reason the EPA doesn't want to test for toxins in East Palestine: The agency is familiar with dioxins, having researched its adverse effects, and if they test the soil in East Palestine for it, they will find it
By Stephen Lester, 2 Mar 2023

https://toxicfreefuture.org/wp-content/uploads/2023/03/100-Groups-Dioxin-Letter-to-EPA-FINAL.pdf
Toxic-Free Future: Letter to US EPA Administration RE: Dioxins and the East Palestine Train Derailment, March 13, 2023

https://whyy.org/articles/did-dioxins-spread-after-the-ohio-train-derailment/
WHYY: Did dioxins spread after the Ohio train derailment?: Scientists say burning vinyl chloride can indeed generate highly toxic dioxins, some of the most dangerous human-made compounds.
By Associated Press, Maddie Burakoff and Drew Costley, February 25, 2023

https://www.in.gov/idem/files/report_10644640_SW8290FC_L4_R1_dfr.pdf
Report of Laboratory Analysis for PCDD/PCDF
Report Prepared for the State of Indiana By Pace Analytical Services, LLC

https://www.cantonrep.com/story/news/2023/02/14/what-chemicals-were-leaked-from-ohio-train-derailment/69901772007/
Canton Repository: What are vinyl chloride and isobutylene? More about the chemicals released in Ohio train derailment
By Taijuan Moorman, Updated Feb. 15, 2023

https://chej.org/vinyl-chloride
The Center for Health, Environment & Justice (CHEJ): Toxic Tuesdays: Vinyl Chloride

Other Environmental Incidents

https://response.epa.gov/site/site_profile.aspx?site_id=15907
US Environmental Protection Agency (EPA) On-Scene Coordinator (OSC) Response: Moody Landfill Fire. Also archived at https://archive.vn/lilct

https://www.npr.org/2023/03/12/1161920664/months-long-landfill-fire-alabama-reveals-waste-regulation-gaps
NPR (National Public Radio): A months-long landfill fire in Alabama reveals waste regulation gaps
By Zoe McDonald, March 12, 2023 (From WBHM 90.3 FM). Also archived at https://archive.vn/UClMq

https://ens-newswire.com/alabama-persistent-landfill-fire-prompts-state-capitol-rally/
Environment News Service: ALABAMA: Persistent Landfill Fire Prompts State Capitol Rally, January 25, 2023

https://ens-newswire.com/kansas-keystone-pipeline-spill-cleanup-plan-agreed/
Environment News Service: KANSAS: Keystone Pipeline Spill Cleanup Plan Agreed, January 9, 2023

https://whyy.org/articles/camden-toxic-dirt-pile-health-concerns/
WHYY: 'What are they going to do next?': Health concerns emerge as officials get ready to clean up Camdenn's toxic pile of dirt: As officials prepare to clean up an illegal dump site in Camdenn's Bergen Square neighborhood, concerns about the health of residents are raised.
By P. Kenneth Burns, September 28, 2022

https://www.thespec.com/life/hamilton-region/plastimet-the-inferno-that-never-went-out/article_bebe89d0-4b1e-5b8f-a6e1-c81cba16a7c7.html
The Hamilton Spectator: Plastimet: The inferno that never went out: The fire burned for four days, and inside the bodies and psyches of Hamilton firefighters for years, October 16, 2021

https://orionmagazine.org/article/the-pirate-of-illiopolis/
Orion Magazine: The Pirates of Illiopolis
By Sandra Steingraber

Toxic Substances Control Act (TSCA) Lawsuit over Water Fluoridation

https://fluoridealert.org/issues/tsca-fluoride-trial/fact-sheet/
Fluoride Action Network (FAN): Fact Sheet on Toxic Substances Control Act (TSCA) Lawsuit

https://fluoridealert.org/issues/tsca-fluoride-trial/law-suit-documents/
Fluoride Action Network (FAN): Toxic Substances Control Act (TSCA) Lawsuit Documents

Nuclear

https://www.ecoccs.com/nuclearcomments.pdf
EcoC^{2}S [Irucka Embry): RE: Scientific Inquiry/Public Comments to the Tennessee Solid Waste Advisory Committee concerning the disposal of solid waste with "extremely low levels of radioactivity" at the Allied Waste (formerly BFI) Middlepoint Landfill in Murfreesboro (Rutherford County), Tennessee
By Irucka Embry while he was the Project Engineer at the Rutherford County Landfill, 27 July 2007

If you have access to R, you can use the following R code to view the following data sets yourSelf. Only the first 6 rows of the following data sets are available in this document:

USAEC_facilities_nuclear_accidents: Criticality Accidents in USAEC Facilities, 1945-1970 (Trinity Atomic Web Site)

civilian_nuclear_accidents_wiki: Civilian nuclear accidents (Wikipedia)

military_nuclear_accidents_wiki: Military nuclear accidents (Wikipedia)

nuclear_accidents_ranked: Ranked Nuclear & Radiation Accidents and incidents (The Guardian)

nuclear_accidents_wiki: Nuclear and radiation accidents and incidents (Wikipedia)

nuclear_accidents: Nuclear & Radiation Accidents and incidents (The Guardian)

nuclear_power_accidents_country_wiki: Nuclear power accidents by country (Wikipedia)

```
# Check to see if install.load, iemiscdata, data.table, and pander are already
# installed. If not, then install install.load, iemiscdata, data.table, and
# pander.
if (!requireNamespace(c("install.load", "iemiscdata", "data.table", "pander"))) {
    install.packages(c("install.load", "iemiscdata", "data.table", "pander"))
    # install the required R packages
}

install.load::load_package("iemiscdata", "data.table", "pander")
# load the required R packages
```

Criticality Accidents in USAEC Facilities, 1945-1970 (Trinity Atomic Web Site)

```
data(USAEC_facilities_nuclear_accidents)
# from iemiscdata package

pander(head(USAEC_facilities_nuclear_accidents))
```

Date	Location	Active Material
1945-08-21	Los Alamos, New Mexico	6.2 Kg delta-phase Pu
1946-05-21	Los Alamos, New Mexico	6.2 Kg delta-phase Pu
1952-04-18	The Los Alamos Scientific Lab., New Mexico	92.4 Kg uranium metal , 93% U-235
1954-02-03	The Los Alamos Scientific Lab., New Mexico	53 Kg uranium metal, 93% U-235
1957-02-12	The Los Alamos Scientific Lab., New Mexico (GODIVA)	54 Kg uranium metal, 93% U-235
1961-11-10	The Oak Ridge National Lab., Tennessee	75 Kg uranium metal, 93% U-235

Geometry	Total Fissions	Cause
Spherical core tungsten-carbide reflected	~1016	Hand stacking reflector
Spherical core, Be reflected	~ 3 x 1015	Hand stacking reflector
Cylinder unreflected	1.5 x l0l6	Computation error
Sphere unreflected	5.6 x l0l6	
Sphere unreflected except for experiment	1.2 x l0l7	Shift of experiment
	~1016	Too rapid assembly

Physical Damage	$ Loss
None	-
None	-
None	-
Slight warping of pieces	$600
Warping, oxidation near melting close to center	$2,400
None	-

Civilian nuclear accidents (Wikipedia)

```
data(civilian_nuclear_accidents_wiki)
# from iemiscdata package

pander(head(civilian_nuclear_accidents_wiki))
```

Date	Location	INES Level
1952-12-12	Chalk River, Ontario, Canada	5[1]
1958-05-24	Chalk River, Ontario, Canada	5[4]
1958-10-25	Vinča, Serbia (then Yugoslavia)	4[8]
1958-12-30	Los Alamos	
1959-07-26	Santa Susana Field Laboratory, California, United States	4[8]
1960-04-03	Westmoreland County, Pennsylvania, United States	4[8]

Type	Description
Reactor core damaged	A reactor shutoff rod failure, combined with several operator errors, led to a major power excursion of more than double the reactor's rated output at AECL's NRX reactor. The operators purged the reactor's heavy water moderator, and the reaction stopped in under 30 seconds. A subsequent cover gas system failure led to hydrogen explosions, which severely damaged the reactor core. The fission products from approximately 30 kg (66 lb) of uranium were released through the reactor stack. Contaminated light water coolant leaked from the damaged coolant circuit into the reactor building; some 4,000 m3 (140,000 cu ft) were pumped via pipeline to a disposal area to avoid contamination of the Ottawa River. Subsequent monitoring of surrounding water sources revealed no contamination. After the incident, approximately 1202 people were involved in the two-year-long cleanup.[2] No immediate fatalities or injuries resulted from the incident; a 1982 follow-up study of exposed workers showed no long-term health effects, though Atomic Energy of Canada Limited (AECL) dosimetry files were lost in a 1956 fire. Future U.S. President Jimmy Carter, then a lieutenant in the U.S. Navy, was among the cleanup crew.[3]
Fuel damaged	Due to inadequate cooling, a damaged uranium fuel rod caught fire and was torn in two as it was being removed from the core at the NRU reactor. The fire was extinguished, but not before radioactive combustion products contaminated the interior of the reactor building and, to a lesser degree, an area surrounding the laboratory site. Approximately 679 people were employed in the clean-up.[5][3] A corporal named Bjarnie Hannibal Paulson who was at the cleanup did not die from his exposure but developed unusual skin cancers. Paulson had to testify at many hearings before he was awarded compensation for his radiation injuries.[6][7]

Type	Description
Criticality excursion, irradiation of personnel	During a subcritical counting experiment, a power buildup went undetected at the Vinca Nuclear Institute's zero-power natural uranium heavy water-moderated research reactor.[9] Saturation of radiation detection chambers gave the researchers false readings and the level of moderator in the reactor tank was raised, triggering a power excursion which a researcher detected from the smell of ozone.[10] Six scientists received radiation doses of 2–4 sieverts (200–400 rem) [11] (p. 96). An experimental bone marrow transplant treatment was performed on all of them in France and five survived, despite the ultimate rejection of the marrow in all cases. A single woman among them later had a child without apparent complications. This was one of the first nuclear incidents investigated by then-newly formed IAEA.[12]
Criticality excursion	Cecil Kelley, a chemical operator working on plutonium purification, switched on a stirrer on a large mixing tank, which created a vortex in the tank. The plutonium, dissolved in an organic solvent, flowed into the center of the vortex. Due to a procedural error, the mixture contained 3.27 kg of plutonium, which reached criticality for about 200 microseconds. Kelley received 3,900 to 4,900 rad (36.385 to 45.715 Sv) according to later estimates. The other operators reported seeing a bright flash of blue light and found Kelley outside, saying "I'm burning up! I'm burning up!" He died 35 hours later.[13]
Partial meltdown	A partial core meltdown took place when the Sodium Reactor Experiment (SRE) experienced a power excursion that caused severe overheating of the reactor core, resulting in the melting of one-third of the nuclear fuel and significant release of radioactive gases. The amount of radioactivity released is disputed, with it ranging from 28 Curies [14] to as much as 240 to 260 times worse than Three Mile Island. Over the succeeding years, the site was cleaned up and all buildings and contamination removed. The soil was removed and other soil[15] brought in and now forms a portion of an area near the Simi Valley Adventist Hospital.[16]

Type	Description
Core melt accident	A partial core meltdown occurred at the Westinghouse TR-2 research reactor (also known as the Westinghouse Test Reactor or Westinghouse Testing Reactor (WTR)) at their Waltz Mill site. One fuel element melted, believed due to manufacturing defects in the fuel element, resulting in fission products being released into the reactor coolant water and gaseous fission products being released to the environment. Two million gallons of contaminated water were generated during the accident and cleanup. At least a portion of the water was retained on-site in lagoons, a condition which eventually led to detectable 90Sr in groundwater plus contaminated soil. The site cleanup was completed in 2013.

Military nuclear accidents (Wikipedia)

```
data(military_nuclear_accidents_wiki)
# from iemiscdata package

pander(head(military_nuclear_accidents_wiki))
```

Date	Location	Type
1942-06-23	Leipzig, Nazi Germany	Steam explosion and reactor fire.
1945-08-21	Los Alamos National Laboratory, Los Alamos, New Mexico, United States	Accidental criticality.
1946-05-21	Los Alamos National Laboratory, Los Alamos, New Mexico, United States	Accidental criticality
1950-02-13	British Columbia	Loss of nuclear bomb/Non-nuclear detonation of nuclear bomb.
1950-04-11	Albuquerque, New Mexico, US	Loss and recovery of nuclear materials
1950-07-13	Lebanon, Ohio, US	Non-nuclear detonation of an atomic bomb

Description
Leipzig L-IV experiment accident: Shortly after the Leipzig L-IV atomic pile – worked on by Werner Heisenberg and Robert Doepel – demonstrated Germany's first signs of neutron propagation, the device was checked for a possible heavy water leak. During the inspection, air leaked in, igniting the uranium powder inside. The burning uranium boiled the water jacket, generating enough steam pressure to blow the reactor apart. Burning uranium powder scattered throughout the lab causing a larger fire at the facility.[1][2]
Harry Daghlian dropped a tungsten carbide brick onto a plutonium core, inadvertently creating a critical mass at the Los Alamos Omega site. He quickly removed the brick, but was fatally irradiated, and died on September 15.[3]

Description
A sketch of Louis Slotin's criticality accident used to determine exposure of those in the room at the time. While demonstrating his technique to visiting scientists at Los Alamos, Canadian physicist Louis Slotin manually assembled a critical mass of plutonium. A momentary slip of a screwdriver caused a prompt critical reaction. Slotin died on May 30 from massive radiation poisoning, with an estimated dose of 1,000 rads (rad), or 10 grays (Gy). Seven observers, who received doses as high as 166 rads, survived, yet three died within a few decades from conditions believed to be radiation-related.[4]Slotin worked with the same bomb core as Daghlian which became known as the "demon core." It was later melted down and combined with existing weapons-grade material. .mw-parser-output .hatnote{font-style:italic}.mw-parser-output div.hatnote{padding-left:1.6em;margin-bottom:0.5em}.mw-parser-output .hatnote i{font-style:normal}.mw-parser-output .hatnote+link+.hatnote{margin-top:-0.5em}Main article: 1950 British Columbia B-36 crash A simulated nuclear bomb containing TNT and uranium, but without the plutonium needed to create a nuclear explosion, was proactively dumped in the Pacific Ocean after a Convair B-36 bomber's engines caught fire during a test of its ability to carry nuclear payloads. The crew reported releasing the weapon out of concern for the amount of TNT inside, alone, before they bailed out of the aircraft. The bomber eventually crashed at an unknown location in Canada. Four years later the wreckage was found and searched, but no bomb was found. The weapon was briefly thought to have been located by a civilian diver in 2016 near Pitt Island but this was subsequently found not to be the case.[5]A USAF B-36 bomber, AF Ser. No. 44-92075, was flying a simulated combat mission from Eielson Air Force Base, near Fairbanks, Alaska, to Carswell Air Force Base in Fort Worth, Texas, carrying one weapon containing a dummy warhead. The warhead contained conventional explosives and natural uranium but lacked the plutonium core of an actual weapon. After six hours of flight, the bomber experienced mechanical problems and was forced to shut down three of its six engines at an altitude of 12,000 feet (3,700 m). Fearing that severe weather and icing would jeopardize a safe emergency landing, the weapon was jettisoned over the Pacific Ocean from a height of 8,000 ft (2,400 m). The weapon's high explosives detonated upon impact with a bright flash visible. All of the sixteen crew members and one passenger were able to parachute from the plane and twelve were subsequently rescued from Princess Royal Island.[6] The accident was categorized as a Broken Arrow, that is an accident involving a nuclear weapon but which does not present a risk of war.[7] Three minutes after departure from Kirtland Air Force Base in Albuquerque a USAF Boeing B-29 Superfortress carrying a nuclear weapon, four spare detonators, and a crew of thirteen crashed into a mountain near Manzano Base. The crash resulted in a fire that The New York Times reported as being visible from 15 miles (24 km). The bomb's casing was demolished and its high explosives ignited upon contact with the plane's burning fuel. However, according to the Department of Defense, the four spare detonators and all nuclear components were recovered. A nuclear detonation was not possible because, while on board, the weapon's core was not in the weapon for safety reasons. All thirteen crew members died.[6]
A USAF B-50 aircraft on a training mission from Biggs Air Force Base with a nuclear weapon flew into the ground resulting in a high-explosive detonation, but no nuclear explosion.[8]

Ranked Nuclear & Radiation Accidents and incidents (The Guardian)

```
data(nuclear_accidents_ranked)
# from iemiscdata package

pander(head(nuclear_accidents_ranked))
```

Level	Definition	People and environment
7	Major accident	Major release of radio active material with widespread health and environmental effects requiring implementation of planned and extended countermeasures
6	Serious accident	Significant release of radioactive material likely to require implementation of planned countermeasures.
5	Accident with wider consequences	Limited release of radioactive material likely to require implementation of some planned countermeasures • Several deaths from radiation
4	Accident with local consequences	• Minor release of radioactive material unlikely to result in implementation of planned countermeasures other than local food controls. • At least one death from radiation.
3	Serious incident	• Exposure in excess of ten times the statutory annual limit for workers. • Non-lethal deterministic health effect (e.g., burns) from radiation.
2	Incident	• Exposure of a member of the public in excess of 10 mSv. • Exposure of a worker in excess of the statutory annual limits

Radiological barriers & Defence in depth control

• Severe damage to reactor core. • Release of large quantities of radioactive material within an installation with a high probability of significant public exposure. This could arise from a major criticality accident or fire

• Fuel melt or damage to

fuel resulting in more than 0.1% release of core inventory. • Release of significant quantities of radioactive material within an installation with a high probability of significant public exposure.

• Exposure rates of more

• Near accident at a nuclear

than 1 Sv/h in an operating power plant with no safety area. • Severe contamination provisions remaining. • Lost in an area not expected by or stolen highly radioactive design, with a low probability sealed source. • of significant public Misdelivered highly exposure. radioactive sealed source without adequate procedures in place to handle it.

• Radiation levels in an operating area of more than 50 mSv/h. • Significant actual consequences. • Found contamination within the highly radioactive sealed facility into an area not orphan source, device or expected by design transport package with safety provisions intact. • Inadequate packaging of a highly radioactive sealed source.

• Significant failures in safety provisions but with no

Example
Chernobyl, Ukraine, 1986
Kyshtym, Russia, 1957
Windscale, UK, 1957; Three Mile Island, 1979
FUKUSHIMA 1, 2011
Sellafield, UK, 2005
Atucha, Argentina, 2005

Nuclear and radiation accidents and incidents (Wikipedia)

```
data(nuclear_accidents_wiki)
# from iemiscdata package

pander(head(nuclear_accidents_wiki))
```

Date	Location	Description
1957-09-29	Mayak, Kyshtym, Soviet Union	The Kyshtym disaster was a radiation contamination accident (after a chemical explosion that occurred within a storage tank) at Mayak, a nuclear fuel reprocessing plant in the Soviet Union.

Date	Location	Description	Fatalities	Cost (in millions 2006 US$)	INES rating
1957-10-10	Sellafield, Cumberland, United Kingdom	Windscale fire at the British atomic bomb project (in a plutonium-production reactor) damaged the core and released an estimated 740 terabecquerels of iodine-131 into the environment. A rudimentary smoke filter constructed over the main outlet chimney successfully prevented a far worse radiation leak.	Estimated 200 possible cancer fatalities[33]		6
1961-01-03	Idaho Falls, Idaho, United States	Explosion at SL-1 prototype at the National Reactor Testing Station. All 3 operators were killed when a control rod was removed too far.	0 direct, estimated up to 240 possible cancer victims[33]		5
1966-10-05	Frenchtown Charter Township, Michigan, United States	Meltdown of some fuel elements in the Fermi 1 Reactor at the Enrico Fermi Nuclear Generating Station. Little radiation leakage into the environment.	3	22	4
1969-01-21	Lucens reactor, Vaud, Switzerland	On January 21, 1969, it suffered a loss-of-coolant accident, leading to meltdown of one fuel element and radioactive contamination of the cavern, which was then sealed.	0	132[34]	4
1975-12-07	Greifswald, East Germany	Electrical error in Greifswald Nuclear Power Plant caused a fire in the main trough that destroyed control lines and five main coolant pumps	0		4
			0	443	3

Nuclear & Radiation Accidents and incidents (The Guardian)

```
data(nuclear_accidents)
# from iemiscdata package

pander(head(nuclear_accidents))
```

Date	Incident	INES rating	Country	Location
2011	Fukushima	5	Japan	37.319444, 141.021111
2011	Onagawa		Japan	38.401111, 141.499722
2006	Fleurus	4	Belgium	Fleurus, Belgium
2006	Forsmark	2	Sweden	60.403333, 18.166667
2006	Erwin		US	36.145, -82.410833
2005	Sellafield	3	UK	54.4205, -3.4975

IAEA description
Reactor shutdown after the 2011 Sendai earthquake and tsunami; failure of emergency cooling caused an explosion
Reactor shutdown after the 2011 Sendai earthquake and tsunami caused a fire
Severe health effects for a worker at a commercial irradiation facility as a result of high doses of radiation
Degraded safety functions for common cause failure in the emergency power supply system at nuclear power plant
Thirty-five litres of a highly enriched uranium solution leaked during transfer
Release of large quantity of radioactive material, contained within the installation

Nuclear power accidents by country (Wikipedia)

```
data(nuclear_power_accidents_country_wiki)
# from iemiscdata package

pander(head(nuclear_power_accidents_country_wiki))
```

	Date	Location
Belgium	2002	Tihange, Belgium
Belgium	2005	Tihange, Belgium
Belgium	2006	Fleurus, Belgium
Belgium	2008	Fleurus, Belgium
Belgium	2011	Doel, Belgium
Canada	December 12, 1952	CRL, Ontario, Canada

	Description	INES rating	Fatalities
Belgium	"Safety injection during hot shutdown at Tihange 2 unit".[12][13]	2	0
Belgium	"Inadequate protection relays and related setpoints".[14][11]	2	0
Belgium	"Severe health effects for a worker at a commercial irradiation facility as a result of high doses of radiation" at Sterigenics.[15]	4	0
Belgium	Iodine-131 release in the environment.[16]	3	0
Belgium	"Inadequate setting of the auxiliary feedwater turbopump".[17]	2	0
Canada	The NRX accident. A hydrogen explosion occurred in the reactor core due to a cascade of malfunctions and operator errors. The world's first major nuclear reactor accident.[20]	5[21][22]	0

	Fatalities 180	Victims	Cost (in millions 2006 US$)
Belgium			
Belgium			
Belgium			
Belgium			
Belgium			
Canada			See NRX accident

	Cost 130,000,000 million dollars	Cost
Belgium		
Belgium		
Belgium		
Belgium		
Belgium		
Canada		

Fukushima Daiichi and Fukushima Daini Nuclear Power Stations

https://CRAN.R-project.org/package=iemiscdata/vignettes/US_Locations_Fukushima_Radiation_Sampled_2011.pdf
iemiscdata: Map of the Sampled US Locations after the Fukushima Power Plant Explosions in 2011
By Irucka Embry, E.I.T. (EcoC^{2}S)

https://eandt.theiet.org/content/articles/2023/08/japan-to-begin-releasing-wastewater-from-fukushima-power-plant/
E&T Magazine: Japan to begin releasing wastewater from Fukushima power plant
By Beatriz Valero de Urquia, August 22, 2023. Also archived at https://archive.vn/xVblz

https://apnews.com/article/japan-fukushima-radiation-water-fish-reputation-1cbcd14c58a461ce0c511d9448f1777b

AP News: Fukushima residents worry nuclear plant's wastewater release in a few weeks will be another setback
By Mari Yamaguchi, July 23, 2023. Also archived at https://archive.vn/vITgt

https://www.tepco.co.jp/en/hd/newsroom/announcements/archives/2021/20210214_01.html
TEPCO (Tokyo Electric Power Company): Status of the Fukushima Daiichi and Fukushima Daini Nuclear Power Stations after the Earthquake that occurred on February 13, 2021 (As of 2:00 PM, February 14), February 14, 2021

https://www.iaea.org/newscenter/news/international-fact-finding-mission-updates
International Atomic Energy Agency (IAEA): International Fact-Finding Mission Updates
By Peter Kaiser, Jun 1 2011

https://www.pbs.org/wgbh/frontline/article/voices-from-the-inside-fukushimas-workers-speak/
Public Broadcasting System (PBS) *FRONTLINE*: Voices From the Inside: Fukushima's Workers Speak
by Gretchen Gavett, March 11, 2012

https://www.audubon.org/news/how-has-fukushimas-nuclear-disaster-affected-environment
Audubon: How Has Fukushima's Nuclear Disaster Affected the Environment?: A year after Japan's nuclear meltdown, scientists are investigating the effects of radiation exposure on birds, other wildlife, and plants.
By Jane Braxton Little, March 09, 2012

https://cisac.fsi.stanford.edu/news/how-did-fukushima-disaster-affect-air-pollution
Stanford University Freeman Spogli Institute for International Studies Center for International Security and Cooperation: How did the Fukushima disaster affect air pollution?

https://www.cambridge.org/core/books/environmental-contamination-from-the-fukushima-nuclear-disaster/54E924E8EBBCA4
Environmental Contamination from the Fukushima Nuclear Disaster: Dispersion, Monitoring, Mitigation and Lessons Learned
Edited by Teruyuki Nakajima, Toshimasa Ohara, Mitsuo Uematsu and Yuichi Onda

https://www.nature.com/articles/srep19915
Predictability of the dispersion of Fukushima-derived radionuclides and their homogenization in the atmosphere
By Róbert Mészáros, Ádám Leelőssy, Tibor Kovács & István Lagzi, *Scientific Reports* volume 6, Article number: 19915 (2016)

https://acp.copernicus.org/articles/13/1425/2013/
Modelling the global atmospheric transport and deposition of radionuclides from the Fukushima Dai-ichi nuclear accident
By T. Christoudias and J. Lelieveld, *Atmospheric Chemistry and Physics*, Volume 13, issue 3 ACP, 13, 1425-1438, 2013

https://onlineethics.org/cases/oec-bibliographies/fukushima-daiichi-nuclear-disaster-bibliography
Online Ethics Center for Engineering and Science: Fukushima Daiichi Nuclear Disaster Bibliography
By Kelly Laas, 2014

http://japanfocus.org/-Sawada-Shoji/3952/article.html
Scientists and Research on the Effects of Radiation Exposure: From Hiroshima to Fukushima
by Sawada Shoji, *The Asia-Pacific Journal*, Vol. 11, Issue 23, No. 2. June 10, 2013

If you have access to R, you can use the following R code to view the following data sets yourSelf. Only the first 6 rows of the following non-metadata data sets are available in this document:

Fukushima_2011_FieldMeasurements_5_Metadata: US DOE/NNSA and DoD Response to 2011 Fukushima Incident: Field Team Radiological Measurements Metadata

Fukushima_2011_FieldMeasurements_5: US DOE/NNSA and DoD Response to 2011 Fukushima Incident: Field Team Radiological Measurements

Fukushima_2011_FieldSampleAirResults_2_Metadata: US DOE/NNSA and DoD Response to 2011 Fukushima Incident: Radiological Air Samples Metadata

Fukushima_2011_FieldSampleAirResults_2: US DOE/NNSA and DoD Response to 2011 Fukushima Incident: Radiological Air Samples

Fukushima_2011_FieldSampleInstrumentResults_Metadata: US DOE/NNSA Response to 2011 Fukushima Incident: Instrument Samples (InSitu Measurements) Metadata

Fukushima_2011_FieldSampleInstrumentResults: US DOE/NNSA Response to 2011 Fukushima Incident: Instrument Samples (InSitu Measurements)

Fukushima_2011_FieldSampleSoilResults_2_Metadata: US DOE/NNSA and DoD Response to 2011 Fukushima Incident: Radiological Soil Samples Metadata

Fukushima_2011_FieldSampleSoilResults_2: US DOE/NNSA and DoD Response to 2011 Fukushima Incident: Radiological Soil Samples

raddata_US_Fukushima_2011: US EPA Envirofacts RadNet (Radiation in the US)

raddata_usa_territories_Fukushima_2011: United States EPA Radiation Readings from 1 March 2011 to 22 April 2011

```
# Check to see if install.load, iemiscdata, data.table, and pander are already
# installed. If not, then install install.load, iemiscdata, data.table, and
# pander.
if (!requireNamespace(c("install.load", "iemiscdata", "data.table", "pander"))) {
    install.packages(c("install.load", "iemiscdata", "data.table", "pander"))
    # install the required R packages
}

install.load::load_package("iemiscdata", "data.table", "pander")
# load the required R packages
```

US DOE/NNSA and DoD Response to 2011 Fukushima Incident: Field Team Radiological Measurements

```
data(Fukushima_2011_FieldMeasurements_5)
# from iemiscdata package

pander(head(Fukushima_2011_FieldMeasurements_5))
```

ID	Measurement Date	Latitude	Longitude	Fixed?	Distance(miles)
142135	2011-03-12 16:00:00	38.47	142.8	No	120
142137	2011-03-12 16:45:00	38.5	143.2	No	138.9
142139	2011-03-12 18:00:00	38.63	143.7	No	167.7
142145	2011-03-12 22:20:00	39.63	143.7	No	208.1
142147	2011-03-12 22:20:00	39.63	143.7	No	208.1
142813	2011-03-16 18:03:00	35.74	139.4	No	148.5

Bearing	Direction	Type	Derived?	Value	Unit	Source
52	NE	Gamma	Yes	0.3	mR/hr	DOD
56	NE	Gamma	Yes	0.9	mR/hr	DOD

Bearing	Direction	Type	Derived?	Value	Unit	Source
59	ENE	Gamma	Yes	0.6	mR/hr	DOD
42	NE	Beta	No	0.225	uCi/m2	DOD
42	NE	Beta	No	0.135	uCi/m2	DOD
219	SW	Gamma	Yes	0.022	mR/hr	DOE

Description	Meter	Probe
USS RR Deck - reading taken at 1m.	N/A	ADM-300
USS RR Deck - 1 meter	N/A	N/A
USS RR - deck, closed window	N/A	N/A
Tractor - horizontal surface	N/A	N/A
Vertical Surface - USS RR	N/A	N/A
Field Team: in The wind - ;	Health Physics Kit	ADM-300

US DOE/NNSA and DoD Response to 2011 Fukushima Incident: Radiological Air Samples

```
data(Fukushima_2011_FieldSampleAirResults_2)
# from iemiscdata package

pander(head(Fukushima_2011_FieldSampleAirResults_2))
```

Analysis Id	Sample Id	Sample#	Type	Fixed?	Latitude
200609	7233	SCF-00001	Air Filter	No	37.35
200611	7233	SCF-00001	Air Filter	No	37.35
200613	7233	SCF-00001	Air Filter	No	37.35
200615	7233	SCF-00001	Air Filter	No	37.35
200617	7233	SCF-00001	Air Filter	No	37.35
200619	7233	SCF-00001	Air Filter	No	37.35

Longitude	Distance(miles)	Bearing	Direction	Collection Date
140.3	39.32	263.4	W	2011-03-21 16:54:57
140.3	39.32	263.4	W	2011-03-21 16:54:57
140.3	39.32	263.4	W	2011-03-21 16:54:57
140.3	39.32	263.4	W	2011-03-21 16:54:57
140.3	39.32	263.4	W	2011-03-21 16:54:57
140.3	39.32	263.4	W	2011-03-21 16:54:57

Source	Description	Filter Type	Volume	Volume Unit
DOE	Field Team: Charcoal Paired with SCF-07628 I-132 (2.3h halflife) activity is assigned to be equal to Te-132 activity, appropriate of conservative dose estimation. Results verified by LLNL and Triage.;	charcoal	22	cubic feet
DOE	Field Team: Charcoal Paired with SCF-07628 I-132 (2.3h halflife) activity is assigned to be equal to Te-132 activity, appropriate of conservative dose estimation. Results verified by LLNL and Triage.;	charcoal	22	cubic feet
DOE	Field Team: Charcoal Paired with SCF-07628 I-132 (2.3h halflife) activity is assigned to be equal to Te-132 activity, appropriate of conservative dose estimation. Results verified by LLNL and Triage.;	charcoal	22	cubic feet
DOE	Field Team: Charcoal Paired with SCF-07628 I-132 (2.3h halflife) activity is assigned to be equal to Te-132 activity, appropriate of conservative dose estimation. Results verified by LLNL and Triage.;	charcoal	22	cubic feet
DOE	Field Team: Charcoal Paired with SCF-07628 I-132 (2.3h halflife) activity is assigned to be equal to Te-132 activity, appropriate of conservative dose estimation. Results verified by LLNL and Triage.;	charcoal	22	cubic feet
DOE	Field Team: Charcoal Paired with SCF-07628 I-132 (2.3h halflife) activity is assigned to be equal to Te-132 activity, appropriate of conservative dose estimation. Results verified by LLNL and Triage.;	charcoal	22	cubic feet

Uncertainty%	MDA	Method Code	Moisture%	Nuclide	Result
0	4.827e-12	Gamma Spectroscopy		Ba-140	0
0	1.124e-11	Gamma Spectroscopy		Ce-144	0
0	2.79e-12	Gamma Spectroscopy		Cs-134	0
0	7.045e-12	Gamma Spectroscopy		Cs-136	0
0	2.578e-12	Gamma Spectroscopy		Cs-137	0
0	1.259e-11	Gamma Spectroscopy		I-132	0

Unit
uCi/mL
uCi/mL
uCi/mL
uCi/mL
uCi/mL
uCi/mL

US DOE/NNSA Response to 2011 Fukushima Incident: Instrument Samples (InSitu Measurements)

```
data(Fukushima_2011_FieldSampleInstrumentResults)
# from iemiscdata package

pander(head(Fukushima_2011_FieldSampleInstrumentResults))
```

Analysis Id	Sample Id	Sample#	Type	Fixed?	Latitude
221799	10325	JIS-0607-1	Instrument	No	37.07
221801	10325	JIS-0607-1	Instrument	No	37.07
221803	10325	JIS-0607-1	Instrument	No	37.07
221805	10325	JIS-0607-1	Instrument	No	37.07
221807	10325	JIS-0607-1	Instrument	No	37.07
221809	10325	JIS-0607-1	Instrument	No	37.07

Longitude	Distance(miles)	Bearing	Direction	Collection Date
140.8	27.64	210	SSW	2011-06-06 08:45:00
140.8	27.64	210	SSW	2011-06-06 08:45:00
140.8	27.64	210	SSW	2011-06-06 08:45:00
140.8	27.64	210	SSW	2011-06-06 08:45:00
140.8	27.64	210	SSW	2011-06-06 08:45:00
140.8	27.64	210	SSW	2011-06-06 08:45:00

Source	Description	Spectra File	Sampling Time
DOE	Description: GOJ in situ measurement. Date/Time is in Pacific Daylight Saving Time.;	0607-1.CHN	1968
DOE	Description: GOJ in situ measurement. Date/Time is in Pacific Daylight Saving Time.;	0607-1.CHN	1968
DOE	Description: GOJ in situ measurement. Date/Time is in Pacific Daylight Saving Time.;	0607-1.CHN	1968
DOE	Description: GOJ in situ measurement. Date/Time is in Pacific Daylight Saving Time.;	0607-1.CHN	1968
DOE	Description: GOJ in situ measurement. Date/Time is in Pacific Daylight Saving Time.;	0607-1.CHN	1968

Source	Description	Spectra File	Sampling Time
DOE	Description: GOJ in situ measurement. Date/Time is in Pacific Daylight Saving Time.;	0607-1.CHN	1968

Live Time	Instrument Height	Uncertainty%	MDA	Method Code
1800	100	0.06495		InSituGammaSpec
1800	100	0.002928		InSituGammaSpec
1800	100	0	0.003808	InSituGammaSpec
1800	100	0.001802		InSituGammaSpec
1800	100	0	0.01594	InSituGammaSpec
1800	100	0.02269		InSituGammaSpec

Moisture%	Nuclide	Result	Unit
	Cs-134	0.4675	uCi/m2
	Cs-137	0.4113	uCi/m2
	Cs-136	0	uCi/m2
	I-131	0.006515	uCi/m2
	I-132	0	uCi/m2
	Te-129	0.5365	uCi/m2

US DOE/NNSA and DoD Response to 2011 Fukushima Incident: Radiological Soil Samples

```
data(Fukushima_2011_FieldSampleSoilResults_2)
# from iemiscdata package

pander(head(Fukushima_2011_FieldSampleSoilResults_2))
```

Analysis Id	Sample Id	Sample#	Type	Fixed?	Latitude	Longitude
197557	8995	SCF-08754	Soil	No	37.66	140.7
197559	8995	SCF-08754	Soil	No	37.66	140.7
197561	8995	SCF-08754	Soil	No	37.66	140.7
197563	8995	SCF-08754	Soil	No	37.66	140.7
197565	8995	SCF-08754	Soil	No	37.66	140.7
197567	8995	SCF-08754	Soil	No	37.66	140.7

Distance(miles)	Bearing	Direction	Collection Date	Source
24.19	313.8	NW	2011-04-17 12:50:00	DOE
24.19	313.8	NW	2011-04-17 12:50:00	DOE
24.19	313.8	NW	2011-04-17 12:50:00	DOE
24.19	313.8	NW	2011-04-17 12:50:00	DOE
24.19	313.8	NW	2011-04-17 12:50:00	DOE

Distance(miles)	Bearing	Direction	Collection Date	Source
24.19	313.8	NW	2011-04-17 12:50:00	DOE

Description	Weight	Weight Unit	Depth
Field Team: Exposure rate in collection area - 800 uR/hr. ; Description: AMS Box North - Untilled Rice Patty Field - Location #1. ;	250	grams	2
Field Team: Exposure rate in collection area - 800 uR/hr. ; Description: AMS Box North - Untilled Rice Patty Field - Location #1. ;	250	grams	2
Field Team: Exposure rate in collection area - 800 uR/hr. ; Description: AMS Box North - Untilled Rice Patty Field - Location #1. ;	250	grams	2
Field Team: Exposure rate in collection area - 800 uR/hr. ; Description: AMS Box North - Untilled Rice Patty Field - Location #1. ;	250	grams	2
Field Team: Exposure rate in collection area - 800 uR/hr. ; Description: AMS Box North - Untilled Rice Patty Field - Location #1. ;	250	grams	2
Field Team: Exposure rate in collection area - 800 uR/hr. ; Description: AMS Box North - Untilled Rice Patty Field - Location #1. ;	250	grams	2

Surface Area(cm2)	Shape	Uncertainty%	MDA	Method Code
100		2.906e-06	4.816e-06	Gamma Spectroscopy
100		2.906e-06	4.816e-06	Gamma Spectroscopy
100		5.818e-06	9.894e-06	Gamma Spectroscopy
100		5.14e-08	5.005e-08	GP Counting
100		5.14e-08	5.005e-08	GP Counting
100		3.215e-08	5.005e-08	GP Counting

Moisture%	Nuclide	Result	Unit
	I-132	-1.977e-06	uCi/g
	Te-132	-1.977e-06	uCi/g
	Mo-99	-1.821e-06	uCi/g
	Sr-90	9.227e-09	uCi/g
	Sr-89	3.398e-08	uCi/g
	Sr-Total	6.911e-08	uCi/g

US EPA Envirofacts RadNet (Radiation in the US)

```
data(raddata_US_Fukushima_2011)
# from iemiscdata package

pander(head(raddata_US_Fukushima_2011))
```

Analyte ID	Analyte Name	Result Amount	Result Unit	Collect End
BE7	Beryllium-7	612	PCI/L	2011-04-20
BE7	Beryllium-7	301	PCI/L	2011-04-04
BE7	Beryllium-7	257	PCI/L	2011-04-04
BE7	Beryllium-7	157	PCI/L	2011-03-17
BE7	Beryllium-7	145	PCI/L	2011-03-22
BE7	Beryllium-7	143	PCI/L	2011-03-27

Result Date	Mat Desc	Samp Size	Samp Unit	Location 1 (City)
2011-04-20	Precipitation	1.5	L	Boston
2011-04-04	Precipitation	1.1	L	
2011-04-04	Precipitation	1.3	L	
2011-03-17	Precipitation	3.9	L	
2011-03-22	Precipitation	0.75	L	Boise
2011-03-27	Precipitation	400	ML	Boise

Location 1 (State)	Location 1 (Latitude)	Location 1 (Longitude)
MA	42.36	-71.06
ID	43.6	-116.2
ID	43.6	-116.2

United States EPA Radiation Readings from 1 March 2011 to 22 April 2011

```
data(raddata_usa_territories_Fukushima_2011)
# from iemiscdata package

pander(head(raddata_usa_territories_Fukushima_2011))
```

State Abbreviation	City Name	Analyte Name	Analyte ID	Result Amount
CNMI	SAIPAN	Uranium-238	U238	0.000283
GU	GUAM	Uranium-238	U238	0.000222
HI	KAUAI	Uranium-238	U238	0.000215
CNMI	SAIPAN	Uranium-238	U238	0.000211
AK	DUTCH HARBOR	Uranium-238	U238	0.000186

State Abbreviation	City Name	Analyte Name	Analyte ID	Result Amount
AK	NOME	Uranium-238	U238	0.000121

Result Unit	Media Description	Collection Start Date
PCI/M3	Air filter	2011-03-21
PCI/M3	Air filter	2011-03-19
PCI/M3	Air filter	2011-03-20
PCI/M3	Air filter	2011-03-24
PCI/M3	Air filter	2011-03-18
PCI/M3	Air filter	2011-03-18

Collection Ending Date	Result Date	Surface Water Source	Half Life
2011-03-21	2011-04-01		4.468e+09
2011-03-19	2011-04-01		4.468e+09
2011-03-21	2011-04-01		4.468e+09
2011-03-24	2011-04-01		4.468e+09
2011-03-19	2011-04-01		4.468e+09
2011-03-20	2011-04-01		4.468e+09

Half Life Time Unit	Location Number-2	Project Number-2
Y	4115	1863
Y	4113	1855
Y	4117	1867
Y	4115	1873
Y	3043	1855
Y	4112	1855

Combined Standard Uncertainty	Minimum Detection Concentration	Analysis Number-2
6.5e-05	7.8e-05	604044
5.3e-05	5e-05	604042
4e-05	3.9e-05	604050
5e-05	6.1e-05	604052
3.8e-05	4e-05	604040
2.6e-05	2.3e-05	604038

Analyte Type	Ana Proc Name	Matrix ID	Project Number-3
R	Actinides (Uranium) by Extraction Chromatography	AIR-FILTER	1863
R	Actinides (Uranium) by Extraction Chromatography	AIR-FILTER	1855

Analyte Type	Ana Proc Name	Matrix ID	Project Number-3
R	Actinides (Uranium) by Extraction Chromatography	AIR-FILTER	1867
R	Actinides (Uranium) by Extraction Chromatography	AIR-FILTER	1873
R	Actinides (Uranium) by Extraction Chromatography	AIR-FILTER	1855
R	Actinides (Uranium) by Extraction Chromatography	AIR-FILTER	1855

Location Number	Sample ID	Sample Size	Sample Unit	Analysis Number
4115	B102638	859.2	M3	604044
4113	B102481	1045	M3	604042
4117	B102766	2100	M3	604050
4115	B102838	1143	M3	604052
3043	B102472	1756	M3	604040
4112	B102466	2480	M3	604038

Analysis Size	Analysis Unit	Analysis Size 2	Analysis Unit 2
214.8	M3		
261.2	M3		
524.9	M3		
285.7	M3		
438.9	M3		
620	M3		

Analysis Proc Number	Proc Type ID	Run Number	Detection Number
133	U	1	232
133	U	1	231
133	U	1	318
133	U	1	320
133	U	1	230
133	U	1	228

Run Start	Duration	Project Number	Study Number	Project ID
2011-04-01	1000	1863	30	JAPAN DEPLOYS 032411
2011-04-01	1000	1855	30	JAPAN DEPLOYABLES
2011-04-01	1000	1867	30	JAPAN DEPLOYS 032511
2011-04-01	1000	1873	30	JAPAN DEPLOYS 032811
2011-04-01	1000	1855	30	JAPAN DEPLOYABLES
2011-04-01	1000	1855	30	JAPAN DEPLOYABLES

Study Name
Fukushima Nuclear Incident
Fukushima Nuclear Incident
Fukushima Nuclear Incident
Fukushima Nuclear Incident
Fukushima Nuclear Incident
Fukushima Nuclear Incident

The Adverse Health Effects Associated with 11 September 2001 Toxic Releases

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Posted by ENS on September 10, 2011 [Recovered with the Internet Archive: Wayback Machine]

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Irucka Ajani Embry, M.E., E.I.T. is the Principal of EcoC^{2}S (https://www.ecoccs.com) in Nashville, Tennessee. EcoC^{2}S is a Nashville, Tennessee-based small business offering the following services: 1) Consulting in a variety of areas [General Consulting, Food Grower, Healthy Living Coach (Promoting Healthy Living through the Read the Labels Campaign), Free/Libre and Open Source Software (FLOSS) selection and installation as opposed to proprietary, closed-source, freedom-limiting software]; 2) Public Speaking; 3) Providing Data Analysis and Data Science Services via R & Offering R Trainings; and other services (https://www.ecoccs.com/services.html). Irucka has a Master of Engineering with a Concentration in Environmental Engineering from Tennessee State University (TSU) in Nashville and a Bachelor of Science in Civil Engineering with Minors in Environmental Engineering and Spanish from the University of Tennessee, Knoxville.

Irucka is a creative & multi-faceted person. He is a(n)

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- herbalist ("lover and user of plants"),
- artisanal home chef & food forager,
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- public speaker/instructor/teacher,
- R data analyst / data scientist / developer / trainer {https://www.ecoccs.com/rtraining.html],
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- self-studier of (agro)homeopathy and biodynamics (https://www.ecoccs.com/resources_links.html#biod_ag},
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- etc.

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