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WORLD HANDBOOK ON LOCAL DISASTER MANAGEMENT EXPERIENCES

for beginners



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March 2013

Tsunami

A song saved lives. Everyone in Simulu island, Indonesia, learns the 1907 tsunami song "Run for higher ground after an earthquake" from grandparents. On my island, only 7 of 78,000 died in the 2004 tsunami, though 230,000 died in the world.



My house in Tohoku, Japan, shook badly on March 11, 2011.

Listen to a warning of a distant tsunami even when there is no shaking.



Japan



Chile

I felt no shaking on March 11 2011, but a tsunami came to Chile.



Tsunami does not always start with the undertow.



The 2011 Tohoku tsunami, Japan © The Mainichi Newspapers



© Ache tsunami museum

The 2004 Sumatra tsunami in Indonesia



© A. Pitorowski

St. Mary's Church in Darlowo Poland in 1497



The 1896 Meiji-Sanriku tsunami in Tohoku, Japan

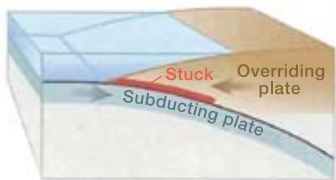
Tsunami scenes are similar no matter where or when. The 1896 Meiji-Sanriku tsunami came after a **slow, weak 5-minutes earthquake** in the night. People did not notice the earthquake so they did not prepare for the tsunami.



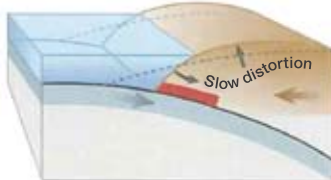
Japan



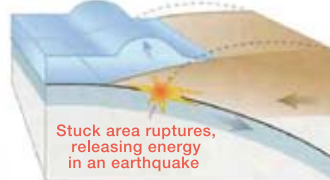
(Tsunami generation)



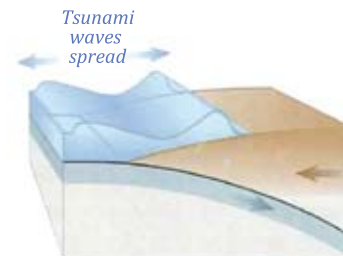
1. Vertical slice through a subduction zone



2. Between earthquakes



3. During an earthquake



4. Minutes later

© USGS



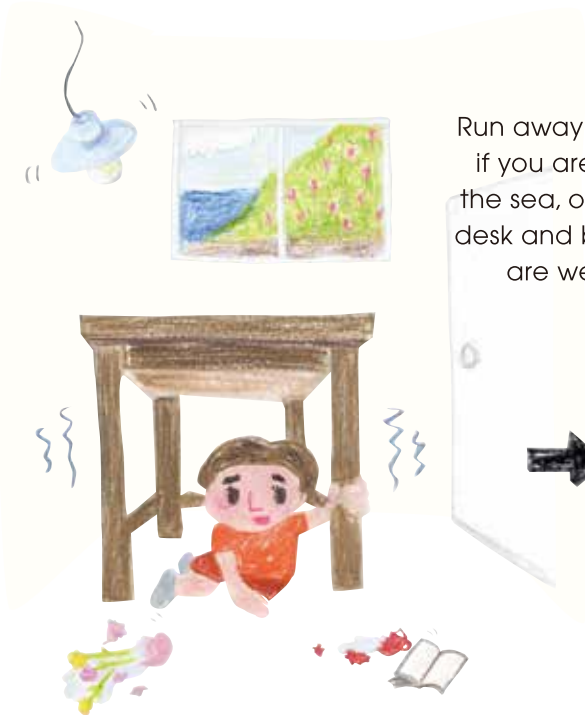
Japan

Dr. Megumi



→ See page 13 (Volcano).
→ See page 25 (Landslide).

How to evacuate



Run away quickly if you are near the sea, or if your desk and building are weak.



Drop! Cover! Hold on!
Protect yourself first during earthquakes.

Go to high ground!
The shaking is your tsunami warning.

Stay there!
Tsunami waves may arrive for hours.

A shaking of over **50** seconds may cause large tsunamis!

-> See page 10 (Earthquake).



Check evacuation signs and routes before disasters.



"Tsunami Tendenko" is a famous saying in Tohoku, Japan. This means "Run to a hill quickly without thinking your family." Trust your family and run even if you are all alone; then you will see them again at a meeting point. Where do your family plan to meet if you have to run separately?



Tsunami Memorials

To transfer lessons to future generations

I built 85 tsunami memorial poles for children in Indonesia after Japanese memorials in 2007.



Prof. Agus Salim
(10 Nov. 1956 - 10 Nov. 2008)



Indonesia



Japan

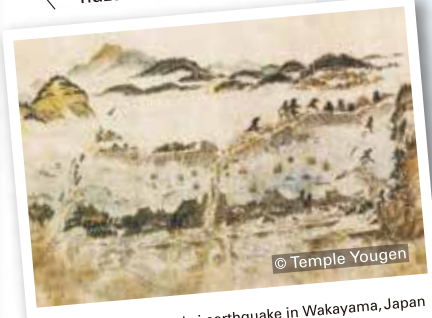


"Don't build houses below this height." Because of this memorial stone, no houses in a Tohoku area were flooded in 2011.

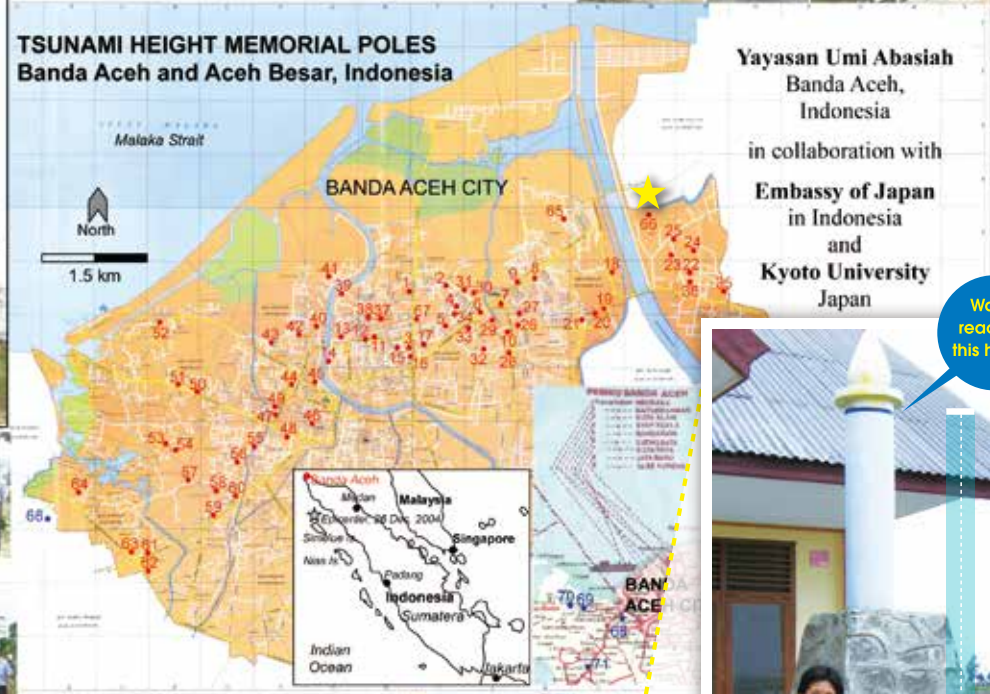


Japan

This might be the oldest tsunami hazard map in the world...



The 1854 Ansei-Nankai earthquake in Wakayama, Japan



Water reached this height.



Earthquake



The 2003 Bam earthquake, Iran

This our school building collapsed and many friends died in the 2008 Sichuan earthquake. We were very lucky. Only the staircase we were on was strong enough to survive the quake.



China



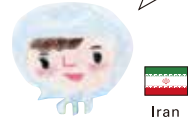
The 2011 Canterbury earthquake, New Zealand

Many buildings collapsed in the 2011 New Zealand earthquake due to building methods from England where earthquakes do not happen.

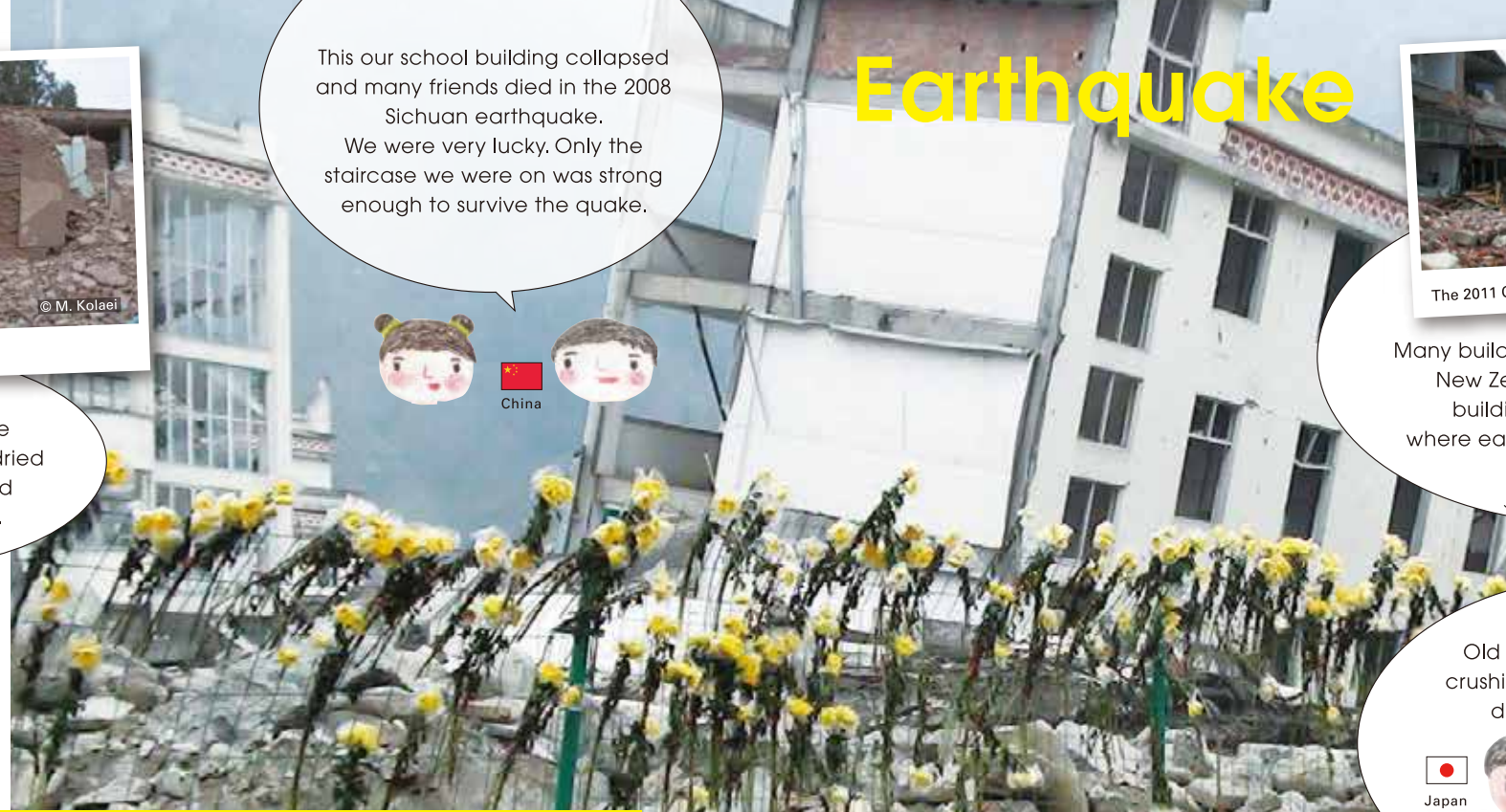


New Zealand

Remember that those buildings made by sun-dried bricks easily collapsed during earthquakes.

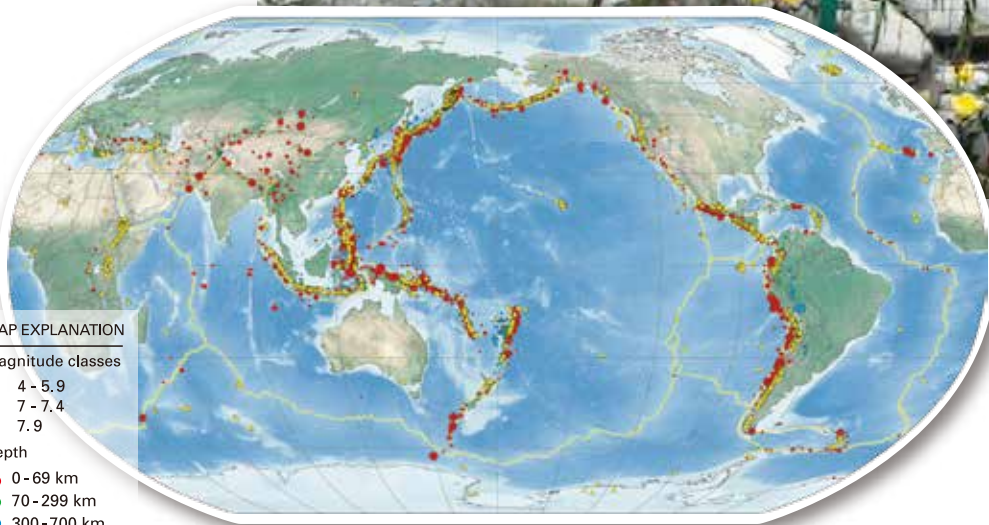


Iran



The 2008 Sichuan earthquake

Earthquakes mainly occur at plate boundaries and active faults.



MAP EXPLANATION
 Magnitude classes
 • 4 - 5.9
 ○ 7 - 7.4
 ○ 7.9
 Depth
 ● 0-69 km
 ● 70-299 km
 ● 300-700 km
 ▲ Active volcano

Earthquake map 1900-2010 © USGS

Old wooden houses collapsed, crushing around 5,000 people to death. Around 7,000 houses burned in Kobe. Beware fire disasters too!



Japan



The 1995 Kobe earthquake, Japan

If buildings are very old or not built well, it can be dangerous to stay inside when a quake occurs. Run outside quickly while protecting your head with hands, books or whatever you have. **Ask your parents and teachers whether you should run out or not!**

 **Unplug things. Turn the gas off.**
 → See page 38 (Fire). 



→ If you stay near the seaside, see page 03 (How to evacuate from Tsunami).
 → If you stay near mountains, see Page 25 (Landslide).

How to evacuate

Indoors

Outdoors

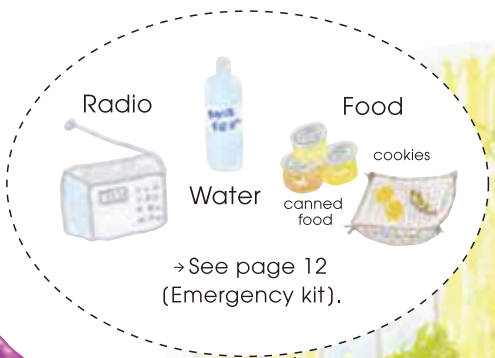
Earthquake resistant building



Drop! Cover! Hold on!
Protect yourself first during earthquakes.

Non earthquake resistant building

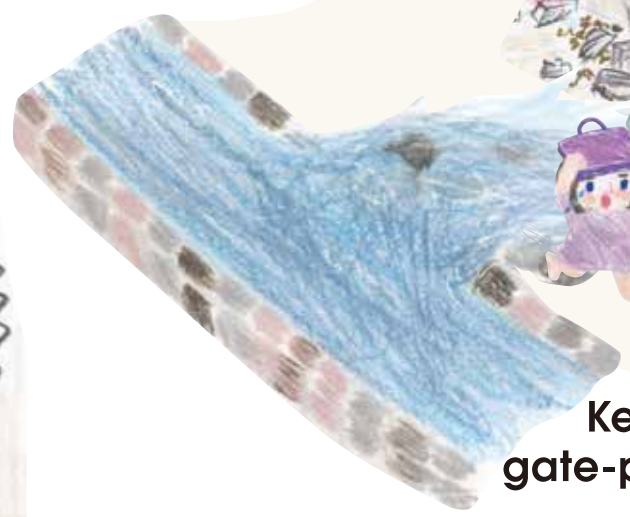
Need to be strengthened to prevent collapse!



→ See page 12 (Emergency kit).



Go outside, but pay attention to falling objects!



Keep away from river-walls and gate-posts and go to a safer place.



Italian seismologists were found guilty in 2012 for saying it was safe before the 2009 L'Aquila earthquake. Science has taught us a lot, but there is still a lot we don't know. We have to decide whether or not to evacuate based on our own judgment while using all information.



The 2009 L' Aquila earthquake, Italy

Ground hazard



Japan



A ground subsidence can occur due to natural disasters and human activities. The ground sank 1.14m below sea level in my home town, Ayukawa, after the 2011 Tohoku earthquake and tsunami. Housing areas and rice fields are still covered with seawater.



New Zealand



A septic tank was lifted up as the ground sank.

A part of the septic tank appeared after the quake. I had no idea what liquefaction was before. It is closely related to how the area used to be before turned into a housing area.



Marshes



Rice fields



Seacoasts

Flashlight



Battery



Water



canned food



cookies

Radio



Battery



First-aid kit



Candle

Match



Money



Passbook



Rope



Whistle



Blanket



Plastic wrap



gloves



Milk



Diaper

Emergency kit

Add a different hazard kit (snow or volcano) to the basic kit.



+ Snow and Ice

→ See page 32 (Snow and Ice).



Snow removal shovel



woolen hat



Really warm coat



Long boots

+ Volcano

→ See page 14 (Volcano).



Poncho



Hat
(Helmets are even better.)



Mask



Goggles

Volcano

Because of ash from Huaynaputina volcano, Grapes didn't bear a lot of fruit in Germany that year, and we couldn't make wine.

A famine hit Sweden by the eruptions in 1601.

A famine hit Russia and people started fighting because of that.

→
Prevailing Wind

Eruption Cloud

Ash (Tephra) Fall

Acid Rain



A lahar from the 1982 eruption of Mt. Galunggung in Indonesia.

"Lahar" is an Indonesian word. It flows down as fast as 100 km/h. Watch out and stay away from it.



Indonesia

Germany

Sweden

Russia

Peru

The 1600 Mt. Huaynaputina

Because of volcano ashes far up in the sky, we didn't get much sunshine and couldn't grow food.



The 1600 Mt. Huaynaputina



The 1983 Mt. Kilauea eruptions in Hawaii USA. Lava flow is 1000°C - 1200°C.

Lava Dome
Lava Dome Collapse

Pyroclastic Flow

Lava Flow

Bombs

Vent

Pyroclastic Flow

Landslide (Debris Avalanche)

Lahar (Mud or Debris Flow)

Conduit

Fumaroles

Ground Water

Crack

Magma



Hat (Helmets are even better.)

Helmet

Be careful about volcanic gas, mountain fire and haze during eruptions. Talk about what to do and where to evacuate in emergency with your family members.

You can use bike helmets to protect your head from volcano rocks when evacuating.

→ See page 12 (Emergency kit).



Lessons from volcanic eruptions

Krakatau volcano erupted in 1883. Lava flows and lahar poured into the sea and caused tsunamis. 36,417 people died. Remember tsunamis can be caused by volcanic eruptions!



The 1983 Mt. Kilauea eruption in Hawaii USA. © J.D. Griggs / USGS



The memorial monument for the 1914 Mt. Sakurajima eruption in Japan



There is a memorial monument of volcanic eruptions in my school yard.

"Don't believe (geophysical) theories when unusual natural phenomena occur. Preparation to evacuate is very important" I asked to construct this in 1924.



"Prepare for the next disaster and keep awareness"

Tsunamis caused by a volcano in Indonesia traveled as far as Kagoshima, Japan, and went up in rivers there in 1883.



The 2011 Mt. Anak-Krakatau eruption in Indonesia © PVMBG, BG, KESDM.



→ See page 01 (Tsunami).

Farm animals are very important for some people to earn money. We need a way to give people money for lost animals.

Do not think about staying home because of farm animals. Some people died by ignoring the evacuation warnings.



Chile



Peru

You are more important than farm animals!

This monument is to remember the tsunami disaster caused by the 1883 volcanic eruption. This is a part of a gunboat carried inland by the tsunami.



The memorial monument of the 1883 Mt. Krakatau eruption and tsunami in Indonesia © S.Taguchi



Indonesia

Volcanoes can cause tsunamis!

Watch out for forecasts and warnings of torrential rain with strong winds.



Korea



The 2003 typhoon Maemi in Korea



The 2011 typhoon Pedring in Philippine

Typhoon

Cyclone



The 2012 Cyclone Funso



The 2008 Cyclone Nargis, Myanmar



The 2012 Hurricane Sandy



After the 2012 hurricane Sandy in NY, USA

Hurricane

Tropical Cyclone

(Hurricane / Typhoon / Cyclone)

Tropical cyclones have different names in different parts of the world: cyclones, hurricanes and typhoons. They can cause several types of natural disasters. The name hurricane comes from "Hurancan" (angry god) from the native American Taino language.



- > See page 19 (Storm Surge).
- > See page 21 (Flood).
- > See page 23 (Debris Flow).
- > See page 25 (Landslide).
- > See page 27 (Thunder and Lightning).

Global storm surges tracks (1985-2005) by NASA

Storm Surge



Prepare for surges by shutting and boarding up windows. Evacuate before storm surges hit your area.




U.S.A



Toyama Japan in 2008

© MLIT

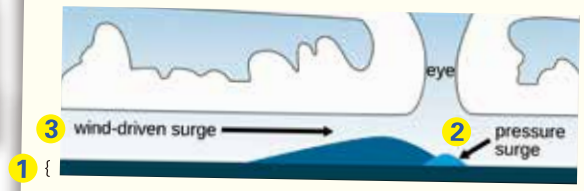
Storm surges are just like tsunamis. They may come many times and cause damage to houses and other structures.



Japan



Wind and Pressure Components of Storm Surge



© NASA

What is a storm surge?

Storm surge combines with the normal tides (1) to create the storm tide (pressure surge 2, wind-driven surge 3), which can increase the mean water level to heights impacting homes and other infrastructure. You may feel you catch a tsunami in a storm.

The 1954 Hurricane Carol, USA © NOAA

Tips for storm-surge evacuation

1. If you are in a house near the sea before storm surges, get as much information as possible and try to make an early decision on evacuation.
2. If you are outside, move away from a river or the sea. Remember that levees and seawalls are not always strong enough to protect you.



The 2005 Hurricane Katrina, USA

© NOAA

Toya River in Kobe, Japan

15 minutes after the rainfall started, the water level rose by 134cm. Five people died including students in my elementary school.



Japan



Flood



People in Bangkok used boats not to get infected and keep themselves from falling into holes or ditches during the 2011 Thai flood.

Flash Flood



© Kobe city



14:35
Rain starts.



14:38

It suddenly became dark and started raining too hard to see ahead.



15 min.

14:50

Water level **-33cm**

Water level **+101cm**

© Kobe city

The river water can rise suddenly after a hard rain upstream **even if it is not raining where you are.**



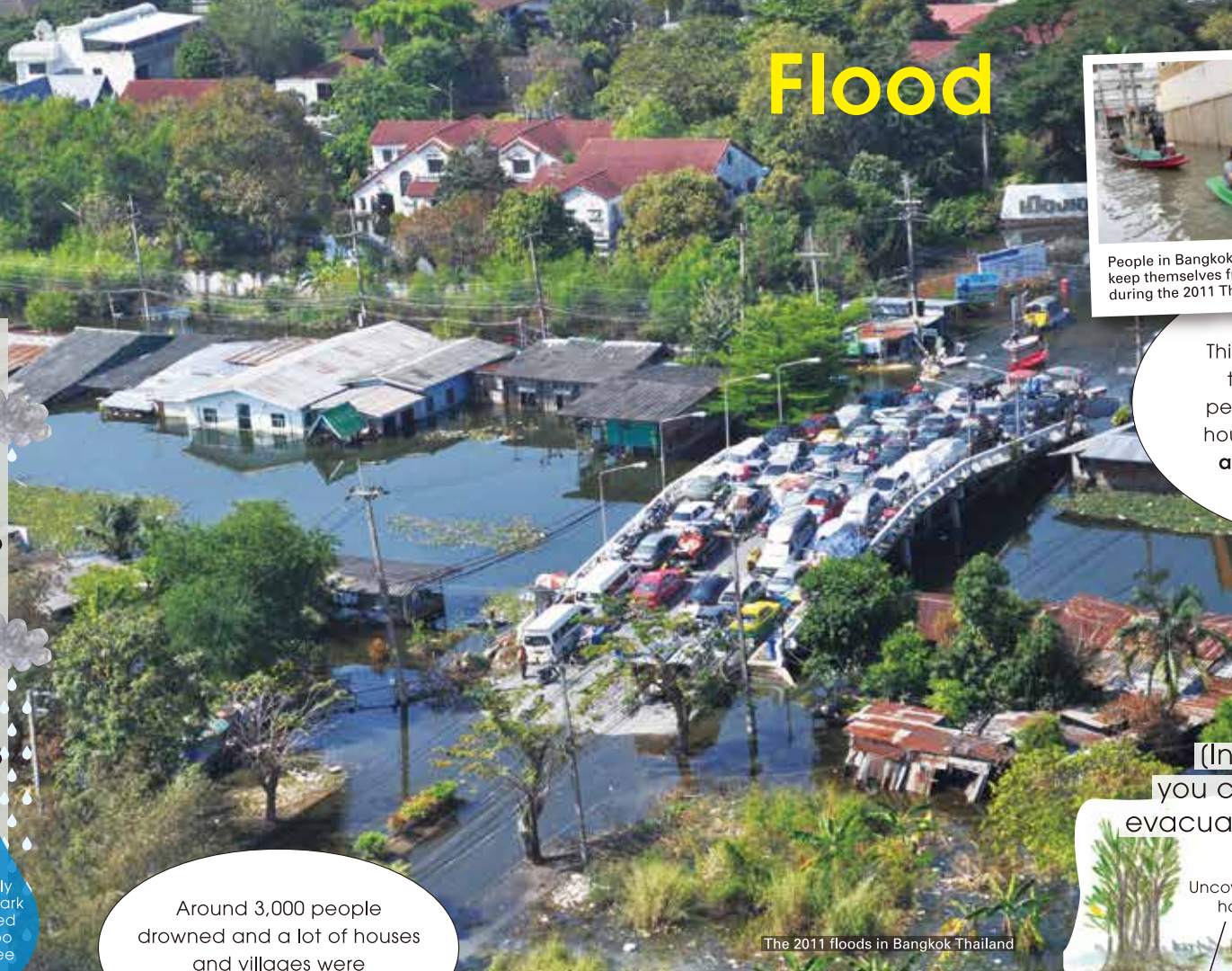
Around 3,000 people drowned and a lot of houses and villages were swept away.



U.K.



The 1607 Bristol channel floods, England



The 2011 floods in Bangkok Thailand

This flood lasted much longer than we thought. A lot of people had to live in flooded houses, so **some of them were accidentally electrocuted.**



Thailand



Unplug things.

→ See page 37 (Fire).

(In case you could not evacuate earlier...)



Uncovered hole Side ditch

Watch out for ditches and holes hidden under the water!

Watch out for dangerous objects hidden under the water!

Use a stick!

What to do before flooding

Indoors
Check hazard maps, weather forecast and warnings.

House doors may not open during flooding. You should take what you need with you and go to a higher and safer place and stay there.



outdoors
You should stay away from rivers, drains, subway stations and underground malls. **Don't stay in a car.**

Attention !
Be careful about drinking and using water after floods. You may acquire an infection.

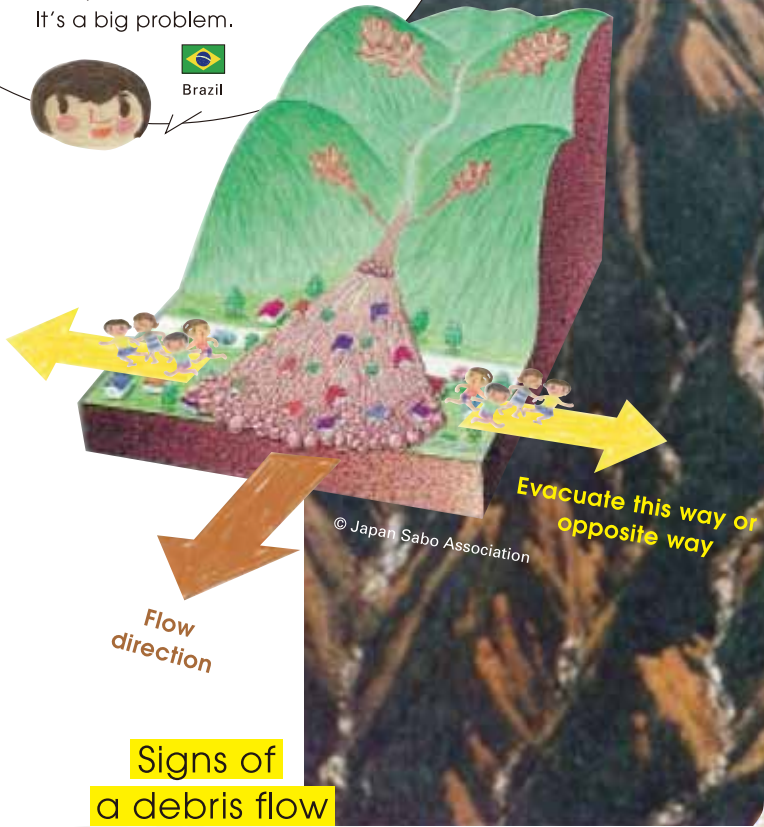
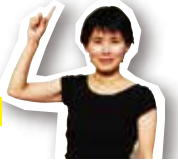
This photo (right) shows mountains in my country, Brazil. People are cutting too many trees illegally, so they cannot hold as much water as before and debris flows occur more easily now in Brazil. It's a big problem.



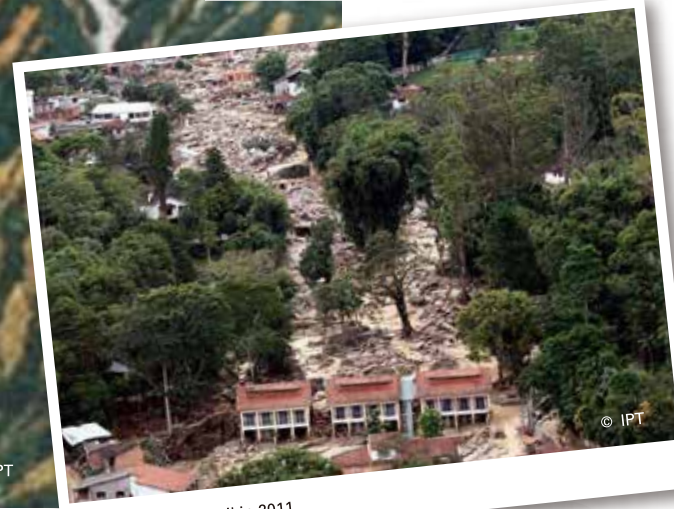
Debris Flow

A debris flow contains rocks and soil with water from local heavy rainfall. It flows down hillsides and rivers and easily destroys houses and other structures all at once. It can go down at 20-40km/hour.

Watch out for 7 signs and heavy rain forecasts in your area. And always evacuate early!



Signs of a debris flow



Sul e Sudeste, Brazil in 2011.



The river water is getting low while it is still raining.



Small rocks start falling off little by little.



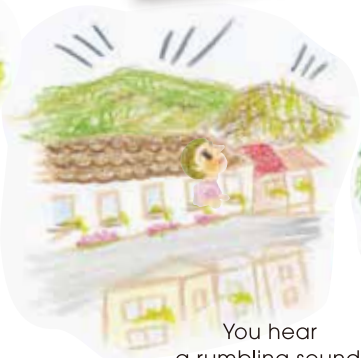
The well water gets muddy.



Water springs from the hill slope.



The river water gets muddy.



You hear a rumbling sound.



Cracks show in the ground.

Landslide

A slope failure occurs when a slope collapses suddenly as the earth in the area weakens because of rainfall or an earthquake. Because it occurs quickly and suddenly, many people fail to escape.



Indonesia



Slope Failure



© Japan sabo association



What is a landslide?

Landslides occur for a lot of reasons including earthquakes, heavy rain, snow, volcanic eruptions, human modification of land and logging. Landslides may bring on tsunamis in coastal areas. Landslides occur quickly, often with little notice, but **what we should do is to stay informed about changes in and around your home that could signal that a landslide is likely to occur.**

If you find a sign, make a big noise and inform that it's coming. The photo case is a bamboo bell.



Signs of slope failure



The well water gets muddy.



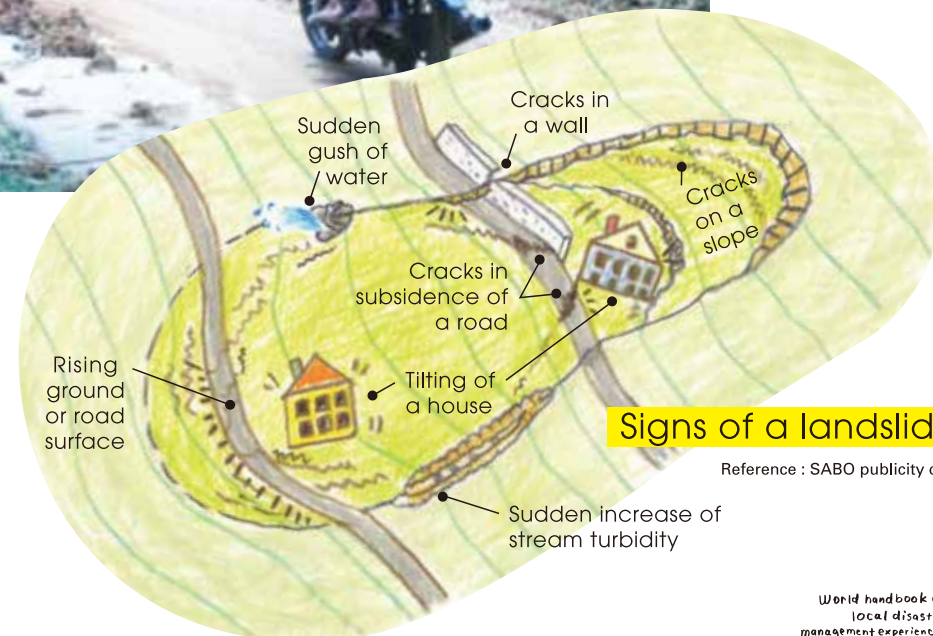
Small rocks start falling off little by little.



Water springs from the hill slope.



A slope failure in Santos, Brazil in 1928



Signs of a landslide!

Reference : SABO publicity center

The signs are the thunder and the thunder clouds are getting closer and closer.

Thunder and Lightning

Indoors



Unplug things.

Caution !



If lightning strikes you when you have something metal or glasses on, you may get very bad burns.



It is not always safe from lightning if you have rubber boots or a vinyl raincoat on.

27



If you see lightning and hear thunder at just about the same moment, the storm is right above you. You should shelter in buildings or cars as far as you can hear thunder.

Lightning is the result of the build up and discharge of electrical energy. The air in a lightning strike is heated to 50,000 degrees Fahrenheit. It is this rapid heating of the air that produces the shock wave that results in thunder (NOAA).

Close your umbrella.



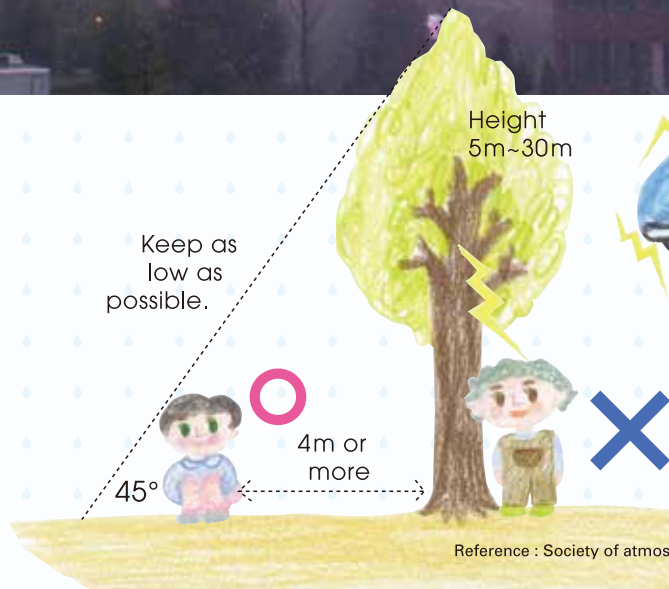
Outdoors



It is dangerous to hold long objects high, such as fishing rods and golf clubs.



It is safe to be in a car. Park the car in a safe place, turn the engine off and wait for the thunder to go away.



Reference : Society of atmospheric electricity of Japan

Tornado



The 2008 Iowa tornado in USA

I heard a low rumbling sound and felt unusual.



The signs are very strong winds, hail and lightning.



Hail

Tornadoes can break power poles and big trees. Stay away from them. It is dangerous to stay in a car.



Pull down the shutter doors.

Outdoors

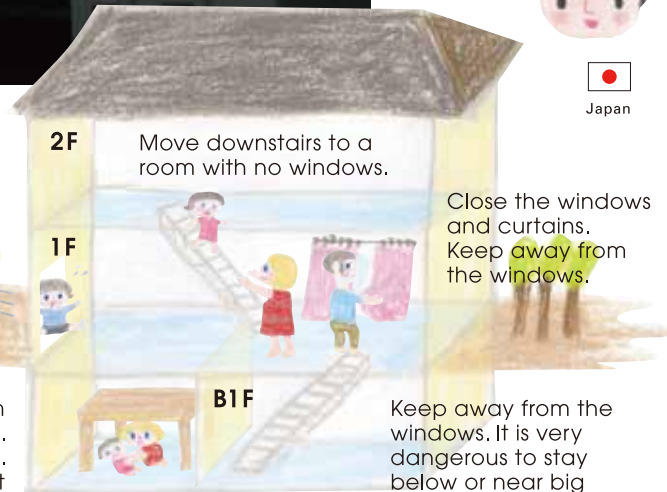


A tornado event

Indoors

Go inside a building.

Move to a small room with no windows. Hide under a strong desk. Crouch and protect your head.



The 2012 Tsukuba tornado in Japan.



The 2012 Tsukuba tornado in Japan.

The bottom of a very dark cloud was hanging down like a funnel. It was moving while sucking up building elements like a vacuum cleaner.

It caused huge damage to a small area in a very short time.

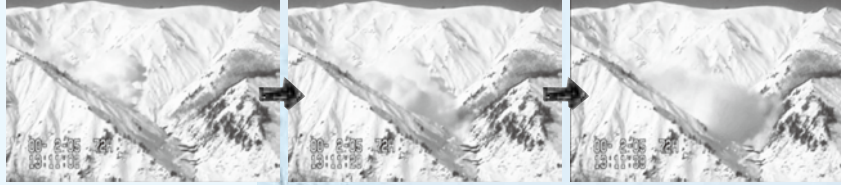


Japan

The 2012 Tsukuba tornado in Japan © Kenji Yoshizawa

Snow and Ice

The snow cover reached up to 25 feet in the Boston area during the 1717 Great Snow.



Happou (Mt. Hakuba) Japan

[A surface avalanche]

Around 4,000 died in the 1962 avalanche in Mt. Huascarán (6,768m). Around 2,000 died in the 1970 avalanche caused by the Ancash earthquake.



Peru

How to survive an avalanche



Use your arms like "swimming" up to the surface.



If you can't use your arms, cup your hands in front of your face to create an air pocket.



Curl in a ball to create some space around you. Stretching out, you may not be able to move soon.

31



Power lines sagging after heavy ice storm in USA in 2004 © NOAA

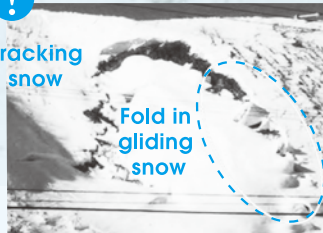


The Great Snow in New England USA in 1717 by Cotton Mather

Signs of avalanches



Cracking snow



Fold in gliding snow



Snow bowls



Cornice



Smoothing

Take extra care for a surface avalanche when you see snow bowls, cornice, smoothing. It can reach very far!

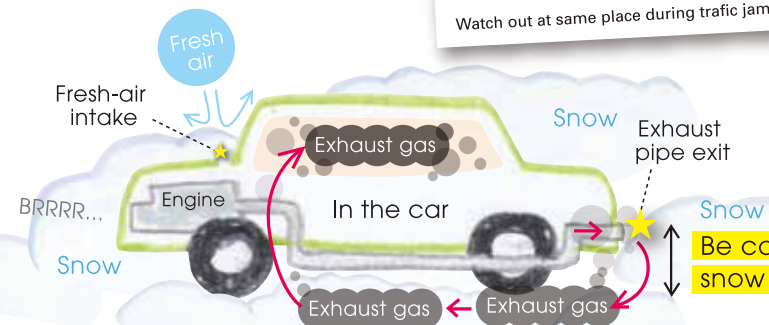


Nigata Japan in 2012 © Kamimura
Watch out at same place during traffic jam.

Prepare emergency supplies, thinking that you will have no power and water.



→ See page 12 (Emergency kit).



Be careful when snow is 15cm deep.

Be careful of exhaust gas poisoning while staying in a car with deep snow around.

Drought

Drought is a condition in which water is too little for people, plants and animals to live. In developing countries, even small children often have to drink dirty water during drought. We had to give up our land and become refugees in 2008.



Ethiopia



Ethiopia in 2008 © USAID



© University of Missouri Extension

Corn field, west central Missouri, USA in 2006.

Drought occurs not only in developing countries but also developed countries. It can cause a lot of damage to plants.



U.S.A

Drought means that we have no food not only for tomorrow but also for a long time in the future, because drought kills plants for us and we do not have seeds to plant for future food.



Ethiopia



© USAID

Ethiopia in 2008



© USAID

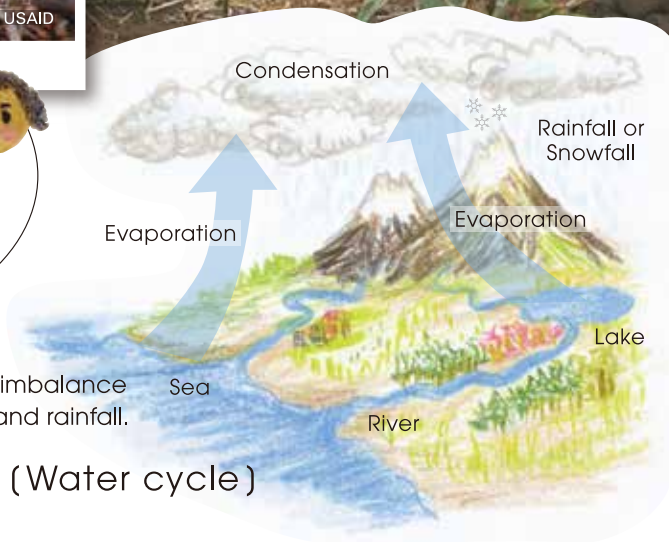
Kenya in 2008

Farm animals are very important for us, but we cannot give them enough water during drought.



Kenya

Drought results from an imbalance between evaporation and rainfall.



(Water cycle)

A drought is simply a long period (usually a season or longer) of dry weather where less than normal or no precipitation falls. **We can neither control weather nor prevent drought. It is important to make new systems** like saving rain water in tanks before severe drought. International support is also important to help countries in drought.



Haze is caused by dust, smoke and other very tiny, dry things floating in the air. Once it occurs, you cannot see a clear sky. Here we mainly talk about haze by smoke from wild fire.



Haze



© FS.FED.US

The mosaic of burned, underburned, and unburned areas of this wildfire Monroe Mountain in USA. photo by B. Campbell.



© FS.FED.US

The Oak Creek area the year following the prescribed burn in USA in 2005

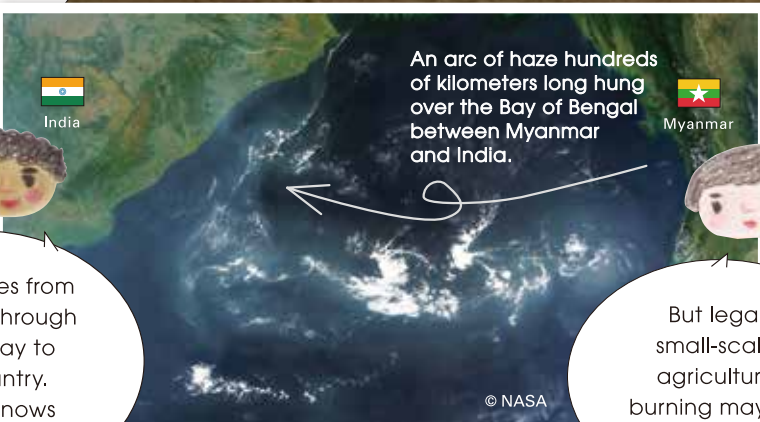
There are several reasons for haze: careless fire, thunder, drought, and heat wave. After a clear sky continues because of heat wave or drought, a fire can spread easily. Once it occurs, we can lose not only precious resources but also houses and even lives.



We use airplanes to keep a forest fire from spreading. It is very difficult to stop it.

Try not to breathe in the smoke.

Johnson wildfire in USA. Photo by B. Campbell © FS.FED.US



An arc of haze hundreds of kilometers long hung over the Bay of Bengal between Myanmar and India.

© NASA

An arc of haze on November 9, 2011.



Australia



India



Myanmar



But legal small-scale agriculture burning may be sustainable.

Poor people in my country clear jungles by burning though the government told them not to. That is because they need more land to plant palm trees for their survival.



Indonesia

I didn't know that. We should buy palm oil for a proper price to support poor Indonesian farmers.



Australia

As long as people in other countries buy palm oil for a very cheap price, poor Indonesian farmers have to keep burning jungles.



Indonesia

Haze is a regular problem in Southeast Asia caused by land and forest fires in Indonesia. Those fires mainly affect our countries, Brunei, Philippines and Thailand. Smoke prevents safe flight and orders groundstops. Indonesian people should stop it right now.



Malaysia



Brunei



Singapore

Fires break out during floods because power poles fall down and cause short circuits.

Foreigners can easily become disaster victims, too. When an earthquake occurred in 1906 in San Francisco, many immigrants living in China town died because their houses were poorly built. Also, many of them

couldn't evacuate in time because they didn't understand the language well and couldn't get enough information about the disaster.

Fire

When cars crash, their batteries can cause a fire. Gasoline goes everywhere even to the sea and catches fire. The fire spreads quickly as waves help the gasoline move.



Flood



Earthquake

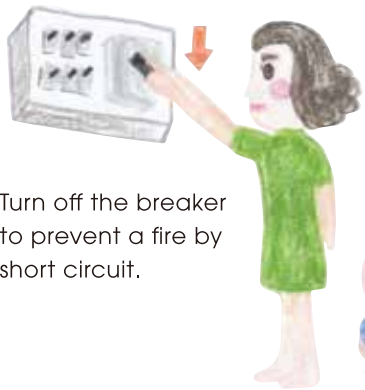


Tsunami

→ See page 21 (Flood).

Before evacuation

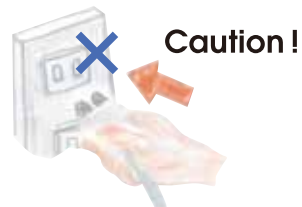
Remember that a fire may break out anytime anywhere during evacuation.



Turn off the breaker to prevent a fire by short circuit.

After returning from evacuation

Watch out for a short circuit when you first plug things in after coming home from evacuation.



The 1995 Kobe earthquake, Japan

→ See page 10 (Earthquake).



The 2011 Tohoku tsunami, Japan

→ See page 01 (Tsunami).

Remember "Three Quicklies" when you see a fire.

1. Get help quickly
2. Put out quickly
3. Run away quickly



It is important to get help quickly when you see a fire. Ask adults to put out the fire quickly, and run quickly away from the fire.