

**Name of unit:** Geographic project (Natural environment and disaster in the world)

## **Damage from the Sumatra Earthquake and Tsunamis in the Indian Ocean from the Earthquake and their Cause**

### <Targets of the class> :

**Research the catastrophe of the Sumatra Earthquake and Tsunamis in the Indian Ocean using maps and think of the role of Japan, a country with frequent earthquakes**

1. Understand the damage caused by the Sumatra Earthquake and Tsunamis in the Indian Ocean
2. Consider why so many lives were lost (the cause of so many victims)
3. Find the ideas for protecting people's lives from tsunamis
4. Prepare for disaster caused by tsunamis, which can occur in Japan and in the world

### <Schedule of the class> :

**The 1<sup>st</sup> period:** Understand the damage caused by the Sumatra Earthquake and Tsunamis in the Indian Ocean shown on the Global Map

**The 2<sup>nd</sup> period:** What increased the damage? Natural environment? – Learn via discussions and analysis in groups

**The 3<sup>rd</sup> – 4<sup>th</sup> periods:** Work on analyzing the causes of the damage by using maps - Analyze in group

**The 5<sup>th</sup> – 6<sup>th</sup> periods:** Work on researching the causes of damage from the Sumatra Earthquake and Tsunamis in the Indian Ocean (mapping) / Preparation for presentation (using PC)

**The 7<sup>th</sup> – 8<sup>th</sup> periods:** Presentation about the causes and lessons of the Sumatra Earthquake and Tsunamis and conclusion

### <About educational materials> :

**Materials used in the class for understanding the actual situation of damage caused by earthquakes and tsunamis:**

**Visual aids and maps for understanding the focus of an earthquake and its magnitude, and the mechanism of tsunamis and damage**

NHK TV programs recorded on video tape (Science Eye, Close-up Gendai (=now), and Sekai no Macikado (=Streets in the world) ) 5-10 minutes

Images of maps: Data of Global Map (Ministry of Land, Infrastructure and Transport), Simulation of tsunami (Advanced Industrial Science and Technology, etc.)

- The actual situation of the earthquake and the tsunami were revealed one year after their occurrence.
- We can see simulations of the effect of the earthquake and the tsunami, and the areas affected.

### **Using GIS (Geographic Information System):**

**Using the Global Map as map data suitable for understanding the natural environment of the world**

The maps of the coastal area of the Indian Ocean at scales of 1 : 1,000,000.

- It is available free of charge by downloading from the website of the Global Map (Geographical Survey Institute)

**Using the materials of the Data Map for considering the causes of the increase in damage**

The data for developing thematic maps by U.N. agencies and NGOs, as well as 'Inochi no Chizucho (=Atlas of Lives), is used.

- Develop a data map by yourselves.

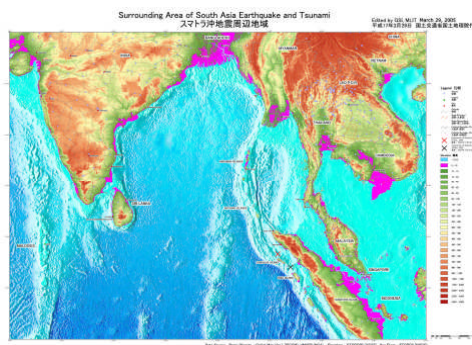
**Using Chizu Taro for a GIS software application to read map data**

For GIS software, ArcExplorer available by downloading free of charge via the Internet, or Chizu Taro, which costs 3,500 yen

- ※Available by download via the Internet (free of charge for 2 weeks)

Damage caused by the Sumatra Earthquake and Tsunamis in the Indian Ocean shown on maps

<b>Plan for the class:</b>	
<b>The first period:</b> The Sumatra Earthquake and Tsunamis in the Indian Ocean shown on the Global Map Multipurpose classroom (Tuesday)	
<b>Flow of the class:</b>	
<b>Details of the class</b>	
<b>00-05 minutes</b> Introduction	<p><b>Show the Global Map of the Indian Ocean where the Sumatra Earthquake and Tsunamis occurred (see the image on the screen below) to remind students of the disaster caused by the earthquake and tsunamis on 2004.12.26.</b></p> <p>Ask a question: Let students answer from the Map. → Terrain of the seabed? Ask a question: What does the purple point on the Map indicate? (Identify the name of areas including the name of countries, flatlands)</p>
<b>05—20 minutes</b> Development 1	<p><b>Recognize the great damage caused there by the recorded NHK TV programs.</b></p> <p>Ask a question: Why didn't people run away from the seashore during the ebb where they could see the tsunamis were closing? → Several minutes after that, people were swallowed up by the tsunami (Why!?) Why didn't they run away in spite of tsunamis closing in on them? Why? → Visually understand the distressing spectacle after the tsunamis.</p> <p style="color: red; text-align: center;">Purpose (Remind students of the news 14 months ago)</p>
<b>20—30 minutes</b> Development 2	<p><b>In order to let students understand the actual damage caused by the Sumatra earthquake, show the damage map (see the next page) and let them enter what can be found from the map on a worksheet (see the annexed paper) by a group of around four students.</b></p> <p>Ask a question: What country's seashore did the tsunamis reach, and what damage did the tsunamis cause? Why was the damage different between countries? Organize what students thought by group. Enter the number of people who died because of the disaster on the map of the worksheet.</p> <p style="color: red; text-align: center;">Purpose (Examine the readiness for the study of the Sumatra Earthquake and Tsunamis.)</p>

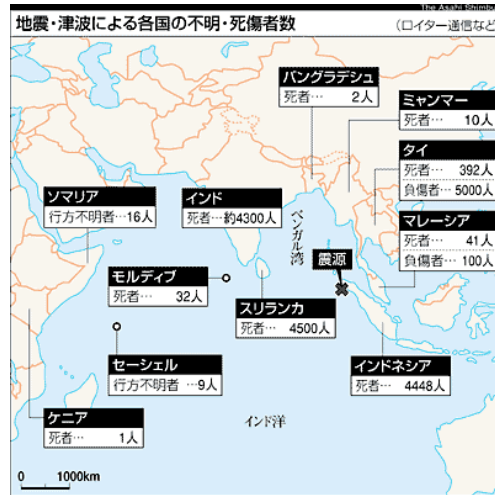


30—40 minutes

A few groups make a presentation about their worksheet completed in Development 2.

The name of the countries, the number of dead, the number of ruined houses, etc.

\* Students from other groups add other details to correct the worksheet.



For additional information, show the animated transmission of tsunamis on the screen again.

40—45 minutes

**Summary of learning in this class**

The Sumatra Earthquake and Tsunamis on December 26, 2004 caused the most disastrous damage to countries on the coast of the Indian Ocean. It was also found that the level of the damage was significantly different between countries.

In the next class, think of the causes of the above.

**Plan for the class:**

The second period: What increased the damage? Natural environment?

Discussion / Analysis (Wednesday) Multipurpose classroom

0—10 minutes

Review of the last class

**The Sumatra Earthquake and Tsunamis caused a great natural disaster with more than 220,000 victims.**

**Ask a question:** As to the countries and areas having suffered great damage, what geographical conditions do they have?

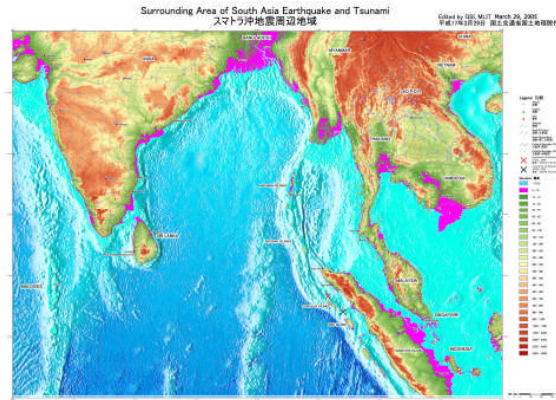
**Purposes (Research the actual situation of the damage, and make an estimate of the reason why the damage was so significant)**



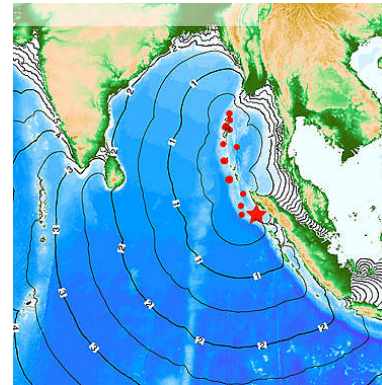
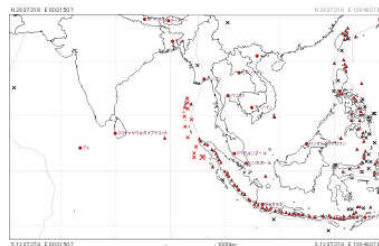
10—30 minutes

**Purpose:**  
Check whether students are ready to use their knowledge about world geography, i.e. natural environment of the world, the gross-form and the mobile belts of the world, etc.

**Ask a question:** See the map of the terrain (the Global Map) for the coast of the Indian Ocean (seabed and land) by PC (one per group) to discuss in a group on the causes of the earthquake and tsunamis that occurred there.



Picture of the Global Map



Pay attention to the height of the tsunamis, the focuses of the earthquakes in the past, great earthquakes in the world, volcanoes, and plate boundaries.

→ **Students enter the results of discussion on worksheet 2, and one or two groups make a presentation.**

**(Estimate) The focus of the Sumatra Earthquake was on the plate boundaries where there are ocean trenches. Volcanoes and active faults are also there. The terrain of this area is similar to that of Japan.**

**Ask a question:**

Japan is the same as Sumatra, i.e. volcanoes, the ocean trench, and intraplate earthquakes occur a lot...!

If an earthquake of equal magnitude occurs in Japan, will hundreds of thousands of human lives be lost like Sumatra?

- \* 'Tsunami' is a Japanese word used worldwide. Japan has experienced tsunamis many times.
- \* Tsunamis have occurred in Japan? (Sanriku Coast, Okushiri Island, Middle part of the Sea of Japan...)
- \* Will a tsunami that takes tens of thousands of lives occur?
- \* Earthquake prediction, Protection from tsunamis, Techniques for prediction and warning, Disaster prevention education
- \* Why were so many human lives lost in the great tsunamis in the Indian Ocean at that time?

**Ask the question:** → What are the differences between Japan and this area, which suffered great damage caused by the tsunami?

Are there any factors to increasing the damage other than the natural environment? Let's think about that!

30—40 minutes

**Purpose:** Japan often suffers damage from tsunamis.

40—45 minutes

## Plan for the class:

**The third period:** Search for the causes of the damage by developing a map  
Work / Analysis (Wednesday) Library

**0-45 minutes**  
(Time worked)

**0-10 minutes**  
Preparing the GIS  
software application  
Chizu Taro

**10-35 minutes**  
Carrying out the  
overlying → Enter it in  
the worksheet

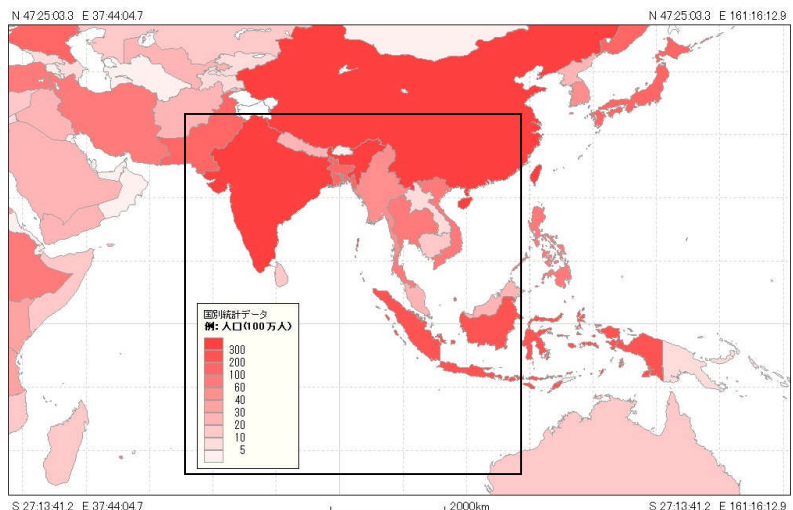
**35-45 minutes**  
Consideration and  
discussion with seeing  
the thematic maps

**Distributing the  
worksheet 3**  
Enter the result of  
consideration for  
presentation in the  
worksheet 3  
Select one or two  
themes to think of by  
group.

**Purpose:** Foster the ability to  
make use of materials such as  
GIS data or paper maps in line  
with a theme.

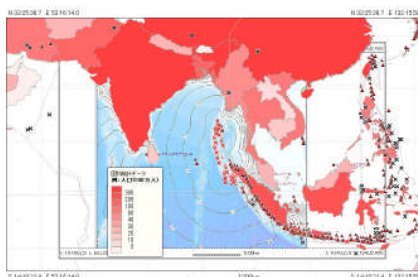


**Details of work:** By using the GIS installed on PCs, try to overlay several thematic maps indicating the state of development in the countries of areas where the earthquake and tsunami occurred on the maps indicating natural environments there. Based on it, discuss by group the relationship between those environments and themes.



### Developing the population distribution map

- GNP (GDP)
  - Infant mortality rate
  - Starvation rate (WFP)
  - Population density
- Drawing the maps above from the folder of the PCs, overlay them on the map of natural environments or the map indicating the state of damage.



If there are statistical maps of other themes for searching for the causes of the damage by the Sumatra Earthquake and Tsunamis, let students develop them. (To the next class)

**Plan for the class :** The fourth – seventh periods : Search for the causes of damage by the Sumatra earthquake and tsunamis (Thursday and Friday) Library

**The fourth period**

**Purpose :** Search for the causes of damage by the Sumatra earthquake and tsunamis. Through the development of data maps using a PC, think of the relationship with the damage caused by tsunamis.

In addition to the data maps already input in the software folder, students will collect data for the themes they have determined for themselves, input it into the GIS software to develop their own data maps.

Expected map data : Average length of life of the world, Suicide rate in the world, GDP per head

**After school**

**(The fifth period)**

(after school) Preparing the draft for presentation in the multipurpose room Using PowerPoint, the result of consideration through group discussion is organized.

→ Prepare the pictures of the maps for presentation (PowerPoint)



**The sixth – seventh periods**

**Make a presentation for about five minutes per group**

**Evaluation of learning:**

The presentation by each group is assessed by each student on a scale of one to ten (teachers assess it on a scale of one to one hundred). After the presentation, the assessed results are entered in the assessment sheet for the whole project.

**Make a presentation of the result of research and consideration in a group of four students.**

**Summary**

**Lessons learned from the Sumatra Earthquake and Tsunamis**

- Where should the fear of tsunamis be taught? It may lead to composure in our daily life.
- Construction of sea banks to protect from tsunamis – Nation building to withstand natural disasters such as tsunamis
- Call for international cooperation in rehabilitation in terms of economic assistance and ODA!
  - Education : Education for disaster prevention should be provided.
  - Society : Necessity of education for holding each person in high regard

**What can Japan do as one of the Asian countries?**

- Make use of the ODA for promoting the transfer of prevention technology (early tsunami warning system) Warning announcement system by the use of broadcasting (television and radio)
  - Invitation to Japan for training, sending technical experts, etc.

**It is necessary to defend our safety for myself also in Japan.**

- Let's make the disaster hazard map.