**00:00:00**

**Wan Zuhairi Wan Yaacob**

So, good morning. Thank you so much Professor Kotake for inviting me for this lecture, and then it is very difficult to choose the best topic for the students here because I think you are all in the engineering background and then I am more on science background which is probably slightly different. So in order to fulfill the requirements by Professor Kotake and the Kaga – Kagawa College, I would like to share with you a topic of environmental geology, environmental geoscience with the title of fundamental concepts of environments, okay. And then I tried to Google the meaning of fundamental concepts of environment, I am not sure whether it is correct or not. Is it correct?

**[Male]**

Yes.

**Wan Zuhairi Wan Yaacob**

Fundamental concepts of environment.

**[Male]**

Yeah, that's exactly translated to – to Japanese.

**Wan Zuhairi Wan Yaacob**

All right, okay. So, today before we begin, I think I have to skip – okay, I have to skip this one because I think Professor Kotake has already explained about myself, but normally, you can get my website, www.wanzuhairi.com, and then I am also on Facebook so if you – if you like to make friends with me, you can, you know, send me message to Facebook, and then I also have blog on Facebook, and then I also have blog on geo-environment as well. And then today I am going to discuss about environment, what is environment. This is not on your slide.

Actually environment is everything surrounding us, okay. For example, in this room, the desk is the environment for you, okay, and then the temperature also the environments, and then possibly there are microbes on the table that's considered as environments. So environment is everything surrounding us, whether in this class or whether you go out, you can see the trees, you can see the sun, you can see the soil, so they are all environments for us, okay. And then there is a nice problem to explain about environ - environment, okay, where it says environment it was not given to you by your parents, but it is loaned to you by your children. So, it means that in this case, we have to consider our future generations before we start developing our – our environments, okay. For example, you can see this is all related to mining. You try to extract minerals from the ground. And then, at the end, we produce a big pit, a big hole in the ground, and then we leave it to our future generations, to our children, okay, which is not good. So in this case, the environment is not belong to us. The environment is belong to our next generations, to our children, yeah.

Okay, a very textbook – a very good textbook on environmental geology or environmental science is - you can get it from Keller – Keller, E.A. 2000, and then it's already its eighth edition now, it is very, very popular text book. And then in the first chapter of the book, Keller explains about eight concepts of environmental science or environmental geology starting with the population, people, we. We are the problem for the environments. And then the first one is population growth. So that means if we have many people on this planet, we are going to have environmental problem, okay. So population growth, sustainability, how we can achieve sustainability, okay, how we – how we can develop our environment so that it is going to sustain and then there will be no problem to our next generations, so that's sustainability. And then limitation of resources, our resources are limited. Gold, you know gold, gold is limited, okay. Minerals to make car also limited and then food, probably limited, okay. So that's limitation of resources. Soil - a very good soil, fertile soil for growth of plants, of food is also limited. And then the fourth process that is discussed by Keller is called Hazardous Earth Processes.

**00:04:59**

If I mention about tsunami, probably you will know, tsunami is also part of the earth processes. It occur naturally because of the dynamic system of the earth, okay. The problem now is people stay very close to the – to the beach. So people stay to the beach, come tsunami, then there is a problem there, conflict between nature and humans, so that you have a problem there. So basically earth processes become hazardous when there are people stay in that place, okay.

Number five is systems. Earth is a systems, part of our universe. We have Planet Earth. And then on the earth we have another subsystems. We have water, we have air, we have soil, rock, and then we have plants, and then they are called hydrosphere, atmosphere, biosphere, and also lithosphere, okay. So scientists tend to categorize or tend to divide all those systems into different systems. For example, you are working with river, so river is your subsystems, okay. You are working with the lake, lake is your subsystems. So earth is our systems. And number six is uniformitarianisms, okay. This is the popular terms in geology, where uniformitarianism is you looking at the present and the present is also occur in the past, so that's uniformitarianism, the terms uniformitarianism, but for environmental geologists, we see the present, we can predict the future, so that's very important for us. We see what, anything happened in the present and then we try to predict what is going to happen in the future. So that's the meaning of uniformitarianism. And then geology as a basic environmental science, we need another expert from engineers, from – evaluated from lawyers, and then from chemists, in order to get a very holistic approach into the environmental science. And then the most important things, number eight, is our obligation to the future. We have our responsibility to our children, so that we can give something to our children for the coming generations.

Okay, this is the problem with the populations, okay, because we are going to have more people stay in a very small place, so this is the formula given by the Garrett Hardin. He is the – he was the American ecologist, and then he said that total environmental impact of population is equivalent to the product of impact per person multiplied by population. If the population is higher, then the impact will be higher. So as a result, Garrett Hardin take the suicide, he killed himself because he tried to reduce the number of people on this planet, so he killed himself in order to reduce the people on the planet. And then, yeah, if the population increase, the impact increase, and then you need more resources.

And then another problem now is like here, this is in Kuala Lumpur, so we have so many people live in Kuala Lumpur and then there – there – there is no more space on the flat ground, so people start to develop on the hilly – hilly ground, on the hill like that, okay, on the mountain like that. So people start to build a house on top of the mountain, on the hill, then they got a problem with landslide, okay. This is the problem of population growth because there are so many people they don’t have any place to stay, they stay near to the hazardous process of the – of the earth, like here, landslide has occur. So exposure of people and human structures to natural hazards. Landslide and then there are houses here and they are very risky for – for – for – for the health and for the safety and property.

Okay, this is the exponential growth of people, okay. This is what we call the population bomb. You know bomb, bomb, explosive, all right. So population start very slow, okay, at the beginning. It start very slow at the beginning and then until about 1500 to 1900, population start to increase, it's like a bomb, okay. It's starting to increase exponentially, all right.

**00:10:11**

So the amount of people live in this planet is increasing, okay, exponentially, all right. For example, population in the world is about 7 billion and then there are two countries or two states in this world that have population more than 1 billion, China and India, so they are most populous people in this world in China, in India. I think Japan is about 127 million and then Malaysia is about 29 million, so we still have some space for more population in our states. Okay, this is a nice joke from one of the cartoon in Malaysia, Lat’s, the – the author of this cartoon. So basically if you have more children, you need more money, okay, you need more money, because you need to support your children, okay. So that's - this is the impact of the high population in your area, for example. Okay, population growth.

All right, Professor Kotake already talked about pessimistic and optimistic. Pessimistic means we don’t have to do anything to control the population because the population will control by itself, okay. Optimistic means we have to do something to control the population because there are so many people, we don’t have enough food, we don’t enough – we don’t have enough space, then we got a problem with our – with our environment, okay, because earth has its own carrying capacity, okay. We have limited food, we have limited fertile soil, we have limited space, so it has carrying capacity. If you have many people, then it's going to be over the carrying capacity of the planet, then we got a problem with our – with our life, okay.

So remember, pessimistic means we don’t have to do anything, optimistic – optimistic means we need to control the populations. I give you example of pessimistic scientists. They say that – they say that we don’t need to do anything because the population will control by themselves. For example, war, okay. War can make the population decrease because many people die because of the war, so that's why we say pessimistic. Disease like AIDS, H1N1 also can kill people, so it makes the population decrease. Tsunami, in Acheh, for example, it’s about 300,000 people die, so that's the process of making the population decrease. And also earthquake in Haiti, it’s about 220,000 people died.

Okay, I will give you example, okay. This is the – the exponential growth of the people and then you can see there is a slight curve, depression, of the population line here, and this is the place where there is a plague in Europe, people get sick in Europe because of the bacteria, all right. And for – for this accidents, there were about, the plague in 1340, this is the year, 25 to 30 million died, people in Europe died because of disease, and then you can see there is decrease in population during this time from 25 to 30 million deaths. So this is example of how the populations will be controlled by itself, okay. We don’t have to do anything, by - if you saying about the pessimistic scientists. Okay, we go to the optimistic scientists in China, because they have so many people, about 3 billion in China, or 1.3 billion in China, they have population problem. They have – they don’t have enough food, they don’t have enough space to stay, they have – they don’t have enough job, then they make this policy, one family one child policy in order to control the - the people in China. So normally in China, if you marry, you need only one – you – you, the government only allow you one kids, one children or one daughter or one baby.

**00:15:00**

Okay, this is a simple question that is not in your handouts. Which group do you prefer? Optimistic or pessimistic? Optimistic meaning control your population, probably I think in Japan, you probably have one or two kids in your family, right? But this is one example, the world's biggest family. This man has 39 wives, 94 children, and 33 child - grandchildren, so this is the – this is his whole family, okay, one man only. So this is possibly pessimistic, I don’t care about the earth problem, I don’t care about the population, all right.

Now we go for sustainability, this is definition by the World Commission on Environment and Development. I will just read it, sustainable development is a form of progress that ensures human development and that - this is the – this is the most important point of this definition - meets the needs of the present without compromising the ability of future generations to meet their own needs.

So by this definitions, it means that we can develop our environment, but at the same time we need to consider our future generations, we need to consider our children, all right. If we fill - if we can – if we can fill up our car with oil, with fuel, we hope in the future, future generation can also get the same treatment, the same life as what we are experiencing at the moment, yeah. This is another definitions by Securing the Future, UK Government, also similar things, sustainable will enable all people throughout the world to satisfy their basic needs - food, clothes, car, so that's the basic needs - and enjoy a better quality of life. You enjoy your life, okay, you can go to school, you can go to shopping, you can work without compromising the quality of life of future generations. So you have to consider the future generation whatever activity that you do in this – in this environment. For us, as a geologist, we try to get the minerals form the ground, so we mine the oil, we mine the gold, but at the same time, we have to consider the future generation by taking care of their - of the environments and of the social life and other tenets of life.

Okay, to achieve sustainable development, so this - the point which is called sustainable development, and then to achieve sustainable development, you need three important factors or parameters. The first one is you have to consider about our environment, you have to consider our social activity or social life or social factors, and also you have to consider the economic factors. So in order to achieve sustainable development, any development that you are trying to plan to do must consider environments, must consider economy, and must consider social aspect. For example, a good governance – a good government, in Japan for example, that's part of the social. If you have a very good government that can give you a very nice regulation on environment, so that's the social aspect of sustainable development.

And then environment, you know environment that we stay now has the limits. We have a very limited resources, so that's considering of environment. Economic, we try to give money to all people, people can have same amount of money, so that's kind of way to achieve sustainable development. Or possibly you say whoever throw waste, you know waste, whoever throw waste to the ground, they have to pay some money. So that’s the way how you put money or economy to control the environment. So in order to achieve sustainable development, you need to have the understanding of environment, you must have a social, anything related to people, human, us, so that’s social, and then anything related to economic, money - money is economic. So if you have these three, then probably you can achieve what we call the sustainable developments, okay. Example, okay, probably that’s in your slides.

**00:20:00**

This is very simple example. You build a new office block, a building like this. A new office block is being built in your neighborhood. It uses recycle material - recycle material, employ people when it is completed. The building has been designed to use solar power, sun, so you get energy from the sun, has good insulation, so that means there is - there is no waste of energy from the buildings and then uses the minimum of water possible, water, okay. So is it very sustainable, quite sustainable, not sustainable? Which one is the answer? I think that’s on your - okay, you already knew the answer, right. Okay, so the answer is very sustainable. Why? Because the office will provide employment, people can get job because they are building a new structure, help in economics and social sustainability because you give money to people, you give job to people. Building the offices will use up natural resources, but it does contain recycled materials so you build a wall using recycled materials, the roof also from recycled materials, have a good insulation, no wasting of energy, and use solar power as your main power for your - this is what we call very sustainable.

This is not sustainable, I give you the answer straightaway, this is not sustainable because the organic farming use chemicals, pesticides, chemical fertilizers, and then she produces less and so sells her - okay, in this case, she grows vegetables but using organic method, no chemical use, all right, but the problem now is the product is very, very limited, the fruit is very, very limited and so expensive. You have to pay more in order to get the food, so that’s no sustainable, although it's very good because it does not contain pesticide and chemical fertilizers, but still not sustainable because it is very, very expensive to get the food because it's organic and then it's very, very costly in order to grow plants, vegetables, in the organic way yeah, so that's another example of not sustainable case.

Okay, number three, limitation of resources. This is very, very important for us because our resources are limited. There is a fixed amount of the resources that we have at the moments. Okay, the earth is indeed the only place to live, we only have our planet to stay, we stay on the planet earth, although there is a new saying that we are going to explore Mars, okay. There are going to be a tourist in Mars, somebody will take a jet, a shuttle jet here - from here, from earth to Mars in order to see what is in Mars, okay. So, but forget about Mars, we only have earth to stay, okay. And then our resources are limited because we have limited oil, we have limited gas, wood, and also minerals, so they are all limited resources. So there are two opinions or views – views about our resources. The first one said there is no resource crises, we don’t have to worry about resource, okay. Finding resources is not so much a problem as is finding ways to use them, i.e., easy to find new resources, so this group of people say there is no resource crisis, we don’t have to worry about resource crisis. The second people, the second group of people say that we are in a resource crisis, we got a problem with our resources, we need to do something about our resources.

Okay, how to control the resource. Because there is no resource crisis, we can - he said that - they said that we can use the materials efficiently and intelligently.

**00:25:01**

So we can use the resources in a better way, okay. So that's by using new technology to save fuel, you can make a car more lighter so that you can put less petrol in the car. You can also use solar power to move your car, then we don’t have any problem with the resources, so that’s the opinion. You can use some less or lightweight material to build a car, okay. Probably you can make a car from plastic, all right, which is more lighter, okay. And then you can extract more minerals because you know about technology, okay. With technology, you can get many minerals which is very difficult to get in the ground. So we know more about extracting minerals than we did in the past. Now you have technology, you have computers, you have seismic technology, then you can find new material very, very, very fast. So find new resources faster and then you can mining lower grade of minerals. So although the minerals content is very, very small, but you can still mine the minerals.

Recycling also another process that can increase the – the resource, okay, rec - recycle the materials. The – the resource crisis occur for the second group of people because they say that the resource crisis occur because the exponential growth of people. When there are so many people on the planet, then you have a problem of resource crisis because of the overpopulation. Why overpopulation? Because there are so many doctors in this planet, okay, medical technology. So you have advanced medical technology, many people can survive any sickness, any virus, bacteria, then that will induce the overpopulation. When the population increase, you got a problem with your resource. And then most of the products, this is what we call obsolescence - most of the products that are designed by the engineers are designed not to last long. For example, this computer, you buy a new computer, how many years you can use this computer, about 5 years. After 5 years, you have to throw this into the garbage tank or something like that, so you have to throw it away. So it will increase the – the use of resource. You buy a car, a very big car, you – you probably can use it about 6 or 7 years, after that, you scrap the car, buy a new one. So this is what we call designed not to last long or obsolescence and then we already know that minerals are finite. There is a limit for the minerals. Once you finish the minerals, when you finish mining all the minerals, then it's all gone, okay. You need to wait for thousand years or million years to get the same minerals in that particular place.

So what - what can you do to solve? This is the solution for resource crisis, explorations. You need to go to the sea, to the mountain, in order to get more minerals, exploration, okay, find more minerals. Or you can recycle. This is, for example, PET bottles that can be recycled to produce probably a better things for people, yeah. So recycle or you - you reuse the material. Waste less, don’t waste your minerals, okay. Use less, you use less minerals in your product. You make a car with less mineral in the car, all right. So that's use less. Alternative energy source, you can use solar power, you can probably use hydrogen from water so probably in the future, in order to move a car, you just put water inside, because there is technology that can extract hydrogen from water, so hydrogen can be used to start the car or to – to move the car, all right. And then the last option is wait for another million years in order to get another mineral, okay. So that’s very stupid things to do, you don’t have time to wait another million years in order to get the natural resources.

Okay, this is the cartoon that was drawn by High Moon. You know who is High Moon, all right? He is a sensei – he is a sensei from Kyoto University. He is a professor in mechanical engineering and then he used to draw many cartoons that teach people about our environments, okay. In this case, he says that the very latest all-plastic automobile, okay, because we don’t have metals, we don’t have aluminum to make car, then we can make a car using plastic, for example, yeah.

**00:30:08**

So, this is a very nice person High Moon, yeah, professor from Kyoto University. And then this is also the way how we can recycle our products, this is in Japan, okay, where you can collect all these things from the industry and then the industry will pay you some money in order to get this dispose, and then you smelt - this company smelt these things and then try to get mineral resources from here. So the company get two income; the first one because the – the industry will give you some money to dispose this material and then from this material you can get this material, which is zinc, mineral from this waste, and then the purity is about 99.995% purity. So the company can get money by accepting this waste from the company and then by selling the – the valuable minerals from this waste. You can get copper, you can get gold from this kind of material or waste products.

This is how we can get gold from waste materials, okay, from resources, from the old computer, inside the computer there are so many boards or components parts, and then some of it made of gold, this is gold component in a computer, so you could – you could smelt this material, you can produce gold. Or you can do the old style of mining, go to the ground, make a big hole in the ground, take some ore that contain a little gold, then you produce this gold, same things, but this is very useful. If you do this, recycle your components, then you didn’t have problem with your natural resources. I will give you example, all right.

In order to get, for example, in – in order to mine the gold, all right, in order to mine the gold is like getting two grains of gold from this ton of sand. So you only get gold, two grains of gold, and then this is your waste, you throw it away, and then you produce something like this in the ground, all right, because you need only two grains of gold in one ton of material, so the rest will go to the environments, you throw it away, you get only these two grains of gold, yeah, so this is how - can you imagine how much waste is produced by the old style of mining, yeah, so that's the example of mining.

Okay, the last one would be hazardous earth processes. I think Japan is located on the plate boundaries, very active plate boundaries, which is considered as very active in the – in this world, like, for example, Indonesia as well. They are also familiar with the tsunami, earthquake, landslide, okay. So earth processes is normally hazardous to people, we got a problem with the hazardous material or with the hazardous processes. For example, like floodings, earthquakes, volcanic, landslides, and also mudflows, and the task of the scientists, of the engineers is to recognize where is the problem and then try to avoid people from staying there, okay, and then we try to reduce the threat to human life and also the property.

So in this case, there is a conflict between – oh, that's in my template, the adhan, prayer time, all right. So – so to reduce the - to reduce the impact to human life and property, we have to study about all these things, okay, and then the most important things, there is a conflict between people and natural resources - and then hazardous earth processes. For example, earthquakes. Earthquake occur in the past where people probably not stay in this country, for example, so there is the earthquake, and then when people come to stay here, you got a problem with you and the earthquake, but you have to do something about it. Probably the scientist say, don’t stay here, this is very dangerous area, stay in another area, all right. Probably the scientist say never stay in the coastal area because it's flat, if tsunami comes, you got a problem, or probably they build a wall, okay, but the wall is not enough in order to prevent the wave from coming.

**00:35:04**

This is the way how we try to communicate with the – with the hazardous earth processes. Whether you like it or you don’t like it, hazardous material or hazardous earth processes will still occur and then we have to adapt our life with the earth processes. And then this is the type of - different types of hazardous events, we have natural, we have mixed, and then we have technology. This is purely natural, from earthquake, volcanic eruptions, subsidence, floods, landslides, natural, purely natural, all right, without human contributions. This is mixed, this is natural hazardous events or natural processes with some influence of human actions. We make that events to occur. For example, small earthquakes in a region of below ground disposal liquid wastes, landslides in developed areas, river floods in developed areas. This is the example of where human and nature produce that kind of problems. And then this is only generated by human, we create that problem, okay. Technology, example, subsidence in subsurface mines, you build a dam and then the – the dam is failure, it fails, then you got a problem with it, and then nuclear power plants and also war, right.

So, as I mentioned just now, we got a problem with the nature because there is a conflict between human and nature, but, for example, in Indonesia, there is a big volcano mountain where there are so many people stay here. Why people are staying next - next to the volcanic events - next to the volcanic mountain? Because of overpopulation. So many people, they don’t have food, so they need more food and then they need more space, lands to grow their plants, then they start develop this area. So there is a conflict between people and also the volcanic eruptions, all right. Whose fault? We, human, or the volcanic? So, I think the problem now is with us because we don’t have enough space to stay, so people start to go to the – to the – to the – to this area.

So, the most important duty for earth scientists and engineers is to identify the problem. Everybody know that this is very dangerous, don’t go near it, all right, don’t stay near the mountain, very, very dangerous. Identify the potential hazardous processes, make info available to planners/decision makers by communicate to them and also try to avoid that place in order to avoid any mishaps, any problems with that kind of hazardous earth pro – earth processes. Okay, this is example of another case study or case study where scientists and public meet to talk. This is in Italy where about seven Italian scientists, all right, they are seismologists, this is scientist who are study about – about earthquake, all right, earthquake, and then they got a problem with the earthquake that occur in April 2009 with a magnitude of 6.3 that killed 300 people, and then the government tried to bring the seismologists, people who study earthquake, to the court because they failed to predict the earthquake, all right. They failed to predict the earthquake and then they are brought to – they were brought to the court and then they are going to be sued and then they are going to end up in a prison, jail, because they failed to predict the earthquake.

This is how we, scientists, and the public need to talk and then probably it is very, very difficult to predict the earthquake because nowadays there is no technology that can predict the earthquake. And then latest news that I heard in the news saying that these seismologists will be freed because there is no technology that can be used to predict earthquake. What is – what was occurred in Italy is not part of their faults because - yeah, you cannot – you – you cannot predict earthquake and then this is al – this has already happened, all right, this happens sometimes. You don’t have to – you don’t – you don’t – you don’t – you don’t – you don’t have to be very afraid to predict the earthquake and then this way there is no technology that can be used to predict the earthquake in this case, yeah.

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So this is example of people, scientists, and then government need to have a very good interactions, communication because we don’t need anything like this to happen, earthquake, then people start blaming the scientists, the engineers. If the building collapse, the engineers will get the blame or something like that, yeah. So we need a very good communication between all those three people or stakeholders. And then this is another example building or house on the faults, okay, so this is the fault line and then they build a house here, then after the earthquake, this occur, and then this house got problem here.

And then this is another example in New Zealand where this is the fault line, a big fault line, and then they put a prime minister house next to the fault line, all right. This is example of we fail to - as a scientist or probably engineers, we fail to identify where is the potential hazard sites, all right. For example, this is the fault line, we already - we failed to recognize the potential area of this event, then you build a house here. This is a major fault lines and then you built prime minister house next to the fault line, all right. This is how you fail to predict or fail to identify the source of hazardous earth processes in your particular area, yeah.

You know what is faults? What is fault, you know faults? No, faults? When – when the earth move, so it will move along the fault line. When it move, it will vibrate, because when it move, it will release the energy, the seismic energy, then you have earthquake. So earthquake is pro- produced along this lines, okay. We call it fault, all right. So in order to predict earthquake, try to locate the fault lines, okay. Although we know that we got a problem with the earth processes, sometimes earth processes can bring so many things to us, all right. This is example in Merapi, if you got money, if you got time, you can go to Merapi, very nice place there. Professor Kotake probably have been there. So, I have been there once, very, very good place, all right. You see here, this is a very big mountain with gas coming out from the vents, this is a volcanic mountains, very active, and then you see the area is very, very good for agriculture, because the material that is produced by this event will produce a very good soil and that is good for agriculture and then the best fruit in this area is called salak pondoh, this kind of fruit, very sweet, very juicy, and then very popular. If you go to Indonesia around Merapi, ask for this fruit, salak pondoh, okay, very nice because of the land, because of the soil which is suitable to grow this kind of fruits. It is also good for tourisms. Probably this is a Japanese tourist who probably go there, tourism, and then also you have very nice scenery of – of - of golf course or something like that in that earthquake area.

Okay, we are on time, 12, so as a conclusions, number one, population growth, all right. And then population growth is considered as number one population - number one environmental problem. So that's why can I put population, people, as number one, because people always create the environmental problems, all right, so number one is population growth. Number two is we need to care about our future generations. We can develop, but at the same time, we have to consider our future generations. So development that meets the needs of the present and also the future generations, that's sustainability. Then we know that our resources are limited, limitation of resources, and then we need to use our resources wisely, intelligently, and then we have to keep it for our next generation as well. And then hazardous earth processes. We cannot avoid natural earth processes because they are naturally occur, but we can recognize, we can identify the location of the hazards, probably we don’t have or we need to prevent people from staying next to these hazardous processes.

**00:45:03**

Earth processes cannot be avoided, but the hazards can be minimized and also can be controlled, so we can minimize the people from getting near to the hazardous earth processes, and then we can control the – the death, the property damage to the houses when these hazardous earth processes occur in the future.

Okay, this is another - this is a photo of how Indonesian people try to calm this mountain because they believe that this mountain has a spirit - you know spirit, ghost, okay. What is ghost in Japanese?

**[Male]**

Obake, Yurei.

**Wan Zuhairi Wan Yaacob**

Yurei.

**[Male]**

Well…

**Wan Zuhairi Wan Yaacob**

The spirits.

**[Male]**

Yeah, the spirit of the dead people?

**Wan Zuhairi Wan Yaacob**

Dead – no, the – the spirit that taking care of this mountain, it's a big spirit, all right.

**[Male]**

Thank you.

**Wan Zuhairi Wan Yaacob**

So in order to avoid this volcano from eruption, they try to - you see here, this is a model of volcanic eruptions or volcanic mountain, and then they put money here, they give money to the – to the spirit and then they put all different kind of vegetables in order to make the spirit happy, then there will be no explosions of the Merapi mountain. This is only a belief of the people that live near the Merapi, okay. So another way to tame the Merapi volcanic eruption in Indonesia, we submit those, so this is only traditional way how they control the volcanic eruption.

So I think that's it, my lecture for – for today, and then we are going to wait for my second lecture in risk assessment, and then hopefully you understand what I am lecturing here, and then if you got any problem, then we can start discussing about this and Professor Kotake who probably can – can help me to translate or to – to – to brief about what I already explained in my lecture. So with that, thank you so much Professor Kotake and then thank you so much for all of you for – for – for listening to my lecture. Thank you very much.

**[Male]**

Thank you very much.

**END**