

CLIMATE CHANGE IN THE 21ST CENTURY

***Future Prospects of the “Health”
of our Planet and Mankind***

Venice, St. Elena - 19th may 2007

ENGLISH

ABRAMI Antonino

We can start the proceedings of this important conference. And considering that we are a little bit late, I would suggest to give the floor to Mayor Cacciari and then I will introduce this very important topic. Please.

CACCIARI Massimo

I apologize for the delay. We, as administration of Venice, supported this conference and we thank Mr Abrami for the exceptional organisation, because we believe that it is not only important, but it is particularly significant for Venice, because it is one of the most exposed cities, venues all over the world to this threat.

A threat that is chiefly caused by climate changes, which will be much influenced by our model of development by the way in which we deal with earth, because we believe that the resources cannot be exhausted, but this is not really true or, at least we believe in the (*incomprehensible*) of all, but probably it is not, even though mankind believes it is so.

People believe that the earth is always at our disposal, that it is the eternal source of resources. This is the conviction that has always been believed in and indeed there are also scientific reasons for supporting this kind of relation to the earth.

We believe that we will always be able to find natural resources for our infinite development. Actually I don't have a clear answer to these questions. I would like to share my experience with you, my experience as a Mayor.

On the occasion of a conference on the development of the national airport systems, and in particular of the local airport system, it was taken for granted that over the next ten years the large airplanes will increase from one thousand to three thousands and five hundreds and also light jets will be produced and they will be produced together with Microsoft. And their technology will be so refined that all those that can afford a Ferrari or a Maserati, will also be able to afford a very light jet. And therefore it will be necessary to build a new airport.

The obvious model for experts will be that of using private airplanes like now we use private cars. This is considered a sort of natural and physiological development and I believe that this way of thinking is applied to all sectors now.

Therefore today's conference should enable us to become more responsible, in particular as local authorities and local lawmakers, to discuss, to put into question this deterministic approach to eternal development that will last forever and will be based on the exploitation of natural resources.

We need to be able to understand the state of the art of scientific research and development and discoveries. We also need to better understand climate change and also the rise of the sea

level. And then we have to identify realistic and reasonable policies to tackle or to face this idea to exploit the earth as we like.

I believe that this conference will help us answer to these questions and in the afternoon I'll try and explain the impact on Venice of such changes and I will also explain what the local authorities and the Italian government are now trying to face with this phenomenon. Thank you.

ABRAMI Antonino

Thank you to Mayor Cacciari. And before explaining the reasons for the purposes of this conference, I will now read a few words of greeting of Giancarlo Conta:

"Welcome to all those who accepted the invitation of this Academy of Environmental Sciences to take part in the workshop on Climate Change in the Twenty-first century. And I'm really sorry not to be able to take part in this important event, however I would like to ensure you that I fully support the activities and the spirit of this Academy and I've often appreciated its contribution to the local authorities in Venice. Therefore I will foster and accompany this effort to improve the situation of the future generations on the earth. We believe that the atmosphere and the planet has already shown great signs of sufferance. The signals we are receiving are unequivocal, because the planet is

undergoing big changes and I believe that this phase of change now has to be approached in a very clear and scientific way.

We need to assess the real causes of the changes that are involved with the climate and it is fundamental to understand the extent of the influence of the anthropogenic activities and after assessing and identifying the causes we need to identify the directions to follow with our decisions and these decisions will have to be based on scientific data.

And then we will have to be supported at political level and also by the citizens. Because if the citizens are aware of the possible problems at stake, they will also make their contribution. I don't want to improve the alarm that has already been launched by the press and I would like to avoid or prevent general panic that doesn't help to face problems. Our scientists who are working in this Academy will certainly guarantee the attainment of the goals that will be set at this conference.

I wish you great success to the proceedings in this conference".

So Mr. Conta was talking about the scientists: certainly we are based on scientific data, but we are also connected to other continents and therefore I would like to explain that the organisation of the video conference is structured so that there will be first a scientific presentation that will involve the use of the public.

Then there will be a chairman and a series of speakers. We will also hand out the abstracts of their presentations, and after this part of the conference, there will be a second part concerning the "what to do in the future". We will have to see what are the problems now affecting the planet and we will have to see the timetable of the impact that already occurred and we will also see the impact on human health.

Then we will move to the last part, which is probably the most expected, not less than the first one. We will see how politicians and how lawmakers will decide what to do and we will have to consider forecasts that are not really very optimistic.

Mayor Cacciari was talking about our environmental heritage and now I would like to recall what the Romans said when talking about the environment. They used to say that these are things belonging to everybody that must be protected by everybody. Now we will have to make a qualitative leap, that is society will have to consider both the economic aspect and also the effect on people.

I would like to recall the first conference that was held in 2003 and that was organised by our Academy and at that time the Nobel prize - who is also present here – Dr Carlo Rubbia and I welcome him and thank him for his commitment. At that time he talked about Gabriel Garcia Marquez who was a friend of his. Mr Marquez had told him a small story that also concerns what we are going to discuss. Gabriel Garcia Marquez talked about an

important scientist who was working together with other scientists on a very important project and suddenly his small child said: "Dad, I would like to help you". "Well, you can't, because I'm working now and I don't have time for you". "But I can help you, dad". And the scientist took an image of the earth and cut it in small pieces and then he gave to the small child and said: "This is a puzzle, so just make it". And after a few minutes the child came back and the puzzle was already done. He said: "This is impossible, you must have made some mistakes". "No, I didn't". And it was perfectly done. "And how did you succeed in it?" "Well, actually, you gave me this sheet, but on the back of it there was an image of a man and I simply reconstructed that image". So this is a football fault.

So we can start the first round table: "Climate Change Prediction and Sea Level Rise".

The first speaker is Paolo Pirazzoli. Now is ten o'clock. Actually it had been forecast to start at 9.40 with Filippo Giorgi. We will now try to make up for lost time. Of course everybody will cooperate to make our proceedings smooth and rapid. Thank you.

Actually there is also a video, the introductory video. This is taken for granted.

VIDEO

Between 1997 and 1998 the greenhouse gas emissions increased by 80 per cent. Carbon dioxide almost tripled. CO₂, cars, industries, pesticides.

[N.o.t.: the visuals continue...]

Energy consumption. [...] Temperature of the earth is rising at a very high speed, thus leading to the melting of the glaciers. Oceans are heating, are increasing their temperature, thus leading to hurricanes that are increasingly violent.

This is a list of hurricanes. Katrina hit the coast of Louisiana on the 29th August 2005, it became stronger and stronger because of the high temperatures.

[...] As to rainfalls, thousands of casualties and two hundred and fifty billion dollars of damage, floods are one of the most serious problems also for Europe.

During the period of 1980 and 2002, floods were more frequent in France, Italy, the United Kingdom. The rise of the average sea level is speeding up. The population that live on the coastal area are at risk. The destiny of Shanghai, Calcutta, New York and Venice is perhaps being flooded in the future. In the case of Venice, the typical lagoon forms are bound to disappear, while the sea bed will in general become flatter.

In the lagoon the sea level will reach eighty centimetres in 2100. This panel is made up of two hundred and fifty scientists and it has foreseen that the emission of greenhouse gasses will

continue to grow in the future. We cannot prevent climatic change, but we can reduce its impact. We are facing one of the most serious challenges for the Twenty-first century.

ABRAMI Antonino

I thank Federica. She has prepared an extraordinary video and I also thank professor Giorgi for his patience, for he has supported us together with professor Canziani, from Argentina.

We are a small association, but we have tried to...simply to list a number of facts that are scientifically verifiable. Everything has been tested by ICCP.

We can now start – I think – with the round table. I would leave the chair to Antonio Lopez and professor Pirazzoli.

First Round Table:
**CLIMATE CHANGE PREDICTION AND SEA
LEVEL RISE**

PIRAZZOLI Paolo

Good morning. Before starting, I would ask the speakers to limit their contributions to ten minutes, if possible. The floor to professor Giorgi, "Climatic change from facts to forecasts".

GIORGIO Filippo

I would like to start with a summary of the fundamental results of the last ICCP report that we have seen in the opening video. The evidence about climatic change, the problems caused by human activity or natural phenomena, as well as the possible future scenarios for climatic change.

First slide.

It describes the greenhouse effect in a few words. The earth receives radiation from the sun, it is heated and the emission of greenhouse gasses and water absorb the radiations and the atmosphere is heated. Normally it is maintained at a temperature that enables us to live, but with the increase in these greenhouse gasses, the greenhouse effect increases and the heating increases.

These are some slides on the increase in carbon dioxide in the last one thousand, two thousand years. You see a list of gasses.

Over the last six hundred and fifty thousand years, looking at the six hundred and fifty thousand years we can see that now the concentration of carbon dioxide has dramatically increased and this is something that we should be concerned about.

Next slide.

Carbon dioxide has this overheating effect for the atmosphere, radioactive forcing we define it. It is an overheating effect. There are other factors that can have some effects on the heating or the cooling of the atmosphere. Aerosol, for example.

You see the total anthropogenic effect and the small arrow in the upper part. You see the anthropogenic contribution to greenhouse gasses, human activity and the contribution of sunlight in the last two hundred and fifty years. You see that the heating of the atmosphere, due to anthropic activities, is much higher than the natural part.

Second slide.

This is evidence about climatic change. This is the factual part of the ICCP report. We are in a global overheating trend for the atmosphere. There are a number of evidences. This is the trend for surface temperature, from the beginning of the industrial revolution you see that there are two periods in which heating raised more.

The first was in the 1940s and then after in the 1970s. The trend for the last one hundred years is of about 0.74 degrees centigrade, 0.2 degrees centigrade on average and we see that

for the last fifty years the heating is speeding up 1.38 degrees for one hundred years. Over the last twenty-five years the speed up or the process is even more remarkable: 1.28 turns to 0.17 in the last twenty-five years.

Over the last twelve years, we have the eleven hottest years, since we started surveys about heating.

We see here that the heating is not uniform in the world, but it varies from point to point. Where a point is where heating is higher. In Europe, in the Mediterranean, the heating process is much more relevant than in other areas of the world. These are the hot spots for global warming changes and climatic changes in general. There are many other evidences.

All glaciers, almost all glaciers over the last twenty-five years are reducing their sizes. You see the Alps. There is a rise in sea level. We have some surveys, some measurements made by the satellite that provide evidence of the fact that sea level has risen over the last five hundred years. There is a reduction in the snow covering of the world and there is a strong reduction in sea ice.

So there is a lot of evidence that shows that there is actually a global heating process. Is it due to human activity or to natural activity? The IPCC maintains that it is probably due to human activities with a certainty that ranges from ninety to ninety-five per cent. But this is only true for the last twenty-five years. The last fifty years can clearly be linked to human activities.

How can we identify this anthropic action? This slide shows the human effects, the human factors and greenhouse gasses, aerosols, changes on the surface, deforestation and natural factors, like volcanic activity, variation in the sun radiation activity and there is a certain natural variability.

This slide describes some models. I will skip it.

And then we can..., in order to identify the anthropogenic influence, we can accompany climatic models with both natural and anthropogenic models. We simulate some climatic changes and we try to analyse which factors can reproduce the analysed effects.

You see two curves, two panels. The right curve – the red and black curve and the blue and black curve. The first relates to temperature increase, the blue line refers to a simulation with more than twenty global models, only referring to natural models. The orange curve shows what happens if we had the anthropogenic forcing the increase of greenhouse gasses.

You see that the heating over the last fifty years can only be explained, if we include in our models the production of greenhouse gasses. We are not only analysing temperature, we are also considering other variables, other factors, that are some statistic estimates.

But we can say that it is only by adding the anthropogenic action that we can get to the current results. So we can almost certainly

say that the heating is due to the increase in greenhouse gasses. Let us look at the future. What can we expect for the future? Our forecasts, our projections, I'm not talking about forecasts, because these projections are something different from weather forecasts. We cannot forecast weather in five days. How can we forecast what the weather will be like in a hundred years? But I will discuss this later on.

Climatic change is based on emission scenarios. Scenarios that were developed by IPCC in 2000, based on a number of different possibilities on social and human development. We see different scenarios, A and B. A scenarios are extreme scenarios, B scenarios are more optimistic in nature. Let's just take these scenarios, these possible scenarios for carbon dioxide, we include that in our climatic models and we have the projections.

This summarizes what we expect for the future. It is somewhat complex, but the bottom line, the fundamental message is in 2007 we have calculated a possible range of heating from one degree to approximately six degrees. It is a wide range.

Why is there this high level of uncertainty? It is partially due to scenarios: the lowest value depends on more optimistic scenarios, and this counts for half the uncertainty level we have. And the second half of the uncertainty is due to the type of models we are using, but the prospects are quite different. One thing is having a change of one degree, another thing is having a change of six degrees. As regards sea level rise, our estimates

range from twenty to sixty centimetres. We have updated the estimates on the third report from ten to eighty centimetres. The most likely value has remained the same, but the extremes have changed.

Other changes we are expecting. I would like to confirm what was stated by the introductory video. An increase not only in the number of storms, but an increase in their intensity. We are expecting storms, tropical and extra-tropical storms, that will be much more intense. We also expect an increase in heat waves and above all an increase in droughts. But also the possibility of an increase in the number of floods. So both droughts and floods might increase, because the model are telling us that it rains less, but when it rains, it rains more intensively, because of the higher level of water vapour in the air.

This is the last but one slide we have.

It shows how climatic changes are distributed from a geographical point of view. There is a change of temperature on the left and a change in rainfalls on the right. In the circle I have marked the Mediterranean area. Look at the left, in the upper plot we have the boreal winter. In the bottom plot we have the boreal summer, our summer. For the Mediterranean area we expect very very hot summers. You see that the colour is much darker on the Mediterranean area, so we can expect the famous summer of 2003. Something terrible. Our models are telling us that this type of summer will be more and more frequent.

On the other side you see the summertime colours are not much better. We have a reduction in rainfalls. With this overheating during spring and summer we expect a great reduction in rainfalls. I will summarize therefore by saying that we expect a drying of this area and a trend to a possible desertification.

This is the last slide.

The main uncertainties. There are two great uncertainties: the first is about scenarios for the future. We do not know how our societies will evolve, politicians should support us. But the other uncertainty concerns climate. The major problems relate to clouds in these models and the atmospheric aerosols. Another uncertainty about the carbon cycles – professor Ferrara will tell us about this – and the change in land use, surface land use, when we irrigate, when we deforest the area, we have not considered these processes, but this might change projections, especially on a regional level.

Thank you, thank you for your attention and if you have questions, I'm here to answer.

PIRAZZOLI Paolo

Thank you to Mr. Giorgi. Actually it took you fifteen minutes, so there is no time for questions and I'll give the floor to Vincenzo Ferrara "Climate changes: international mitigation and adaptation strategies".

FERRARA Vincenzo

Well, before talking about the strategies I have three short messages, which are connected to what Filippo Giorgi said.

The first one concerns carbon. Over the last two hundred and fifty years, we emitted in the atmosphere one thousand four hundred billion tons of CO₂ and 57% of it was absorbed by the biosphere and the oceans and a 43% remained in the atmosphere and accumulated. And what accumulated in the atmosphere made the accumulation to increase by 30% from two hundred and eighty to three hundred and eighty ppm.

And what is the message sent by the ICCP? And of course it is also linked to the increase in temperature. The message is that over the last two hundred and fifty years, we made the same progress that the planet...it took three hundred and fifty million years to the planet.

Three hundred and fifty million years ago, the CO₂ concentration was two thousand ppm, and it increased only one million years ago. So the natural biological processes transformed this organic material that went underground and then the atmosphere - when it was clean - allowed the development of life and human beings on the earth. And therefore all what was put into the earth by the planet and turned into organic fossil material, that is fossil fuels. We then used these materials and we emitted them back into the atmosphere and this took just a few years. This is the first message.

Second message. The present situation is unprecedented in the history of mankind. When homo erectus appeared about one million years ago and then turned into the homo erectus etc. and about ten thousand years ago, man became the modern man. But the increase of CO₂ and the increase to one hundred and eighty ppm never occurred. In the Antarctic it was now like that. But this didn't occur until one million years ago and there is also scientific evidence to support it. And this didn't occur also recently, so we have to wait the last fifty years to have this, very high value. And this shows that this value is the highest value that has ever been measured since man is on the earth.

Third message. The scientists of ICCP do not stress climate change, because the earth is subject to climate change anyway. But this takes...usually twenty thousand to a hundred thousand years and there are different natural factors that can contribute to it.

The main preoccupation is the speed of this climate changes and their acceleration. Mr. Giorgi showed linear models in which causes and effects are sometimes by equation, but if the changes are so rapid probably this kind of model cannot be applied, because they are no longer linear and they become unpredictable.

Therefore we have to keep the increase in temperature so low that they can be considered a sort of disruption that can be

assimilated to linear processes and so models can be applied as still valid.

The last message is launched by the UN and the UN faced climate change from the point of view of risk, not from the practical increase in degrees, but the UN said that if climate change becomes a risk for mankind, then we have to face this risk at global level and we have to tackle it, as we tackle all other risks.

Next slide, please. Next, again. Since we don't have much time, I will just skip most of them.

The UN then is basing its action on the mitigation strategy of climate change and then it also has to tackle the downstream risks, so to speak, and the causes or the damage caused by such risk and this is the adaptation strategy. The mitigation strategy actually means preventing the causes of climate change produced by human activity, reducing emissions. While the adaptation strategy means reducing the vulnerability of social, economic situation to adapt to the situation.

The first one must be an international strategy, because all countries have to reduce emissions to be effective and the strategy concerns mainly the sector of energy, because energy and energy production is the main source of emissions, because energy is also produced by fossil fuels.

And the first example of mitigation strategy is the Kyoto Protocol. The Kyoto Protocol talks about differentiated but common

responsibilities and this means that these countries have to show a good example by reducing emissions by five per cent.

So we are all responsible for the problems caused to the planet, but of course industrialised countries have made the biggest contribution, because they began first.

Unfortunately this good example was not given by industrialised countries, because the United States and Australia didn't respect their commitment and also Italy said that it wanted to reduce by six per cent, but it increased by thirteen per cent. And now we will have to reduce emissions by twenty per cent by 2012 and this is of course a daunting task. And other countries didn't keep by their commitment.

Northern countries were more virtuous, other countries were less virtuous and by 2012 we have to involve also other countries. And for example China says that if you are not able to reduce emissions, why should we do it? So there are also problems of equity and ethical problems.

Now I would like to concentrate on the adaptation ...

(N.d.t. The speaker is not talking into the microphone)

...because the (*incomprehensible*) can absorb no more than eleven billion tons a year too, but... and this ability to absorb is decreasing, because oceans are absorbing less and even oceans are emitting gasses. Even vegetation is less able to absorb CO₂ and indeed they are emitting more CO₂ now. And therefore the

absorption system is becoming less efficient. Ten to eleven tons of CO₂ are absorbed.

And even if we were able to suddenly cut all emissions, seventy years would then be necessary to absorb the excess CO₂ in the atmosphere. This means that climate change will continue over the next seventy years and therefore the adaptation strategy is as important as the mitigation one and the two strategies must be complementary.

And Italy also has to carry out its adaptation strategy. Well, it is considered a second-rang strategy, but it is not so and some countries like the United Kingdom and Germany are already equipped to carry it out.

You can skip the next slide, please. Please, next one.

The Ministry of the Environment decided to convene a national conference on climate and it will be hosted by FAL in Rome in September, 12th and 13th of September. And the subject is the changing climate in Italy and what will these changes be like in the future. And that is more or less what Filippo Giorgi made for the Mediterranean.

So what is the impact of climate change in Italy and what is the vulnerability of the Italian territory to such changes? How can we reduce our vulnerability and what are the possibilities of adaptation?

Please, next one. And next one, please. Next one. Next one.

Italy has some vulnerability points that have already been identified and they will be discussed in the specific workshops. First of all the melting of glaciers in the Alps. Glaciers are melting with a rhythm of one per cent each year. And this also causes shortages of water, not only for the basins for the production of hydroelectric energy, but also reduction of water resources in Padania plain for irrigation, industrial usage as well as drinkable water.

And extreme weather events are also increasing and this of course has consequences on underground water, therefore on agriculture, on infrastructures, etc.

And a further workshop will deal with desertification, because it is increasing in Italy, not only in southern Italy, but also in the Northern regions.

And again there is a problem of shortage of water resources, there is also a problem of the costal areas, because the sea level rise at global level ranges from twenty to fifty-eight, where in the Mediterranean is between twenty and thirty. And this is due to thermal expansion. For each degree of increase in temperature, sea level rise increases by 11.1 centimetres.

Then there is the increase of water due to the melting of the glaciers and so on and so forth. So the problem of sea level rise concerns completely different areas.

PIRAZZOLI Paolo

I'm sorry, but your time is over.

FERRARA Vincenzo

So the conference will try and will take stock of all these data and decide how to protect the Italian territory – the soil and water resources – and this in cooperation with the mitigation and adaptation strategies that are important at international level.

Thank you.

ABRAMI Antonino

I would invite the chairman to be very strict, as we have a number of connections with Argentina and this will require speakers from Argentina to wake up very early in the morning, so I invite the speakers and the chairman to stick to their time limits, so as to allow the public...the audience to intervene and make questions.

The floor now to Simone Orlandini.

Unidentified speaker

I have a comment. Some of the audience from the floor is objecting to the fact that there is no discussion. If the speaker exceeds his time limit, you shouldn't cut the discussion anyway.

PIRAZZOLI Paolo

I totally agree with you. So let us reduce the number of the contributions. So let us reduce the duration of each contribution by half. And the time we spare we might use it for a round table at the end. Professor Simone Orlandini: "Bioclimatology, agriculture and environment". We should have a video connection with him.

ORLANDINI Simone

Good morning to you all. I can hear my voice.

I hope you will see the slides. I will be brief as possible to stick to the time limits.

The objective of this report is providing a framework of the role of agriculture in the problems you are discussing. Can you see the slides?

First slide.

I can also start my contribution.

Next slide.

Agriculture, the agricultural activity started thousands of years ago and this activity used to be in a balance with the environment. The problem started to emerge when agricultural activities were modernized. The automation of agriculture started and the production of agricultural products increased to satisfy the demand for agricultural products. And the effects of this change were the impoverishment of the soil, the increase in the use of water and in the use of fossil fuels, as well as problems due to the

reduction in organic content in the soils and the subsequent emission of CO₂ in the atmosphere.

So we can say that, because of this, we had some changes in the type of crops that were adopted in the different areas, depending on economic factors and this was particularly through Europe, because of the contributions provided by the European Union, the European community to the different crops, without keeping into account the need for a balance with the environment at large.

Another fundamental aspect was water consumption. You see here some figures. You can see the role of Italy in water consumption, accompanied by other countries of the Mediterranean area. Spain, Portugal, Greece that use incredibly large quantities of water, if compared with general availability.

And then we have pesticides. The use of pesticides has increased a lot. The quantities used are very high. Italy, as we can see, uses large quantities of pesticides to try and support agricultural production, trying to satisfy the quantitative demand, rather than the quality of demand.

And this is a fund in the use of fertilisers.

And here we get to emissions, energy and emissions. We must say that agriculture plays a very important role as far as emissions and energy consumption are concerned. We see here the relation between Europe, with twenty-five members: agriculture, industrial production and other processes. We see here the important role of Europe in methane, nitrogen oxide and

CO₂ in Europe. If we look at the methane emissions coming from Asia, we see that quantities there are extremely relevant.

This is an important assessment of global emissions by sector. We see that agricultural land use and waste in general account for approximately one third as far as global emissions are concerned. Thus by utilising an adequate form of agriculture with a good use of the territory, we might substantially reduce CO₂ emissions at global level.

These are the CO₂ quantities emitted at European level. We can see that Italy ranks fourth or fifth in the total emission of CO₂ in the atmosphere. The problem is that agriculture is also affected by climate change. We have consequences as far as water resources are concerned, seasonal stages extremely (*incomprehensible*), heat waves and cold waves, but also freezing episodes, diseases, infectious disease that are closely connected to climate change.

We see here an advancement of the growing season that has taken place over the last few years, because of increasing winter temperature. It was even more apparent in the last year.

We also have variations from the point of view of quality. We see here the variation trend in the wine quality that is leading in Tuscany, for example, to a thermal situation that enables us to produce sweet wines, wines that are typical of the southern part of Italy.

PIRAZZOLI Paolo

You have one minute left.

ORLANDINI Simone

Which is the role of bioclimatology? Biometeorology can study the relation existing between agriculture and environment and weather conditions, trying to suggest concrete solutions for a certain problem.

Next slide.

What can we do? With this slide I get to the conclusion. We see that climatic classification can bring us important information on the change trends. You see maximum temperatures in august. We have seen the increase we had in Tuscany over the last twenty-five years. A relevant increase with important information for the management of the territory and the agricultural activity. We see here climatic classification in relation to drought. There is a general increase in the summer and spring period, all over Tuscany, all over the region.

We see here the extreme events that have remarkably increased over the last ten years in Italy. It is important to have operational models available linking environmental conditions to agricultural activity and this will enable us to forecast cold waves, disease, enable us to decide how irrigation has to be managed, how fertilizers have to be used to respond to economic requirements,

but also to safeguard the environment and the high quality of our production.

We can now get to emissions to conclude. Agriculture can certainly contribute from this point of view. First of all from the point of view of green biomasses, biomass. The use of green biomass to produce energy, but there are important implications as for more rational production strategies to be adopted. The use of biopolymers, lubricating oils and pharmaceutical products, as well as tissues...fabrics from agricultural products.

We might conclude by saying that it is very important to assess the effectiveness or the effects of agricultural activity, both from an economic point of view, but also from the point of view of the energy balance, and from the point of view of CO₂ emissions.

And from this point of view I think agriculture can play a fundamental role.

Thank you all.

PIRAZZOLI Paolo

Now I will give the floor to Vincenzo Levizzani. We are talking about "Rainfalls seen from space".

LEVIZZANI Vincenzo

Well, actually, I have a feeling that climate has changed very much in Italy, because winters are very dry and rainfalls are

concentrated at the beginning of summer and of spring and of summer. Is this true?

Well, actually, it is not that easy to say that at present, but I believe that my presentation and my slide, but not only my research, but actually I will present what we are doing at international level, inside the World Meteorological organization together with the Water Cycle Experiment.

Actually we have to see things in perspective. The first weather forecast satellite was launched in 1960 and this means that we have collected data over about fifty years. Of course this is not very much from a climatological point of view. And on 1st of April 1960 the first meteorological satellite was launched. Actually the first satellite used to take pictures of the earth from the space and they used to collect data. Now we have a full network of satellites, which enable us to observe the earth from space, both in a polar and geostationary orbit. How can space observation help in monitoring climate changes that have been described so far? And how can they help us to identify the effects?

Actually, Filippo Giorgi has already said in his presentation that clouds and rainfalls, together with aerosols, are unknown elements in weather forecasts, because it is very difficult to create models about them, because we don't have ideas about processes yet.

So is there a trend or not in the global cycle of water?

This is the main unknown factor, actually. The main issue is that of assessing the existence or non-existence of a trend in the global water cycle. There are evidence...there is evidence about the greater evaporation and also about more rainfalls and an increase in extremes. Actually my uncertainty is very big at present and if you see the blue words on the right, you can see that uncertainty estimates in 1997. So uncertainty moved from fifty to twenty-five per cent, only thanks to more emission. And this implies that the figures that we are assessing at present are not very certain. I won't talk about this, because Filippo Giorgi has already explained it very well. The main problems lie in identifying the most appropriate models of climate changes. Well, clouds and rainfalls are parameters that are ... have not been included in models in a very effective way. Modelists are working extremely well, but we have to provide them with better data. And now we have the possibility to use long records, or sufficiently long records to identify the trends. One possibility is of using the data of the Global Precipitation Climatology Project, of the World Meteorological Organization.

And we assessed precipitation at global level from 1979 to 2003. In the past we used infrared rays, now also microwaves. And the result is that global rainfalls 2.6 mm per day, a deviation of about 0.3 mm per day, it is not changing. And this is not a great surprise, because we are speaking in general terms, so there is one shift from one extreme to the others, to the other.

Therefore it is necessary to see whether just other observations are just a result of what has happened over the last twenty-five years or if things are different, above all in the Mediterranean area. And this is probable.

Here it is difficult to see what I wanted to show, so next one.

And what has been observed is that land observations in dry season show a link to a (*incomprehensible*), which does not apply to the ocean, while the total amount of global rainfalls show a correlation to a (*incomprehensible*), which is not the expected one. Therefore we were quite surprised when analysing these data.

Recently launched census should help us to have a more ... more information about rainfalls and their structure. I wish to comment these slides. These are clouds in 1988, when this wood fires took place that were caused by human beings for deforestation purposes. In light blue there are clouds causing rainfalls and you can see the radar measuring rainfalls, while on the right rainfalls are not being measured. If you look at the image at the bottom, you can see that the radar is now measuring rainfalls, so this shows while deforesting, while burning woods. This is the pink area. When deforesting, aerosols are produced. This aerosol is very small and clouds are formed only when there is a specific aerosol, because the aerosol when they are larger they turn into small particles that then turn into rainfalls. While on the right, the clouds are formed because of the production of

(*incomprehensible*) fire and the result is that rainfalls do not occur. This means that human beings not only release greenhouse gasses, but also these other substances and this is a relatively unknown phenomenon which is not considered by modelists. These are called indirect effect, but this is not correct, because they are not indirect. But they contribute to the reduction of rainfalls. And this also applies to industrial areas, also.

This is the same phenomenon over the Amazon. What we can do now is to provide a classification of clouds, because are somehow influenced by anthropogenic activities. This is (*incomprehensible*) quite plain. And now we can also monitor extreme events, that is hurricanes. There was an animation that we cannot show. So we can measure rainfalls with great accuracy. This is hurricanes seen from a satellite. And this can be done every fifteen minutes. This is probably not very useful for climatologic purposes, but the increase in accuracy should help us.

Next one. Around the end of this decade we will launch a new satellite and this will take place within the Global Precipitation Measurement Project and the purpose of GPM is to measure the acceleration or deceleration of the global water cycle.

So these are the future projects of the international community.
Thank you.

LOPEZ Antonio

According to our agenda we have four more contributions that should stick to the eight minute limit and then by limiting our delay to ten minutes, we will have some questions at the end, so that the audience has the possibility of asking some questions.
Professor Pirazzoli.

PIRAZZOLI Paolo

The slides, please. The next.

The estimates about (*incomprehensible*) for the 21st century were extremely uncertain, so that ICCP in 2001 calculated that they might reach 2mm per year. Up to 2000, the most liable estimate is 1.8 mm per year. Starting from 1992 with the use of altimetric satellites and other oceanographic complex models, we have a jump in the quality of measurements that are now possible in very short periods of time.

From 1993 to 2006 altimetric satellites in the world network of (*incomprehensible*) show a rise in 3.3 mm per year. We are therefore recording an acceleration for which we might try to find some causes.

From 1950 to 2000 when the rise accounted for 1.8 mm per year, oceanographic studies had calculated that the thermal component accounted for 0.4 mm per year.

For the decade 1993 - 2003, when the global heating had caused an increase by 1.3 mm per year, four oceanographic models

found that the thermal component accounted for 1.6 mm per year. Four times higher than the previous decade.

And then there is another component, the melting of the ice cap, of the continental glaciers. The component of 0.8 mm per year raised to 1.2 mm after 1992.

We have therefore an overall sea level that is raising. But the distribution is not uniform. There are areas where the raise exceeds the average and ocean areas where it is lower than the average.

In the Mediterranean we have the same phenomena. In the eastern part of the Mediterranean, in the Adriatic Sea in particular we have a rise that exceeds the average in this period. Whereas in the Ionian Sea we have a slight decrease in the sea level. Which are the causes of this regional variability in sea level change? The first cause is thermal expansion, because we see that the areas of expansion perfectly coincides with the areas where the sea level is rising.

But is this regional distribution stationary? No, it isn't. It varies in space and time. We can see that in the Pacific Ocean, in the Northern part of the Atlantic Ocean in 1993 - 2003, the satellite shows a totally opposite trend to what oceanographic studies have recorded in the previous fifty years.

We see here a mobile vision showing how decade after decade, changes take place in the world's oceans and in the Mediterranean from 1955 and 1998.

We have seen that where the sea level was rising, it was followed by a movement of masses that try to distribute this rise in a more uniform way.

What are the forecasts for the 21st century?

We see the ICCP graph from 2001: an increase from nine to eighty-eight centimetres. In green we see forecasts in the last ICCP report from eighteen to fifty-nine centimetres up to the 22nd century. These estimates are based on physical models and on different scenarios as far as greenhouse gasses emission are concerned, without keeping into account the glaciers, the melting of the glaciers, without accounting isostasy and without considering what was happening in the same time.

This is taken from a scientific publication on line. Sea level rise at global level is very close to the upper limit of uncertainty, and that is the curve that gave an estimate of eighty-eight centimetres for the 22nd century. In the Adriatic Sea, in Trieste we find something that is comparable to the global figures. There is a higher increase in the other areas.

In order to calculate the sea level rise for 2100, we have to keep subsidence into account: 1.3 mm per year, according to archaeologists. A little bit less, according to other scientists. According to other scientists, in Europe there should be a sea level rise amounting to fifteen centimetres more than the world average. In Venice if we add up the different components, we reach a level that in 2100 might reach eighty centimetres.

What can we do to protect this area? I think Mose is not sufficient, because it cannot...it is not waterproof and therefore it can't ...it is not watertight, therefore it cannot keep the lagoon level separate from the sea level.

Before the sea level rise reaches fifty centimetres, we should think of something more solid and more tight. It is not only a problem of Venice and the lagoon that will have negative consequence. We have depressed areas from Monfalcone to Cattolica that are from zero to two meters below sea level.

You see in green and grey, areas that are more than two meters below sea level, and in these areas the risk of flooding from the sea and from the rivers is something real. It will become even more serious if we have a sea level rise in the future.

In order to conclude, rather than focusing on an obsolete project like MOSE, we should perhaps choose alternative types of defence, less costly and less impacting on the environment. An overall project integrating the defence of the lagoon with the rest of the depressed areas in the Adriatic Sea.

LOPEZ Antonio

Thank you, professor. Andrea Rinaldo will talk about Climate change and hydrology.

RINALDO Andrea

In my presentation I'll focus on the hydrological contribution to the draining basin and the Venetian lagoon and then the contribution to climate changes, because they contribute also to the sea level rise. But of course we will talk about scenarios over the next one hundred years, but these scenarios are not compulsory in any way.

Hydrological aspects are now interesting, because probably the instruments that should divide the sea and the lagoon are now becoming obsolete and, above all, because of the fear that hydrological falls, i.e. rainfalls, on the lagoon and then the down flow from these draining basins are not helped by these interruption systems or devices.

We skip one slide, no problem. I'll now show some results of the Research Centre at my Department of the University of Padoa on the specific behaviour of this draining basins of the Venetian lagoon. This was built by mankind and it was built and remade in the last five hundred years.

And it also involves three rivers that contribute to the lagoon and at different regimes (high waters, low waters, etc). This is a complex system.

What I'm showing here are the different measurement station – hydrological and meteorological stations – that exist in this area. They measure fresh water which is delivered in the lagoon and

this involves a project of the National Research Centre and other studies. And the measurement show the flows that occur in thirty-five different measurements points.

Actually this phenomenon (*incomprehensible*) now quite well known. We know the sun radiation, wind and temperatures and everything is considered in a specific time frame.

Actually now we have different systems or instruments to simulate rainfalls and land use. Now it is possible to describe the territory of the draining basin with great accuracy. (*incomprehensible*) of soil types and everything that concerns hydrology is now well known.

Now I'll show some examples. Next one, please. In a hydrological basin, of course, there are different elements that contribute to it, and hydrology has to measure all these aspects and also has to forecast them. Of course, there are different characteristics, because the southern basin is the result of different phenomenon that took place over the centuries. Then there is also land reclamation, etc.

This is the Marzenego basin. These space simulations are useful also only if you can see the contribution of Castelfranco. And these are the climate change scenarios and detailed models and are based on the existing literature. They concern the scenarios with a sea level rise of about fifty centimetres within the next ten hundred years, of course if it is possible to measure rainfalls with different models like that of Montecarlo.

What is interesting is what is used ...what is still interesting of the old model. So we used the (*unclear*) 2002 and we added other events that were recorded events that were recorded in the past and we added fifty centimetres of the tide and then we measured the results. And we were wondering whether the results are obsolete. This hypothesis of Mr. Pirazzoli, i.e. that the flow from the draining basin corresponds to its impact on the lagoon, but this is correct only if there is a coincidence of the interruption time etc.

This is an event of 1951. 1966, in that case, there was an increase of fifty centimetres and therefore this enabled us to consider or to measure actually the effect of the draining basin.

The relation between the straight line and that ... the one with the hypothesis of Mr. Pirazzoli and the five dots are the events that we were taking into account.

The next one.

The results supported the results of Mr. Pirazzoli and with the fifty centimetres increase of the sea level, the contribution of the draining basin amounts to about fifty per cent of the contributions that have been assumed.

This makes now sense, if compared to the present sea level, but it is interesting if you consider the present MOSE system and its water (*incomprehensible*), so if you consider that...

(N.d.t. The speaker is not talking into the microphone)

...in Venice lagoon it's difficult to resorting to a specific model, but properly integrated data enable us to forecast future events.

Probably the only forecast is that we will be flooded by fresh water and Mr. Pirazzoli said that the entire Adriatic Sea is now at risk and probably the Venice lagoon is the only safe place in Northern Adriatic.

Thank you.

LOPEZ Antonio

Thank you for sticking to your time limit. We are now going to discuss "The Forecasts in Sea Level Rise". Professor Canestrelli.

CANESTRELLI Paolo

Our objective is analysing the history of sea excursions in Venice ...of tides in Venice to try and forecast the future.

First image.

The distribution of exceptional tides exceeding one hundred and forty centimetres. They are accompanied by the sound of the sirens in Venice and they cover more than ninety per cent of the Venetian territory. They cause the most serious damage and happen one every five years.

And in a distribution of...for one thousand five hundred years we have had some concentrations with very high frequencies. You see in the horizontal axis that after fifty years there was a very high concentration in the last century.

During the first part of this 21st century, we have had just two events of this type in the last seven years.

Exceptional tides have always accompanied the history of Venice. Since 1200 we have had events of this type. And what happened on the 4th November 1966, it also happened at least ten times over the last two hundred years.

We see here what it means to have one meter and forty of tide in S. Marco Square. There are sixty centimetres of water that might reach your hips. If we have a tide of one hundred and ten centimetres, we have sirens announcing problems for the city. We have thirty centimetres in S. Marco square.

You also see the percentage of the city that is flooded at different levels of the tide. With one hundred and forty centimetres we have ninety per cent of the city that is flooded.

This is the trend of the average sea level in one hundred and thirty-five years, from 1872 to current days. From less two centimetres back in time, we have reached plus twenty-seven centimetres nowadays. So we had a loss in altimetric terms amounting to twenty-eight centimetres.

This are the sea levels, the average sea levels in Venice and Trieste. We see that the average sea level in the two cities could be superimposed until 1939, but from 1930 there is this separation. Venice went up in the curve, speeding up the process. The current difference between the two cities amounts to eleven centimetres.

And the same can be said for maximum excursions. They all refer to many years ago. The most recent refers to 1970, equalling to figures of the past.

What happened with this loss of twenty centimetres? Let's look at the results. By analysing events for one meter twenty - that are announced by the sirens and that flood thirty per cent of the city, therefore causing a number of problems to the city - we have had an increase in the frequency of these types of events of eighteen times.

The one-meter-twenty centimetres tide is eighteen time more frequent today than it was a hundred years ago. For tides that are equal or higher than one hundred and ten centimetres, we have an increase by thirteen times. Had we had sirens at the end of the nineteen century, the alarm would have been thirteen times more frequent than now.

For eighteen centimetres, the sea level that stops the flooding of S. Marco Square has increased by ten times. We can say that low tides have decreased instead. We do not have exceptional low tides in the city. At the beginning of the period we are considering – at the end of the nineteenth century - it was quite frequent to have less than one meter tide. Making canals, dry and impossible for boats, we have a reduction by six times in these types of events. We have approximately twenty events per year below fifty centimetres and this causes some problems for the transit in smaller canals.

Let us skip these images analysing the process on an annual basis, whereas we should look at this graph that shows the highest forty events per decade.

You see that the worst decade of all - in this period of one hundred and thirty-five years - was the period of the 1960s. The following decades lead us to be more optimistic. We do not know what is happening in this decade. The event of the 4th November 1996 has never happened again in this span of time. You see a peak in the decade of the 1960s.

If we analyse the average sea level for the decade, we see an increase from two centuries ago – a constant trend of twenty-two centimetres for the forty years from 1960 to the year 2000 and an increase by four centimetres over the last seven years. But it is too early to include these data in the statistics for period.

If we analyse the distribution of tides over months, in the different months, we can see a shift in the minimum and the maximum event by one month, from February to March for the lowest tides. And from October to November for the highest tides. And this might have important consequences for the environment.

What does this mean?

This analysis of the past to make forecasts of the future. IPCC first and Gorilla, our Regional Research Consortium have made some forecasts – Gorilla is more optimistic and for the year 2100 considers twenty-two centimetres, whereas IPCC, as anticipated by professor Giorgi and professor Ferrara and Mr. Pirazzoli, we

have a fourth IPCC 2001, ranging from nine centimetres to eighty-eight centimetres.

The current IPCC report proposes eighteen centimetres and fifty-nine centimetres as a maximum, but it doesn't keep into account the uncertainty, which is due to the consequences of the melting of Greenland and ice caps from zero to thirty centimetres more.

So even with the most recent scenario we go back to values we have quoted before.

My last slide.

What are the consequences in terms of high tide? If we consider eighty centimetres, if we consider S. Marco Square, the symbol of Venice, in the case of an increase by fifty centimetres - which is the average increase according IPCC – we would skip from fifty-two cases per year to six hundred and fifty-five events per year.

In the case of one hundred and ten centimetres, we would pass from four events per year to two hundred and fifty events per year.

With an increase by twenty-two centimetres – which is the increase calculated by Gorilla – the frequency would slightly decrease with multiplying effect of the frequency. In the case of eighty centimetres, it is again a multiplier by five.

This brings us to adopt an extremely conservative approach in these studies. We have these figures. Let us try to act keeping these figures into account.

LOPEZ Antonio

Now I'll give the floor to Luigi D'Alpaos from the University of Padoa: "Erosion influence in the morphologic evolution of the Venetian lagoon" and this is the last speaker of the first round table.

D'ALPAOS Luigi

Thank you. When talking about Venice, we talk about protecting the city from high tide. But one problem is more complex and concerning as well, i.e. the changes of the morphology of the lagoon. And this phenomenon has been going on now for several years. And it is quite evident if we compare the lagoon starting from the first known situation to the present one.

You can see that there has been a great decrease of the surface of shallow water, i.e. the area that are covered only when there's a high tide. And at the same time there has been a general erosion of the sea bottom.

Captain Dené used to write that during the normal tide, most of the lagoon was covered by water, not only the greatest canals were full of water. But now the situation is no longer like that, because the lagoon has changed.

Which are the causes of such phenomena? Certainly there are some natural factors that have always existed and they are connected to submergence, that is to say subsidence, and the

rise of sea level. And then there are also consequences of human activities.

We have always tried to solve specific problems without considering future consequences, for example the diversion of main rivers or the construction of jetties and the excavation of big canals within the lagoon to reach the port of Venice and then also the industrial area of Marghera.

And this process became more and more intense over the last few decades and this is shown by the differential (*incomprehensible*) which compares the situation in 1970, 81 and the year 2000. You can see that in the central lagoon the sea bottom has risen, the sea has risen and you can also see the negative impact of the morphology of the situation due to the construction of the Canal Malamocco-Marghera.

And which were the causes? Well, actually it started a long time ago. But I believe that the biggest cause was the construction of the entrances of the port. During the high, a sort of jet is produced that does not mix with the other waters and during this process the water is absorbed from all directions. And if the current also carries materials ...outgoing materials, the materials are carried very far from the port outlets. And the materials are no longer used in the exchange of sediments between the lagoon and the sea, which is the triggering cause of such phenomena.

The causes are not the tidal currents, but the waves, the sea waves. You can compare the present situation on the left with the situation of the ninth pier H.

You see that this phenomenon increases when the wind blows and there are sea waves, because they move the sediments and the air current simply moves the fine sediments towards the canals and then to the outlets. And then the sediments are projected outwards by the phenomena described before.

(*incomprehensible*) the sediments remain in the sea and don't go back to the lagoon. And therefore each time the lagoon loses sediments.

Now in this simulation we show what is left before the outlets, after such a phenomenon. After five tidal cycles, plus the wind blowing at ten meters per second – which is not very fast, so... - and unlike what happened in the nineteenth century, the present lagoon tends to deposit the materials in front of the outlets. This material then increases rapidly and therefore showing the quantity of material that has gone lost in the lagoon.

And modelists now could compare what is actually measured, but I believe that the quantity of sediments that goes lost in this way can amount to about five hundred thousand cubic meters per year.

If the wind is the main cause of the sediments, it could be interesting to formulate a model that could justify the erosion caused by the wind and the action that tries to counteract this

erosion. If you consider the (*incomprehensible*) effort on the bottom and the wind action, you see a typical trend. And when overcoming the critical effort, which is the red line, then you can see that the waves can move again the sediments from the bottom of the sea.

A possible model therefore is an erosion process (*incomprehensible*) by sea waves in which the quantity of suspended material is directly proportional to the effort. And then there is the position, action and therefore the material deposited on the bottom is considered to be constant.

On the basis of this model, of this conceptual model – *please next one* – it is possible to interpret what happens when the waves act in the lagoon, so that they can re-suspend sediments.

So there are two stability points – sorry, two balance points – one of stable, and one of unstable balance. The result is that sediments are moved towards stable balance sea bottoms.

This hypothesis has been validated by means of a very complex model which reproduces the action of the tide current and the wind action. And the result is that this analysis is more than acceptable.

Please next one.

And when considering the distribution of the possible density of the lagoon bottom, we can see that the stable regions according to this model, i.e. that of shallow waters, because the tangential efforts do not overcome the critical point. And about sixty per cent

of all points belong to one area, i.e. stable sea bottom. And then there is an area, which includes about ten per cent of all examined points, and in this area the sea bottom is unstable.

Therefore considering the area between the two curves, in the curve of distribution of probability, and you can see two peaks in this curve that correspond to the stable levels and a minimum peak point corresponding to the unstable area.

If this operation is repeated for all lagoons, whose (*incomprehensible*) was known, we can see that in eighty-one where shallow waters were quite extended and then moving forward, you can see the peak considering the shallow waters is reduced, while the low-bottom areas increase, then the shallow-water areas are destroyed and the deposition phenomenon increases - it counterbalances erosion.

Shallow-water areas continue to disappear, but the material deriving from it is no longer sufficient to counter the erosion of the sea bottom and this is the erosion that is taking place now.

So the issue of water areas hasn't disappeared and the water areas are now more extended and deeper than in the past.

So which is the long term evolution? In the beginning the shallow-water areas were very extended and there were also large water areas. And the sea bottom was unstable. In the 20th century shallow-water areas decreased in extension and the water areas have increased and the sea bottom didn't change or remained unchanged.

The shallow-water areas decreased gradually and the water areas decreased while the sea bottom remained unchanged. But afterwards the material deriving from the destruction of the shallow-water areas was no longer sufficient to counterbalance the erosion.

So what is the future of the lagoon? In my opinion the lagoon – considered that the material deriving from the demolition of the shallow-water areas are now decreasing – there won't be sufficient material to counterweight erosion. The sea bottom will be eroded and there could be reduction of even 2.4 meters.

Why can this be true? So the (*incomprehensible*) will be 2.4 meters and we'll see the same phenomenon that we can see in the lakes, in intermediate lakes that in 1901 were quite limited. And the bottom of these lakes is the same once they expanded, as the average depth of the lagoon has increased.

Thank you.

First round table:

Debate

LOPEZ Antonio

We have completed the contributions of our speakers. We have a microphone for the audience. Please introduce yourselves. Quick questions, so that more persons can intervene.

For our technicians, we should perhaps - because we are late, because we started late – we should perhaps... those who will join us from Australia and Poland and Spain and Argentina, so that you can inform them about the delay. They have already been warned.

I will first of all leave the floor to my colleague here at the chair to answer a question that has already been asked. It will allow me to comment on the report by professor Rinaldo who was trying to show that when MOSE is closed, we do not have an excessively high sea level.

It will certainly rise for two causes: rainfall and salt water. As for rainfall, he has made an analysis of the most recent rainfalls, but he has not kept into account the fact that models and forecasts foresee more intense rainfall for the future.

As regards sea water, I think that you have not considered the fact that the gates might be subject to a resonance phenomenon and there is no countermeasure foreseen in order to reduce the impact of this phenomenon.

I thank professor Pierazzoli, because he has suggested some ideas that might stimulate our discussion.

Allow me to say that hydrologic flows are carefully calculated – this is my job – not only the space / time (*inaudible*) is done, but these models are intended to work with modifying scenarios. And not only this. The intensity of rainfall is a thing. The total quantity of rainfall causing an increase – *the chairman is inviting the*

*speakers to slow down and this is because of the translation – the contribution from the drain basin as far as your (*inaudible*) was extremely stimulating, but we have to see your studies also from my point of view.*

The idea that direct rainfall on a drain basin is linked to the contribution by the drain basin itself, ignores the fact that the size of the drain basin is not the same, if it is larger or closer.

And second and last, the objective of my contribution was to calculate the water flows, but with this MOSE and the oscillation of the gates, I am assuming some figures are taken from literature.

The contribution of the drain basin water is fundamental and it is perhaps underestimated. The oscillation and the resonance phenomenon of the gate has been perfectly calculated and there is a contribution in the sea rise amounting to 0.3 centimetres per hour. My calculation is correct and I respond for it.

BOATO Prof.

My name is professor Boato from the Ministry for the Environment, Safeguard Committee. I would like to understand how we can contrast the figure we have heard, a minimum estimate of at least 1.6 multiplying effect for the closing of the gates, which means that in the 31 pessimistic hypothesis by Corila we are already talking of 30 closing, so with this it would become 45.

If we stick fifty centimetres...if we calculate the estimate by IPCC, eighty-nine centimetres, this would imply that the lagoon would be constantly closed. Two hundred and fifty closings per year. I'm not referring to eighty-nine centimetres, which is the worst of these. I'm referring to the fifty centimetres estimate. With the latest projections we would go back to eighty-nine centimetres. We have two hundred and fifty closings by 1.6. It brings us to two hundred and fifty closings of the gates per year, which means that the lagoon should always be closed and separated from the sea and this would entail the death of the lagoon and of the city. This is the figure for fifty centimetres, not for eighty-nine centimetres.

LOPEZ Antonio

Before listening to the answer I would like to greet the friends that are connected with us from Madrid, from Australia, from Dresden and from Poland as well. This applause is for you.

We have another question.

ZITELLI

My name is Zitelli. First of all, allow me to congratulate the International Academy of Environmental Sciences and Mr Abrami in particular for organising such an important event.

My question is connected to this. The problem of the Venice lagoon - I think - must be organised and postponed with a

dedicated workshop, because what we have heard in general terms is extremely important – I think – and it is the very basis for our future research projects.

Can we – on the basis of what has been said today – can we postpone the discussion on Venice, first in a wider scenario including the upper Adriatic area as a whole, and “b” in a prospect that is not going to repeat the debate that has been going on for forty years without any new element.

I am not an expert in climate change. I cannot judge the job made by the IPCC scientists, but I think – and we heard about this yesterday – I think that this should lead us to change our way of thinking, our approach as researchers, as scientists.

During a close meeting, I referred to the disciplinary (*unclear*) of cultures – this is a question for politicians rather than for scientists – this is the subject of our second round table in the afternoon.

LOPEZ Antonio

Let us go on with the discussion on scientific evidence.

Are there other questions? If there are no other questions, we are almost on time. A few words.

First of all I need to apologize with the *rapporeurs* and the audience, because we started our round table with a forty-minute delay and we have managed to stick to the agenda nevertheless.

The next speaker after the break will be professor Canziani who is connected with us from Argentina. He's waiting already.

Thank you professor. We will listen to your contribution in fifteen minutes. Thank you all for being here, we will break now for coffee break. Fifteen minutes.

Second Round Table: **IMPACTS OF CLIMATE CHANGE**

CONTI Marcelo Enrique

We can resume our proceedings. Can I please have another video for our connection to Argentina, Sidney, Poland and Madrid? Ok, now, the picture is complete.

Now, I'll give the chair to professor Conti and Mr Iglesias, the Chairman of Selvas. Two main pillars of our academy.

Now...so we have problems with our connection with Mr Pachauri from India. We always have problems getting in touch with India, although India is not really back as far as technological development is concerned.

Good morning, professor Canziani from Argentina.

So we can now start this second part and this is a round table focused on the impacts of climate changes. The speakers have nine minutes of speaking time, so that we can have enough time to ask questions.

Now, I'll leave the floor to professor Osvaldo Canziani from Buenos Aires.

CANZANI Osvaldo

Good morning to everybody. Thank you for being there.

I'll speak in Spanish, because it is easier for me. The problem of the working group two and the basis of the report of the IPCC concerns the effects of climate change on human systems and these effects are very visible.

The conclusions drawn is that climate change also has an impact on the physical system and on physiology.

Next slide, please.

Also plants are affected.

Next slide, please.

This is an examples of the impact on different ecosystems, for example some birds are loosing food because of changes and there also other problems.

And this is an example of the disappearing of a glacier in Bolivia.

This is another case of a glacier in Argentina. And here you can see what is now happening all over the world. Actually there are problems with the (*inaudible*), so there is also an impact on the water systems and on fresh water.

Here you can see the difference between developing countries and industrialised countries. Also we have figures for Latin America, but not actually for Europe.

So you can see the impact also on developing countries, in Africa and in Asia in particular.

Therefore Europe plays an important role as far as these activities are concerned. So the systems have changes, because of overheating and the effects on coral and the glaciers in the regions. There is a big impact – above all – in the mountain regions, in the Andes.

Now there is also an impact on forests and the change of the sea level has an impact on low-line coasts and all this also has effects on human health. And this happens also in areas where insects live.

So which is the problem of corals? This is a very clear problem and it is clearly showing what climate change is, because corals are being bleached, so to speak. And also there is a concentration of CO₂ in oceans and this leads to ocean acidification. And this makes it difficult to keep the system active.

There is also a problem of carbon monoxide. And underwater systems are also affected by this.

This image is a result of a survey carried out in the low-line coastal areas and here you can see the effects on the coral system.

The most affected regions are the Arctic – because here temperatures have increased five times more than in other areas – then there is the problem of (*inaudible*) and the lack of humidity above all in Sub-Saharan Africa and in the small islands that are affected by the increase of sea level.

Then the Asian mega deltas and here people have to move from these areas, otherwise they...because their land is flooded and there is also a reduction of water along the coast of the Pacific Ocean and in other areas.

And this is of course a very serious problem for the future.

All regions have to face serious problems and poor people (*incomprehensible*) have to tackle such problems – of course also the younger children and the elderly are affected above all, in terms of health questions. A good example was the heat wave in Europe in 2003. Moreover other effects that were not recorded in the past. And therefore statistics and their quality have to be improved.

NASA satellites are showing this. Glaciers are melting. This is also in the latest report and there is also an increase in the sea level, but this is of course catastrophic. Again there are problems of communication and this also has repercussions on future scenarios.

All questions linked to the ice sheet melting have a strong impact on the coastal areas and there is also a problem in the increase of salt. Frank has already observed this and this has enabled western Europe to keep higher temperatures, but the intensity is now decreasing and the temporary cooling down could however cause changes in the sea and this would also affect fishing activities.

All this (*incomprehensible*) the global warming. Other colleagues have already mentioned such problems, which are particularly serious. However some areas will experience a worsening of such effects. There is for example the rise of the sea level, which will cause specific problems in areas such as Buenos Aires or Nigeria.

Here you can see the effects in Europe of the heat wave in 2003 and this is again a very serious problem and we have to be vigilant on this, because probably this will occur again.

These are examples of extreme events, for example hurricanes that caused catastrophes in different regions of the earth. This area in Argentina, for example, has expanded.

Then there is also the problem of drought, which is now affecting several areas of the world - for example, above all – Sub-Saharan Africa. And if the sea level rises, according to our mathematical models, we can see that tens of thousands of people are loosing their land and indeed the report is talking about environmental refugees.

And this of course has also repercussions on geopolitics. This is definitely a problem that needs to be tackled in the near future. Adaptation is a solution. At present research is being carried out, which will continue and if we aren't able to cut greenhouse gasses emissions, the problem will continue and will affect in particular the weakest areas.

The report said that a two-degree increase in temperature can cause problems to water supplies in different regions of the world and can also affect the production of food. Therefore it is necessary to well-manage adaptation in order to promote sustainable development.

Thank you.

CONTI Marcelo Enrique

Thank you, professor, for your contribution.

We know that the subject you dealt with would certainly require more time, but let us pass to the second speech. We have a video to show, that should be ready right now and then we can go on with speakers. I forgot about the video. I apologise for this. Can we see the video, please? I invite professor Canziani to stay with us, because there will be some questions afterwards.

VIDEO

When the last tree will be gone, when the last river will be poisoned, when the last fish will be captured, then you will realise that money cannot be hidden.

Climate change in the 21st century, the impact of climate change.

The interpreters apologise, but we have not seen the video before and this certainly can influence the quality of the translation.

Human health and the health of the planet are at risk without any distinction between rich and poor countries. The impact of climate change has a potential to hit millions of people.

The consequences will lead to food and financial crisis, migrations of masses of people, the drying of the soil, the melting of glaciers, heat waves that will become more and more frequent. They will transform water in a rare resource, in a scarce resource for just few privileged people.

And climatic change will particularly hit Artic and African regions, coastal areas, small islands and large deltas.

The increasing heating of the atmosphere leads (*inaudible*) as a factor for infectious diseases that endanger the health of the whole of humanity.

Temperature in the troposphere has increased by five degrees as against the pre-industrial period in 1750. The current increase is around 0.2 degrees centigrade per decade.

2005 was the hottest year ever recorded by NASA.

In the 1980s there were a hundred and eighty-three natural disasters and the number increased to two hundred and thirty-six in the period until 2005. In 2005 there were four hundred and thirty events of this type.

All nations will be hit by the changes in climate. Fuel combustion and deforestation are the major causes of greenhouse gas emissions. In order to save our societies and our economies, we must get free from our dependence on fossil fuel. According to

the Stern report, in order to limit the impact on climate change, we need immediate actions: changing our life style and our attitude can contribute to the mitigation of climate change consequences.

CONTI Marcelo Enrique

Let us go back to our presentation. We have professor Bogotaj of the University of Slovenia.

BOGOTAJ Lucka Kajfez

I'm probably the first speaker in English. I'm coming from Ljubljana, neighbouring country Slovenia and I'm like Filippo Giorgi here, Vice-Chair of ICCP, but he works in working group one and I work in working group two.

Next slide, please. Next slide.

So, many of you may think that climate change is something that will happen in the future, but it's here and it's giving an impact now.

Next slide.

It's in Europe, not just in the US or somewhere in Bangladesh and rising temperatures are already affecting us.

Next. And we all know deep down that there are natural causes to it, but mostly humans are to blame.

Next slide.

One of these things. Many Europeans experienced this year especially the early onset of spring. This year spring arrived one

month ahead of the usual time. It is a typical example of how the leaves of the trees every year practically unfold earlier, so until now ten days earlier, all the (*inaudible*) appear.

Next slide. We've seen these pictures before. Whenever we go through the Alps or through the Andes is the same phenomenon: glaciers are practically gone – the small ones – and the big ones are just to observe maybe fifty years more.

Next slide, please.

We all remember – I hope – the heat wave in 2003, but look at the rivers, and in Switzerland, which should be a country full of water. And the same happened in many places. So the fish at the time will be probably gone.

Next slide, please.

So now Europe is vulnerable, but there are special parts of Europe that are extremely vulnerable to climate change. We see Arctic which is melting away and probably summers in the Arctic will be on the sea ice free soon. All moister-limited ecosystems will be dry by the end of this century, if we don't act, and especially we are living in – and we are now in the Mediterranean sea – is probably the worst heat region in the future.

Next slide.

So what does the temperature rise of 1.5 to 2.5 degrees mean for the plants and animals in Europe? It means that twenty to thirty per cent will be at high risk of extinction.

Next slide.

Where? All over Europe, but the region you see here in the dark red are particularly hit. So a lot of percentages of this ecosystem will be seriously affected. Dark red up to sixty-two per cent of flora – for instance – can be extinct by the end of the century.

Next slide.

The hot spots. These changes that are more pronounced and will be in the future are the Iberian peninsula – Spain, especially – central Europe, and also Scandinavia with its tundra. So even (*inaudible*) resource which dear to us and nourish maybe up to six, to eleven per cent of species in the next fifty years.

Next slide.

And all these ecosystems don't have many options to adapt. You look at the mountains, the plants cannot go higher, because the mountain ends. Same goes to tundra. There's the north pole up there. So we might need new conservation sites in Europe to protect these endangered species. And we probably need more money and more concerned to do that.

And one other option that is possible. We should reduce our stress, our other's stress we are putting to this ecosystem. So they can survive climate change better.

Next slide.

Now to manage ecosystems. We need to eat, we need our forests and also dramatic changes are projected. Crops suitability will change across Europe, for instance – at the beginning – there will be some winners, like northern Europe, which will have better

crop production, but there will be losers and the Mediterranean area is projected to be such.

Also forests are very sensitive to climate change. Not maybe in the year scale, but in ten years of scale you can see devastating impacts. And we saw a video and the pests. All sorts of insects will develop faster and they will attack crops and they will attack forests as well.

Next slide.

And one thing very important. We all would like that our forests will be a (*incomprehensible*) to think, so they could store the additional CO₂ we are putting into the atmosphere, but unfortunately these protests stopped. About ten years ago, a lot of our European forests are becoming a new source of CO₂, so we cannot rely that our sins will be buried in the forests. Unfortunately not.

Next slide, please.

Agriculture. I've mentioned there will be losers, there will be winners. But we will all have to adapt, because there are other prices to agriculture. You know that the European Commission wants to set high standards for the production of bio-energy, introducing bio-fuels, so these will also be a price to agriculture, not just the climate change itself.

Next slide.

This is a simulation of this winning and losing situation. Some countries will have reduced yield of wheat, for instance, including

Italy. But on the northern part of Europe, like Denmark or Poland, they will have new chances to grow wheat. This means also a serious market disruption, because the producers of some crop will now have less production.

Next slide.

Forestry, again winners and losers. But we think that forests probably will grow better in the north, because in some regions because of the drought, pests, diseases, forests might decline seriously. And again I have to mention the Mediterranean.

Next slide.

Not just the forests will have stresses, but the distribution of forests and the plant varieties in the forests. This is an example of French birch forest, *fagus sylvatica*, which is now dominant of the western part of France, but as climate warms, birch will follow the preferred temperature. So this can mean dramatic, different site, different countryside. Also aesthetic value of the countryside can be changed.

Next slide, please.

Nobody talked about fire, but I think fire risk in Europe is increasing already. In the summer we have more and more forest fires. And this is the very sad projection for Spain. How the fire risk will increase. So the number of fires will just go up, following the temperature increase.

Next slide.

This is too many information on this slide, but I would like just to draw your attention to the Mediterranean region. All these red arrows pointing down mean bad. So there are regions in Europe with less red arrows, but Mediterranean – even when we look mountains, dry land, grass land, wet land, aquatic ecosystems – everything goes for worse. So the Mediterranean – believe me – is a very hardly hit area.

Next slide.

So is this the solution for the Mediterranean? Next *Barca di Noè*. Now, please go back. So, usually, we would flee from the floods to preserve animals, but now in the Mediterranean we will have to preserve water, probably.

And my conclusion. *Next slide.* So, I mean, I'm not totally pessimistic, because somebody just told Europe will have also some short benefit. These benefits can last for ten, twenty years and they mask our efforts to mitigate climate change, because we will have some profit probably. But the majority of changes in Europe will increase our vulnerability.

So climate change actually to the ecosystems put another, very serious pressure.

Thank you for your attention.

CONTI Marcelo Enrique

We would like to thank the interpreters who are working in an excellent way and I thank of course the chairman and of course at

the end of all speeches, you will have the possibility to ask questions.

Now I give the floor to the next speaker. The speaker is abroad, professor Butler from Melbourne. Good morning to you.

BUTLER Colin

Can you hear that? Oh, good. Thanks very much for this invitation to speak so far and to be tackling climate change friendly, not flying.

I have been thinking and writing about climate change for almost two decades and it's a bit of a dream, actually a bad dream to see so many things - that I thought would be further away – coming true. I just hope that the things that I'm thinking about could happen in the next thirty to fifty years in fact don't come true, because it's very disturbing.

Some people write of the worst cases, so we don't need to consider that, but I'm also a medical practitioner and if a person comes through the door or rings me up and says: "I have chest pain", the first thing I have to think of is "Could this be cardiac? Could this be a heart attack?". You have to deal with the worst case, in order to deal with it.

Anyway... in fact, if I could have the next slide?

I conceptualise the health impact of climate change fairly simply. I classify them into primary, secondary and tertiary effects. Some of the effects we heard about from the previous two speakers.

With the primary effects – things like heat waves. There's some benefits as well: there will be warmer winters, also at higher altitudes it will be warmer. Another primary effects will be from extreme weather events and the impact of injuries from flooding and so on.

The secondary effects have particularly to do with changes in the ecosystem and particularly effects in the insects and what we call the vectors, the insects such as mosquitoes and ticks, which transmit communicable diseases.

And the tertiary effects – they're not so much written in the public literature, but there's a little bit there and I think that this will increase and this is perhaps the most subtle, the most disturbing, perhaps the most difficult to understand, but I think actually not that hard to understand. It's just there's some sort of taboo to talk about these things.

I'm talking about here a sort of cascade of governance around the world, starting in particular in poor countries. It has to do with factors such as food scarcity, famine, conflict, population displacement, refugees.

Now, if I could have the next slide.

The World Health Organisation, WHO, has already recognised that climate change is contributing to the global burden of disease. In 2000, or seven years ago, they considered climate change already responsible for between two to three per cent of diarrhoea disease in developing countries and six or seven per

cent of malaria and another vector-borne disease called dengue fever.

At relevance, that report also discussed a substantial decline in food regime and therefore the levels of undernutrition with potentially many adverse health effects, particularly in developing countries.

Now the next slide follows up - to some extent - previous speakers. This is an inquiry, even though many of you may have had to experience this three and a half years ago: thirty thousand excess deaths and that's probably a conservative figure.

If I could have the next slide?

This shows the relationship between daily temperature and deaths in Parisian hospitals. You can see after several days of extreme heat the death toll rose markedly.

The next click of the slide.

You cannot be sure that this is anthropogenic climate change. But the literature increasingly says that with climate change these events are much more likely to happen. They could happen without climate change, but they're more likely with climate change.

So now, I can move on to the secondary health effects. There are many (*inaudible – bad reception*) diseases which are climate sensitive. *Click the next slide too.* Especially the so-called vector-borne diseases.

Now I should point out that, just as phenology changes, the nesting of birds and the flowering of plants and so on, it's natural that we would expect changes in the distribution and perhaps the behaviour of insects, but it doesn't automatically mean that the diseases will change, because you've also got this impact on public health. Public (*inaudible – bad reception*) can substantially modify and often ameliorate the changed distribution of mosquitoes. Some diseases are more amenable to that than others. And that public health also makes the epidemiology a little bit harder to sort of clearly demonstrate, but we can be pretty confident that tick-borne encephalitis has shifted north in its distribution in Europe. It has shifted north in Sweden and it has also shifted north in the southern boundary of its range, so overall the total number of people at risk may have not changed much, but it's different people.

There is a vaccine for tick-borne encephalitis, but it doesn't necessarily have to be a major public health event; but it does show that the diseases are changing as we'd expected, as well as other things are changing too.

There is quite some evidence that malaria in east African islands has also changed in distribution. It's gone on further, climbing at higher and higher altitudes. I don't have time to go into, but there is also evidence that certain food-borne diseases such as salmonella have changed.

Now the next slide shows – this is from modelling – it shows the estimated geographic region for the main vector of dengue fever. You see on the left there, that's Australia in 2000 and the current zone of dengue transmission. And on the right, under medium and in most of the climate change scenarios, you see that grey area increases. We took that model on the 2100 and it comes as far south as Sidney. Dengue fever can cause death, but it's not a major cause of death, but it's certainly a problem. There's no vaccine for it and there is no cure. It's a virus.

Now, I want to turn to the last part of my talk, to the tertiary health effects. *And the next slide.*

Now these are highly indirect, they're large scale and they're legged and they have got many co-factors. But as the previous speaker has shown with hurricane Katrina and droughts – I don't have the slide to show the predicted changes in agricultural productivity globally – but they are quite profound, with winners and losers again being a common story. And perhaps if you look far enough, you'll see that there are far more losers than winners. But even if there are sort of a combination of winners and losers, that's still a problem, because of increased inequality that can lead to resentment and migration and refugees and so on.

Can I have the next slide?

Literature discusses what danger climate change is, but I think - if you're living in Africa – you could argue that dangerous climate change is already occurring. Margaret Beckett, the UK Foreign

Secretary, has already said that global warming is maybe a factor in the conflict in Darfur.

Can I have the next part on that slide?

Ah, I think we missed a little bit there, but she talks about Sheila Varasi (??) in Bangladesh, but anyway we will stay with this one. In the lake Tanganyika, in a very volatile part, conflicts in that part of Africa, in the great lakes district near Rwanda and Burundi and the Congo, which is already a very volatile area with much conflict. The fish harvest from lake Tanganyika has declined not because of over-fishing but because of climate change.

Can I have the next slide?

The commentary on that paper pointed out that the human implications of this were potentially dire in this region.

Can I have the next slide?

The Stern report has predicted tens to hundred millions more people being flooded each year with a warming of three to four degrees. That's later in this century. So many of these people will become refugees. Some are very likely to be extremely resentful of the world (*inaudible – bad reception*), without being too (*inaudible*), I think it's plausible that some will turn to violence to try and strike back in that world.

The next slide is caught up in smoke. Until few years ago, the development community largely thought that climate change was a bit of a take issue, that you really needn't to worry about, that there were many more things on the plate. But this report

happened smoke about five years ago by consumers and developers in the environment risk concluded that climate change had the potential to cripple development in Africa.

Can I have the next slide?

I'm not sure of the time, but I'm getting to the end. There are numerous things about refugees. Some of them have been mentioned by previous speakers such as the reduced snow in central Asia, producing the run-off in the rivers and irrigation, sea level rise, reduced crop yields again in central Asia, migration, also mental despair, mental stress, more forms of suicides and so on.

Now, if we go on to the next slide...

CONTI Marcelo Enrique

Dear professor, one minute.

BUTLER Colin

... as to the health impact of climate change, do we say these primary and secondary events classification, for which population, provided public health remains alert and active, it should be manageable – I mean it will be problematic – but it should be manageable.

But if you go to the other part of the slide – for poor populations – these problems are likely to be more severe. But on the other hand, the health problems for poor populations at the moment are

already amiss, in the short run they'll still be failing, but as time goes on they will become more and more important.

The next slide, which is the second last one, is about these tertiary effects. So for poor populations the burden of disease through famine and conflict could already be very high and as we move forward in time, this could lead to governance failure. More and more in a quality way, between rich and poor world, and the poor saying: "Well, why should we restrain our carbon emissions, since you know you caused us so many problems."

So it could lead to a sort of cascade of governance with failure to address greenhouse gas emissions on a global scale. And that eventually could fight back and affect public health and governance in rich countries so that – *if you just click the slide again there* – so the burden of disease could actually be very high, for all sorts of diseases far more than just vector-borne diseases.

So this is the final slide. If - I hope, you know, conferences like this – if we can respond to the emerging risk of human global health, then we can develop the coordinated action that we need to restore the health of the globe, a stitch in time.

Thanks very much.

CONTI Marcelo Enrique

Thank you very much, professor. We are now connected with Poland. I invite all foreign speakers to remain connected with us

and I pass the floor to professor Kundzewicz. I apologise for the bad pronunciation of your name, professor. You have the floor.

KUNDEZEWICZ Zbyszek

I feel very honoured and pleased to participate in this innovative conference.

Could I have the next slide, please? Next slide.

Anthropogenic warming has slightly had a disturbing influence on many physical and biological systems. Impacts are occurring now already, as a consequence of climate change.

This polar bear is a symbol, it's an iconic species that is losing its environment.

Could I have the next slide, please?

Projections for the future tell us that some systems, some sectors and some regions, are particularly vulnerable to climate change. As demonstrated already by professor Canziani and professor Bogotaj, among vulnerable systems and sectors there are ecosystems – many types of ecosystems - water resources in mid-latitudes, agriculture in low-latitude regions and human health. Where else, among regional vulnerabilities and particularly severe ones are expected in the Arctic, in Africa and in all low-line places near to the sea: coastal regions, small islands and mega-deltas.

Next slide, please.

Impacts due to frequencies and intensities of extreme weather events are very likely to increase. I'll just show you a few examples. All three speakers before me referred to the heat wave in Europe in 2003, summer of 2003. It was very very warm, or hot then and many people died. But it can be seen as a proxy of typical summers in the 2050. In the 2050 it's not going to be unusual. It's going to be a norm, an average. Later in the 21st century, even hotter summers are expected.

Next slide, please.

Another extreme event of particular severity in a warmer climate is heavy precipitation events. It is very likely that the frequency of heavy precipitation will increase in most areas in a warmer climate. This will have a lot of negative impacts for different sectors: for agriculture, forestry, water resources, human health and also industry, settlements and society. Many people have died in recent flood events and many billions of dollars in material damage were observed. And the future looks even more difficult, in the sense that material damage to settlements, to industry, to infrastructures, roads, etc. are very likely to increase.

Could I have the next slide, please?

The next slide shows us another extreme event, likely to increase in severity. Droughts, lack of water. Very important for the Mediterranean countries. Also for Italy. Globally the area affected by droughts is very likely to increase in the future and the adverse effects will touch many sectors.

Most and foremost – I would say – agriculture and forestry. Land degradation is foreseen: lower yields, crop damage and crop failure, life or deaths is shown in this photograph from Sahara region and increased risk of (*inaudible*) fire. Water resources will suffer, and water stress.

About human health and mortality effects, professor Butler has just mentioned a moment ago, but I also would like to mention very serious adverse effects projected for industry settlements and society. Water shortages are likely to increase. Reduced hydropower potential and potential for migration.

Next, please.

Some impacts are likely to be positive. For instance it's a good story for Northern Europe, because in Northern Europe agriculture is temperature-limited and temperature will grow. It's going to be warmer, so Northern Europe will benefit, but globally the potential for food production is projected to – even if it is projected to increase with this small warming – for larger warming, the food production is projected to decrease and in many areas in lower latitudes, in less developed countries. The food production is likely to increase ... food potential is likely to decrease with any warming, even a small one.

Next slide, please.

Yes, there are adaptation options. Actually, many of them. But the present adaptation options are by far not enough. We have an example of a present adaptation option from a less developed

country where the drought is getting severe. Actually, much more will have to be done, in order to reduce vulnerability to future climate change. But if we mitigate the climate change, then many impacts can be avoided. So actually...

(N.d.t. The speaker is not talking into the microphone)

The next to last slide shows you a map of the globe. It's a map from our chapter of the IPCC report. It shows you changes in run-off, projected changes in run-off, in about ...well, in several decades from now, end of the century.

So you see that around the Mediterranean, there are reddish and yellow colours which means less water, less run-off. It's not good news, unfortunately, because on the top of that you have another piece of news, telling you that it's going to be warmer or even hotter. So both higher temperatures and less run-off.

That's why you can see a box of summer in Spain, that indeed electricity production potential of existing hydropower plants is likely to decrease by more than a quarter, by more than twenty-five per cent by the 2070s.

In other areas, such for instance Bangladesh, it is very dangerous that any additional warming, like two degrees, even two degrees – a very modest warming – will lead to a high increase of inundated areas. Twenty-five per cent more of the whole land underwater.

Already now - in 1998 about seventy per cent of Bangladesh was underwater – now it's likely to be even more, far more, if the climate warms.

In another graph showing you the hot spots comes from the Indian Ocean. Small Indian island, near to the coast of India show you that even a small sea level rise will cause a huge shrinkage of fresh water lands, by twenty-five to ten metres.

Also in North-East in Brazil, (*inaudible*) but also ground water recharge, it's likely to decrease by a lot, by more than seventy per cent. So if you don't have service water there, you will not be able to use ground water, because the ground water recharge will decrease, so probably expensive desalination will be the only option.

And my very last slide shows you the acknowledgements to the co-authors of my chapter that I have referred to. It was a chapter on fresh water resources and their management and it was a collective work by many people and I was one of the coordinating authors. I invite you to refer to this chapter in a couple of months, when it is going to be openly available in the IPCC web page. Thank you very much for your attention.

CONTI Marcelo Enrique

Many thanks to professor Kundzewicz for this interesting presentation. We have now the report by professor Benito who is connected from Madrid, from the Centre for the Studies of the

Environment. He will tell us about the... his report, the SPHERE Project.

BENITO Gerardo

Good morning. Thank you. Well, I will deal with some aspects of the SPHERE Project, a European project.

Next slide, please.

First of all I would like to speak about the relation between flood and climate change.

Is the number of frequency of floods increased over the last few years? Looking at this graph, you can see the damage caused by floods and extreme events all over the world, and you can see that damage has increased very much over the last fifty years. You can see the last part of the Twentieth century. However these data should be better managed, because of the qualitative analysis of risk of free elements.

First of all the level or increase in risk, which is closely connected to the frequency and the extension of flood...the extent of flood, and then the damage caused by the assets that are exposed to such floods.

The danger depending directly on climate change has increased three times since the 1970s, while vulnerability depends on other factors, such as land use and previous flooded. Therefore the vulnerability has increased since 1970, from the point of view of risk.

Now, we considered the relation between these factors and we studied data concerning the past and concerning several areas participating in this SPHERE Project and we concentrated on Spain and southern France. These are the areas that we studied considering data for the last a hundred years and historic data of the last one thousand years. And if you consider the instrumental series of some rivers of the Iberian peninsula, you can see that the extent of most floods, above all in the (*incomprehensible*) Tajo, has not changed over the years, notwithstanding the construction of dams on these rivers.

Actually extreme events have increased. We used a series of historic records and archives and other sources and documents concerning past events. We also studied some buildings and we also evaluated the damage caused by the increase in water.

For example, the flood in 1967 caused serious damage. And we also used registers, dating back to 1947, when there was the flood of this river and then we analysed the sediments. And on the basis of all these data, we can reconstruct the river floods. There are also the marks that were left by the floods over the last ten thousand years. In the river banks we could evaluate also the flow rate of the rivers and we could also evaluate the extent of the floods. As for the Tajo river, there is a flood that took place over the last ten thousand years, from the Mesolithic age, and we could draw the trend for this river.

Above all, events were not homogeneously distributed through the years, but there are some peaks due to some climate changes or specific climate situations. Up to now, the events were very similar to some past events and the distribution of extreme events also changes over time.

Here you can see a change in the distribution of river floods in the Iberian peninsula and changes were due to cold waves, for example. These are data concerning the past ages, and we can see that past events even had a double extent if compared to events that took place at the end of the 1920s. This diagram shows the frequency of extreme events in north-west Spain and we also there looked at some indicators.

You can see the indicators concerning climate and they concern changes in the alpine area. You can see the period of greater frequency of extreme events corresponds also to the reduction of the melting of the glaciers. We also created a relation between the frequency of events and some specific climate events, such as some activity. For example, there is a greater frequency when the solar activity increases.

We also assessed a relation between the NAO index and the number of extreme events. Here you can see that the negative values in the NAO corresponds also to the number of extreme events. We believe that considering this relation to the past, we can forecasts for the future. For example the NAO indicator can be integrated in models concerning the atmosphere. And

generally speaking, it is believed that in the future there will be negative values of the NAO index and a reduction of such values in the Atlantic area. We also used such information to develop statistics concerning frequency.

In this slide, we show our results. They concern (*incomprehensible*) quantities for the Pacific period (???) and yet you can compare the situation in the Mediterranean in the past and in the future.

Now you can see that the quantity was twenty per cent higher than the present one. So the conclusions are that along the Atlantic coast there was an increase in frequency and extent. But there was a reduction in the number of extreme events.

At present, there is also an increase in the flow rate of rivers and in the Mediterranean areas apparently extreme events are increasing, that is to say flood and droughts, because there is an increase in river floods.

Moreover these regions are now more vulnerable, because of anthropic settlements. As for adaptation, it should be based on the assessment and planning of such risks.

Thank you.

CONTI Marcelo Enrique

Thank you very much, professor, for the presentation of this very interesting project. I would now invite professor Enzo Tiezzi who will tell us about forecasts on climate change and their impacts.

TIEZZI Enzo

First slide, please.

Colours are not so clear unfortunately. Almost fifty years elapsed since – as a fairly bright student – I worked in the United States at the university, dealing with climate change. And forty years have passed since, together with a colleague, Alfonso Maria Liguori, who is no longer with us, I started studying models on the basis of the models by (*unclear*) about the different atmosphere on Venus and on the Earth - that were equal, they were the same at the beginning. Venus atmosphere is full of carbon dioxide. There is a temperature of plus two hundred degrees centigrade on Venus, and starting from its most ancient times, the situation on the Earth started.

The Earth changed its atmosphere becoming what it is now. But since then we can – we started to study the increase in the greenhouse gases. At that time we were just a few warning the world about this danger. Nothing similar to what happened last December in...last winter in December in Buenos Aires during the conference on sustainable development and climate change.

As I am a chemist and a physicist, I started to study the emergence of novelties, trying to correlate these novelties with other new processes, so the emergence of new elements and their correlation with other new situations.

Finally this year, on the 6th of January 2007, we finally read the limiting global climate change report by the European Commission and everybody was able to see things as I saw it fifty years ago. This report had been preceded by another report of the 28th of October 2006 and finally these elements were becoming apparent to most scientists.

And then the IPCC report for which I worked as a consultant. Next slide and the following slide shows the global changes in temperature and the next slide the effect of this on sea level rise. We should immediately say one thing that was partially hinted to during the previous two contributions.

According to the IPCC, the global rise of the oceans in the world - because of the melting of the ice caps and of the glaciers - is on average forty-two centimetres in fifty years. This is the average figure. But this is not true for the Mediterranean area, where the average figure is half of this. Twenty centimetres. So we have an average figure in fifty years: twenty, twenty-five centimetres for the Mediterranean and forty, fifty centimetres for the oceans. And this is something important that should lead us to reflect on figures for Venice.

Important studies are those that an American professor is developing – he was born in Siena, my city - professor Lorenzini, who works at the Smithsonian Centre for Astrophysics in Harvard. Thanks to the satellites in the upper part of the atmosphere we can study the variations in temperature and correlate these

increase in temperature with the emergence of novelties and the rising in the level of the oceans overseas.

In my view, Lorenzini's studies and the studies of his group are extremely important.

In the next slide we can see that the number of events is increasing – and this is the final part of my contribution – and I really hope that you will focus your attention on the emergence of new elements in particular keeping into account the number of extreme events we are witnessing. We have heard lots of figures in the previous reports in the health sector, in agriculture. All these studies at the Siena university are focusing on this, that is to say calculating the number of events. We have known for years that the number of hurricanes in the world is increasing.

Next slide.

We can see the correlation, that is to say the number of extreme events that have taken place in certain areas and the carbon dioxide emissions. Katrina had been forecast ten years before. So from this point of view, we should be extremely concerned about the number of times a certain event takes place.

My last slide shows that one of these novelties concerns high tides in Venice. Although correlated to different levels of tide, not necessarily in line with the increasing level of the oceans – of the Atlantic and Indian ocean – I'm not expecting Katrina to take place here, but what I expect is the calculation of the risk. A city

where the high tides are more than ... are being multiplied by four is a city at danger.

And some time ago I wrote about the need to respond to the attack of the tides. And in this sense I'm extremely in favour of the MOSE project, although it is only one of the things that have to be developed in order to protect the city.

To conclude, I think that we can finally state that our forecasts – made forty or fifty years ago by Alfonso Maria Liguori, myself and others – unfortunately, and we've seen this at the world conference in Buenos Aires, are now taking place and we must therefore do something in order to counter this trend, resorting to scientific rationality and accompanied by the love for our artistic and cultural heritage.

CONTI Marcelo Enrique

Thank you for your nice words and certainly we appreciate your approach. Now I'll give the floor to Ezio Todini. Only one recommendation: these are the last two speakers and since apparently there are several questions to be asked to the speakers, I'm asking them to be brief. I rely on you.

TODINI Ezio

I don't have a problem concerning floods.

Next slide.

It often (*incomprehensible*) with a deterministic approach, but the problem is quite complex, because – if compared with the periods of shortage of water which are quite long, such periods – floods - are quite short.

When tackling floods, it is necessary to assess in a clear way what are the advantages that you can obtain, and above all it is necessary to integrate in assessment and management all elements concerning uncertainty, above all considering climate change. For some years we have been talking about sustainability, which is not only economic feasibility, but also environmental safeguard. Also for future generations. And the basic principle is that water is no longer a factor of development, but it is a limiting element for development. And therefore environmental, social, economic and legal aspects have to be taken into account, together with uncertainty.

Moreover analysis should not be limited to problem itself, but to the entire basin scale, because it is impossible to think that an action taken in one point of a basin cannot have consequences on the rest of the basin.

When managing water resources, problems are analysed considering all the interconnections between all these aspects and the complexity of the problem of floods is greater than the traditional problem of managing water resources.

In this case, it also necessary to assess specific aspects which are not simple. A few years ago, after the event in the Mississippi,

the holistic approach was introduced and this approach divides the problem in two phases: the planning phase, during which the prerequisite have to be created for the projects and during which the population has to be prepared to face the risk and all these operations are extremely important. Then there is also a second phase, which is the emergency management on the one side and the reconstruction phase and the assessment of how things were managed.

The sustainable approach is much more complex than the holistic one, because we have to rethink the way in which we tackle floods, because this is not only linked to the construction of different structures, but it is a much complex problem. It is necessary to develop indicators, which can be useful also to policy-makers, because technicians love making calculations and offering figures, but policy-makers do not think in terms of figures or volume of a basin or reduction of damage. They reason in terms of advantages for the population or general advantages, such as the creation of jobs.

And therefore these indicators have to connect the reduction of risk ...of flooding risk with economic resources. As I said before, this is a complex and unsolved problem, because the extent of floods is not comparable with a scenario concerning water resources and the risk analyses are quite difficult to carry out.

The framework directive of the EU considers floods as temporary events, to which EU directives are not applied.

Now a directive is being developed that specifically concerns floods. And it is quite complex. I'll make an example of the non-sustainability of the Tagliamento river case.

Tagliamento river is the last river in Europe, which is still in a natural state, so to speak. It is a sight of European interest. It is exceptionally important from a naturalistic and economic point of view. The construction of a detention area is there foreseen and there will be a bank – and that area is meant to prevent flood from flowing upstream, but the project was not studied according to the scale of the river. The river was divided in the upstream and the downstream area. And the (*incomprehensible*) also approached in a traditional way. And therefore there is no detailed assessment of the environmental and of the social impact.

Moreover there is no consensus among the local population. Well, people were asked to approve or reject of the project, but it was not really assessed together with the people.

Therefore the final considerations are that the protection from floods and structural measures often create illusive feeling of certainty and people tend to build new buildings in these areas that increase risk again and this is a sort of spiral.

Therefore it is necessary to change our approach to quality of life in the future. We have to accept a reasonable level of risk and use the newly available technologies as much as possible, to provide real-time forecasts, or at least forecasts that are acceptable in terms of time.

And then we have to radically change the way in which we protect ourselves from floods.

Thank you.

CONTI Marcelo Enrique

I'll pass the floor immediately to professor Carraro.

CARRARO Carlo

I am the only economist among the speakers of these two first sessions. My task is accompanying economic values to the physical events that have been described by the previous speakers. We have described climate change impacts, but we have not explained what they mean in economic terms.

We can go on with the slides.

First of all we must say that there's a high degree of uncertainty in our economic estimates, accompanied by the scientific uncertainty. Economic uncertainties are even larger, because projecting what is happening today in one hundred years is extremely difficult.

A number of factors intervene, about which we know very little... technological progress, for example, which prevents us from developing the models that economists use. These models have the same structure and the same scale of other scientific models. The collaboration is fruitful, but the numbers are subject to a high degree of uncertainty.

You can go on with the slides.

What are economists doing? They take all the possible impacts or sectors being partly linked to climate change and they try to understand how the economic system is autonomously responding to this.

There are initial costs: infrastructures or loss in economic activities, in tourism for example, but then the economic system adapts, modifies itself and has new economic activities prevailing in time. So in assessing the impact, we must not only think of the immediate impact, but also of all the consequences that are involved in the different sectors.

Let us look at some figures. This is a summary of one hundred and eight studies that I have analysed and collected, that tend to quantify the cost of climate change.

The Stern Review calculates this cost in five, twenty per cent of the GDP, a considerable loss even in the most favourable case.

Whereas when we consider a number of studies that take into account the form of adaptation we can adopt, how we can adapt to climate change, this cost will certainly be reduced between zero and five per cent.

Some people consider that there might be some positive effects for climate change if the variation remains in the range of a few degrees centigrade. But if we also think of the structural changes that can be brought about by climate change, these costs range between zero and six per cent.

Another way to measure these impacts is measuring the cost, the economic impact of one ton of carbon in the atmosphere. You can see that most of these studies calculate between zero and twenty-five euros per ton of carbon. A limited quantity of money. Only the Stern Review is at the opposite extreme, seven hundred and fifty dollars per ton of carbon.

This difference between most of the studies and this review is based first on the rate of discount, that is to say how we calculate the ratio between the cost we are going to bear in the future and the value of money today.

It is as if in the Stern Review we would not keep into account future values, the cost of climate change that will take in twenty, thirty, fifty years is much higher. But as we normally do in economic analysis, you calculate a discount rate between two and three per cent, a rate that decreases in time from three to two per cent. Then the cost as it is assessed today is much much lower.

The second important element is uncertainty and this is the positive aspect of this article, which was harshly criticised because the economic estimates it makes are quite unsatisfactory, but they certainly brought about an important innovation on one point, that is to say the role of uncertainty in assessing economic damage.

If we adopt probability to calculate the possible economic damage, values have to be higher and this can explain this

difference in cost between the Stern Review and the rest of the studies made in Italy, Europe, Japan.

This is for the cost of climate change. Let us see the cost of the mitigation, that is to say the cost for the reduction of greenhouse emissions.

This is a summary of a project I coordinated together with IMCP, which is at the basis of the report by the Stern Review and was also adopted as the basis for the fourth report by IPCC. These are costs involved in stabilising the quantities of greenhouse gasses between four hundred and four hundred and fifty parts per million.

The objective of the European Commission is very difficult. The level today is three hundred and eighty parts per million. In Europe we have tried to calculate the cost of this type of process and the first information you get is that you have to find its timing. When should we start reducing emissions? The year is the year 2025. Considering an average of the different models, they have tried to calculate this cost, so we still have time to revert the trend. This does not mean that we can avoid reducing emissions. Reduction can certainly start in 2025.

So we have a small margin to put up this cultural, technological, social organisation in order to reduce emissions.

Next slide.

It describes costs. And this is the situation in the most favourable scenario. Costs - as you can see - are quite limited, less than half

percentage point. The less optimistic prospects involves slightly higher costs: one per cent on average.

So we can certainly say that there are a number of different hypothesis, but the cost for the reduction of emissions is limited after all. IPCC Bangkok calculated a figure between one and three per cent of the GDP, so the cost to stabilise emissions is still limited.

If we compare this costs with the advantages we will get and the benefits we will get, we can certainly say that the advantage brought about by mitigation is really important. And this will lead us to sustainable growth, preventing a number of the impacts from climate change.

So the message from the economic point of view is not as catastrophic as the others. Economic systems can certainly adapt and produce favourable results for the prosecution of the human species.

CONTI Marcelo Enrique

Thank you for your contribution. Now I open the floor. Actually our guests are still connected from abroad. Please remain online, to reply to some questions. Please. Is it possible to ... could you please introduce yourselves?

BOATO Professor

I'm a member of the commission for the safeguard of the Ministry of the Environment. Professor Tiezzi presented a figure, which is in the average, but I don't know if he considered the level of the ice caps in particular, and therefore the fifty centimetres have moved to eighty centimetres.

But if the average is about forty-two centimetres, whereas the average is usually thirty-two, forty without the melting of the ice cap...it is strange to hear that in the Mediterranean is about twenty and not thirty centimetres. But I would like to know what are the models that are applied. We saw also projections and not model hypothesis.

Therefore I would like to know how the forecasts made by the IPCC have been (*incomprehensible*).

CONTI Marcelo Enrique

Who would like to reply? Professor Tiezzi can reply? Is he in the room? He will reply later on. Next question, please. Professor Tiezzi is now here. Professor Rubbia, please.

RUBBIA Carlo

Actually I would like to raise a fundamental point that concerns all presentations. Everybody has talked about linear phenomena: if CO₂ doubles, then all the other figures connected to it are doubled. There is no feedback, no correlation between the...

(N.d.t. The speaker is not talking into the microphone)

...process is ... we are not sure that the process is linear. Actually it is an exception when it is linear. First example, that of permafrost in the north. You said that the main effect is the disappearance of glaciers and of the arctic region, and this implies a change of the temperature from under to above zero for very wide areas.

These areas are saturated with methane and this has an effect that is seventy times greater than that of greenhouse gasses. So the situation is very clear. When the permafrost becomes liquid, the bubbles are released, and so the methane is in the air. And the situation is self-sustained. But this mechanism can work on itself.

Then second important element, which was mentioned by Al Gore, is that of the gulf stream. This is determined by a pump, which is the ice coming from Greenland. But you know that it is rapidly disappearing. And since there is no longer this pump of cold liquid that moves the gulf stream downwards, this can cause a switch of the stream from the north to the south of Europe, but this occurred several times. And of course this can have great effects on the climate, on northern Europe.

Therefore the system is irreversible, therefore it can also create or generate chaotic phenomena. We all know that in meteorology is generally chaotic. There is this butterfly effect that starts an hurricane. And this is impossible to understand from the point of

view of the IPCC, which makes linear analyses of these phenomena.

Therefore these are the main question marks, which we should reflect. And all calculations made by the IPCC end with the year 2000, as if the following years should not exist. But we know that most emissions are based on coal, and certainly in 2050 and 2030 there will be people that continue to burn coal. And even though the technology will be extremely developed in industrial countries, this won't apply to developing countries.

We therefore don't know which is the integral of the entire phenomenon. If we continue to apply the same conditions also after this deadline, if we personally won't be there, it doesn't mean that we are not concerned with the problem.

Then last question. How long does it take to CO₂ to get back? The time which is necessary to restore a normal situation on the planet is not two hundred years, but it is million of years. Because the only system to eliminate CO₂ is the (*incomprehensible*) but as we know this is a very slow process. And therefore we are talking about climate change that could last thousands of years and if we continue to release CO₂, it will probably last thousands of years.

CONTI Marcelo Enrique

Thank you professor for your intervention. Professor Giorgi and professor Ferrara to reply to professor Rubbia. And there is still the question by professor Butler to professor Tiezzi.

GIORGIO Filippo

About the non-linear systems, I believe there is an absolute misunderstanding. I don't know who said that the IPCC has not considered that the system is working in a linear way. This is not true, because all models used in the IPCC are not linear and they include all non-linear systems, which are known in the climate system.

The warming itself is a non-linear phenomenon, because it is caused by a series of effects: the fact that there is more vapour in the atmosphere, that the ice-caps are melting etc.

Therefore all models consider the non-linear aspect, and as for the question of the 2000...2100, I should say that IPCC is making forecasts that range for later than that year, but I simply showed those ending there.

There are also projections for the 2300 or for thousands of years. You should read the entire report. And the question of the sea level change is not a short term issue, but it is a long term issue. Because phenomena such as the melting of Greenland or western Antarctica, well, they could happen and they would be irreversible phenomena.

Then I agree with professor Rubbia when he says that the CO₂ recovery does not last a few years, but thousands of years.

FERRARA Vincenzo

Linearity means all aspects that we can take into account, but there are some phenomena that we cannot consider. For example, if the earth temperature increases with a rhythm greater than four degrees per century, linear phenomena can start that we don't know. For example, the gulf stream is based on the difference of salinity between northern and central Atlantic and if salinity increases, the gulf stream stops. If it is lower, the gulf stream starts.

There is the thermal and aline system in the Mexican gulf that starts or doesn't start the gulf stream. And when salinity goes down very much, the stream stops. And this happens when the ice of Greenland melts. And now it is around two hundred and twenty cubic kilometres per year. And if this increases, there will be a further reduction of salinity in that area. There will be an abrupt climate change which was shown also in the film "The Day After Tomorrow".

But this happened already twelve thousands seven hundred years ago, when during the warming phase, the ice sheet of Greenland and Canada melted and much of this water was stopped by natural dams made of ice, then this dam broke and the fresh water from northern Canada went into the Atlantic and the gulf stream stopped and we had one thousand two hundred years of glaciations. After that period the gulf stream started again.

This ice period was started by the fact that the gulf stream stopped, so we know how it works, but we don't know where it starts, actually. So it is a linear phenomenon. And we don't know when Greenland and Antarctic can collapse, but this could happen tomorrow. And thousand years ago it happened, but at that time when the sea level was higher.

And if there is an increase or a decrease in temperature, in general, it could happen that in the next few years Greenland could melt completely. In that case, the difference...the sea level rise could not be four to fifty centimetres, but seven meters, but nothing is predictable unfortunately.

And this year's novelty is the likeability. Each scenario has a probability and a reliability. The IPCC believes that the scenarios with two, three degrees of increase in temperature are more probable, more reliable.

And scenarios with increases by above four degrees are not reliable, because they are not predictable.

CONTI Marcelo Enrique

Thank you for your reply. Now I would like to ask our colleagues from abroad if they would like to contribute. We are still waiting for professor Tiezzi, please.

Professor BOATO

The answer is easy. There is an enormous difference between the oceans and the Mediterranean. This is at least the present situation and we hope that it will continue also in the future.

Hurricane cycles need very huge masses of water and the Mediterranean can host certain events, but they are not as strong as in the ocean. The data are the same that are used by the IPCC.

It foresees an average of forty-two centimetres, because in the oceans extreme events are stronger, so to speak, while in the Mediterranean the average is between twenty-two and twenty-five. However, what professor Rubbia said is correct.

If we have to think about non-linear models that would appear after 2100 for phenomena like the ones that have been described now, then things change completely. But these problems will have to be tackled by our nephews and nieces, by future generations. I'd like to thank professor Rubbia for his intervention, because he cast light on several aspects. The problem is that of chaos and chaotic models. And I've been working on these for several years. Professor Zapotinsky (???) said a few days ago that we can see chaotic behaviour also in the (*incomprehensible*) also to oceans and seas.

(*incomprehensible*) foreseen this and the recovery time is very very long, because this is a biological time, so to speak. So the only solution is that of moving to renewable energy as soon as

possible, so that we can reduce emissions of greenhouse gasses.
Thank you.

CONTI Marcelo Enrique

Thank you to you. I don't know if professor Butler is listening to us...

BUTLER Colin

Thank you. Thank you for this chance to speak again. I'll just very briefly comment on non-linearities in human systems. I think this is also very important. There are numerous examples, where one small change can have a big impact on a human system. For example with conflict. If you think of Rwanda in 1993, then you think of it in 1994: some small changes did an enormous change there. You also think of loss of infrastructure from extreme weather events and again also conflicts destroying infrastructure and also destroying human capital. So if we think far enough ahead, as in the physical systems and rising sea levels, this has enormous consequences for civilisation. That's all I need to say.

CONTI Marcelo Enrique

Many thanks. Is there time for a last question? No, actually we have to stop now for our lunch break. We start again at three thirty. Downstairs there is lunch.

Third Round Table:
RESPONSE TO CLIMATE CHANGE

ABRAMI Antonino

Let us start again with our afternoon programme, with the political round table. Felice, please, come back to the table. Round table number three is the political one. It involves both national and international contributions. We have a connection with Argentina, one with Dresden and the last contribution will be by the two Nobel prizes, Perez Esquivel and Carlo Rubbia.

So we go back to our agenda. We must say that all the international connections worked perfectly, except that with India. The discussion has been stimulating and interesting.

We have also discussed local issues, local in inverted commas, because when I say local, I'm referring to Venice, which is not a local issue. It concerns the whole world. It is an open window to the world. The world is looking through this window at us.

As the Minister has to go, so we will give him the floor first, but if you want to listen to our first link with ... the connection with Argentina, just tell me.

So let us open our connection with Argentina with Lilian Corra who chairs ISTE. Hi Lilian, can you hear me? The video is bad, I must say. Yes, Lilian I can hear you. I don't see you, but I can hear you. I can hear you perfectly. I hope we can solve this

technical problem. If the problem goes on, we might perhaps, skip this contribution and try the connection with Dresden.

So we are connected with Dresden with Christian Korndorfer who is in charge of the environment section. He is the first collaborator in terms of environmental policy of the German government. Please show me the video. Good afternoon, Korndorfer. Can you hear us? Mr Korndorfer, can you hear us?

Everything went all right before and now that we have the Minister here...I'm not saying that it's your fault. So let us start. Can we have the video? The last video. Let us start with the introductory video and then we will try the connection.

VIDEO

Agriculture. Health. Coast lines. Natural ecosystems. Tourism. These are the most vulnerable sectors that are impacted by climate change. IPCC informs on the measures that have to be adopted and about the rising danger we are running. Energy supply. Transports. Electrical vehicles. The building sector. Integrated photovoltaic panels. Industry. Reduction of carbon dioxide. Agriculture. Biological agriculture. Reduction of fertilisers. Biomass. Water management. Reforestation and forestry. Conservation of forests. Reforestation. Waste disposal. Recycling. We urgently need a policy to check climate change. The objective of the European Commission is that of limiting the increase of temperature below two degrees centigrade. The EU

countries are committing themselves to reduce greenhouse gasses by thirty per cent within 2025.

ABRAMI Antonino

Let's go back to our discussion. I would give the floor to Mr Garlick. Is he here? If he's not ready, Felice Casson has the floor.

CASSON Felice

Good afternoon. I would like to say a few words about two specific issues. These issues are first of all the International Criminal Court for environmental crimes and the precautionary principle.

I think that nowadays we cannot avoid intervening to sanction criminal behaviour also in terms of environmental crimes. Because for decades, we have all been aware of the fact that some behaviours that had detrimental effects, over the borders, can no longer be accepted, nor can they be sanctioned, unless there is an international approach.

There are many examples, starting from the half of the twentieth century. In London, for example. But we can all recall a number of episodes, disasters that take place in the seas, when there are accidents, with ships that transport dangerous or hazardous materials and national authorities are unable to identify the real responsibilities and cannot apply sanctions.

The need to verify facts and impose sanctions – economic sanctions, in particular – might serve as a deterrent. As I am convinced that repression is not the most important stage in environmental terms, as is for other criminal activities. And this is particularly true for the environment. Repression can be important, if it is accompanied by a number of pre-emptive measures.

I would like to recall that this subject has been discussed by the Italian Parliament with a number of questions by MP Bianco, for example. We have been asking our government to support this subject and this is something we have to thank the Venetian community for, as well as the International Academy for Environmental Sciences. We have been supporting this idea for years. We think that it can become something real. A few months ago, during a conference organised by the UN on criminal law, we were discussing the creation of an International Criminal Court. A section of this court might be devoted to environmental crimes. The fact that this is a subject that is under the scrutiny of our international organisations, is clearly shown by the fact that a Committee has been set up in terms of human and civil rights. On that occasion the need has been stressed to set up an International Criminal Court for environmental crimes, because the environment - in the widest meaning of the term - is a primary asset that has to be protected and safeguarded.

So this is the path our government should follow and I'm convinced that our Minister Pecoraro Scanio, our Minister for the Environment, will certainly say a few words about the route we have to follow.

The other remark I wanted to make refers to the precautionary principle. We - here in this room – give it for granted that the precautionary principle is part of our heritage. Quite the reverse. When you work in the different sector and have something to do with environment at national and international level, you become aware of the fact that in order to have this principle universally accepted a long way has still to be done.

Just an example. After the fire in the Delonghi factory in Treviso, on the occasion of the different investigation and verification that had to be made, we heard members, people in charge of the local entities that have to control the environment, we heard them say, we heard them declare that the precautionary principle is something that still has to be proven, that is not yet implemented. And I wonder how public administrators can still be there in their office, after saying things like this. Without realising that in terms of environment, the role of public administrators is that of preventing damage. Therefore acting as safeguard for both people and the environment.

Another sensitive issue is electro-smog. Electromagnetic pollution. According to studies carried out by the Ministry for the Environment and the Ministry of Health, we have heard some

important representatives of the Ministry speak against this precautionary principle. So it is not just a question of a local mentality, of a right-wing extremistic approach.

If the Ministry itself is questioning the scientific and political value of the precautionary principle, it means that we still have a long way to go. So I will stop here by repeating that repression is important, but we have to safeguard health, before damage can occur.

ABRAMI Antonino

Thank you to Felice. Now I give the floor to Mr Ebner, both because he opened the first conference of this Academy and also because he is committed to climate changes and within the European Parliament. He also developed a very interesting resolution of the EP.

EBNER Michl

Thank you, chairman. Ladies and gentlemen, the European Union or the territory of the EU is covered by one third ...one third of the surface of the European Union is covered by – and now he has stopped, because he is waiting for the slides. Well, I shall continue anyway. So one third of the EU territory is covered by mountains. About ten per cent of the population of the EU lives in this mountain areas. In Italy even fifty per cent of the territory is covered by mountains, but only just until

a few years ago, the EU considered mountains only from the point of view of mountain agriculture, not as a live space or a natural area, or a natural reserve from very different point of view, for example that of water and water for irrigation and an area of detention for rainfall. And therefore these areas were simply considered a sort of safeguard areas for flatland.

Climate change is affecting the mountain areas in a particular way. The answers are the most important areas in the EU from the point of view of mountain areas. And the global warming is affecting the mountain areas and in particular the Alps, where is more felt than in the flatland.

From 1950 to 1975, the warming was three per cent every ten years, while in the last few decades the increase was more remarkable. Nowadays in summer there are temperature over zero degrees, above four thousands, maybe five thousands metres and the results of this are clearly visible. But sensation is caused only by the melting of glaciers.

Even though it is not known that the ice sheet is moving with a sort of fragmentation and in 2002 in Caucasus two million tons fell and killed thirty-three people. Or in 1993, when many cubic metres fell or 2004 in the (*incomprehensible*) mountains close to Bausen, one thousand tons fell. Simply because of permanent frost didn't act any more as glue. And also a change in flora. And the increase of expansion of certain plants is considered as a risk.

Of course climate change also has an impact on people. Five hundred and ninety-nine out of six hundred and sixty-six ski resorts are considered safe, as for the snow cover and these (incomprehensible) but with one degree increase in temperature, there will be about five hundred safe stations, safe resorts, with a four degrees increase, there will be two hundred safe resorts.

And if you compare the municipality of Ortisei – a very well-known tourist resort, where average increase in temperature is of two degrees centigrade – you can consider the remarkable impact of climate change.

If you know south Tyrol, you know that close to Bosen there is the municipality of Fié and when I was a child I used to go ski to Fie or to Colla, which is east to the municipality of Bosen, but there it is impossible now to ski.

In Germany with a one degree increase of temperature, high percentage of ski resorts will no longer be able to work. With a two degrees increase in temperature the areas with regular snowfall will be hit. In particular in Friuli Venezia Giulia there will be a reduction of forty-five per cent; in south Tyrol seventy per cent. No, actually I made a mistake. It will be seventy per cent of the present quantity and south Tyrol will have a seventy per cent the northern area; sixty-three per cent Piedmont and Lombardy, and will have seventy per cent of the present area still covered in snow.

These pictures compare to different situations and well, they are quite impressive. Even though this is not a single example, but there are several one. As far as the European Union is concerned and its environmental policy, it should be said that the European Parliament and the European Commission since 2002 has been adopting initiatives against the adverse effects of climate change and this in addition to the traditional energy policies – policies for energy, reduction of energy consumption and traditional environmental policies. This year the European Commission has launched its energy packet that identifies the European priorities for the next years. There will be a twenty per cent reduction by 2020, that is to say a twenty per cent increase of initiatives to reduce CO₂ emissions. An increase by twenty per cent of renewable energies, more financing for energy research, about two point five million euro for climate and one point nine billion euro for research in climate change. Large amount of money will be devoted to transport, for example the introduction of the Euro Vignette for trucks. Also important steps will be taken for air transport, air traffic and this is new, because this sector was (*incomprehensible*) for several years. And now we are moving towards a new international agreement that should modify the 1944 Chicago Agreement, which is still applied above all by the United States. It's actually considered as a safeguard of market freedom, but (*incomprehensible*) one of the main sources of pollution, which should regulate it.

Environmental policies concern all actions in favour of biodiversity, action plan for sustainable land use, and also the concept that those who pollute should pay, this applies to enterprises, the reduction of emissions and then instruments with the eco-label and also systems for waste management and audit. And to conclude the European Parliament is a pioneer in the field of environmental policies and this is due to the fact that the Europeans was not always able to ... didn't always enjoy the (*incomprehensible*) decision procedure. Also mayor Cacciari can confirm this, because ... and since the European Parliament hasn't much power could have also ... could develop long-sighted policies, but now the situation has changed and greater caution is necessary.

However I believe that when the Parliament fosters wide-ranging policy, even though it cannot fix the smallest details, this can lead an environmental policy to be applied to the entire European Union. And we, as Italians, should be glad for this, because the national politicians hadn't paid great attention to the environment as it happened with the European Parliament, because there the Northern countries of course are much more interested in these problems.

Last month the Parliament, in the plenary session approved the proposal to set up a temporary committee for climate change and I believe this is an important step forward, because there are just a few ad hoc committees that are set up to this purpose. And

usually ad hoc committees of the PE have a great advantage. First of all they follow a clear political line and they also have a clear deadline, and moreover these committees have a specific life that is to say twelve months and after twelve months they must deliver.

Now I shall not recall you all the competences that you can read in the slide, but to conclude I would like to say that this permanent committee - outside and above the other permanent committees – has wide powers to monitor and even propose actions and wide-range actions. And I believe that this is a very important fact and I also believe that this shows a great sensitivity of the European Parliament. And even the member states show great sensitivity to such problems that perhaps are even bigger there.

Thank you.

ABRAMI Antonino

Minister Pecoraro Scanio.

PECORARO SCANIO Alfonso

Allow me to congratulate the International Academy for Environmental Science for its commitment. Italy is a country where debate and discussion are necessary.

First of all allow me to go back to what Mr Ebner has just said on the work of the European Parliament. I can say something that Mr Potteri will officially announce to the European Parliament on

Monday, that is to say that we have collected the necessary number of signatures, the absolute majority of the members of Parliament in favour of a proposal by the European Parliament to give a strong signal in favour of post-nuclear, post-fossil energy policies. This is something quite remarkable, I think – sixty-four Italian MPs have signed out of seventy, a very high percentage – and I think this will be a very strong signal, because it is very hard to get to the absolute majority in the European Parliament. To have them personally sign a written official declaration on a subject. And it is a strong signal of support by the European Parliament against CO₂ emission in order to build a post-fossil, post-nuclear energy system. And it is not easy in Europe, because we have many countries that are still investing a lot in fossil fuels and in nuclear energy.

It is a step towards the reform of the world energy system. Climate change. I will repeat what I declared on may, 10th to the UN Assembly that was holding a conference of the Sustainability Committee of the UN. And it was the first time I had the chance to speak to that assembly. As I do not like reading the written texts they prepare for me, I felt the need to explain to the different ministers, who were there to represent the countries of the world, to explain them that now, this year, we have no more excuses.

I do not know whether we had justifications before. After the fourth report by the IPCC, two thousand five hundred scientists from all over the world – one hundred and forty countries – three

reports – they all agree in declaring that there is a climate change which is faster than our declarations.

They identified three great sectors: transport, energy and the building sector as those that most contribute to the temperature rise on the planet and therefore to the greenhouse effects. They all agree that we need substantial reforms.

Well, here I will repeat what I said there, that is to say that the international community has a great serious responsibility in the face of the future generation to acknowledge the situation, to identify greenhouse gasses, to recognise the current and future consequences of our emissions.

We need a real reforming approach in favour of the environment. It is not something easy. We have to reform the energy system, we have to reform transport and the building sector. In Italy we need three great reforms and implement a fourth great reform that has already been done, that is to say the reform of agriculture and forestry, that was launched in 2001 in order to have a multi-functional agriculture, to limit our production to food products, but to include reforestation, biofuel or agro-energy, doing this in an environmental-friendly way, without cutting forests and resorting to this as one of the possible solutions, that is to say by changing fuels.

Therefore we do not only have to change our sources of energy, but we also have to change our habits.

Biofuels – and professor Rubbia will certainly describe this subject much better than me – on one hand, and on the other hand we have hydrogen that is having some difficulties, but is the object of European platforms.

I think we should avoid a challenge among different alternative energy sources. We have thermal energy, we have photovoltaic energy, we have thermal and dynamic energy. The Archimedes - Rubbia project. These might turn into real power stations that might vary their production according to requirements. We have to work for this to turn into a strategic project.

Clearly, great reforms have to be adopted. In our country we lack this reforming approach. We are having great discussions about the recognition of the rights of not married couples. Let us imagine a real reform of the energy sector. It seems almost an impossible task, but we have to try to do this. We have started this process in our financial law, we need reforms in the energy production sector, in the certification procedure for the building sector.

We are funding and supporting financially solar energy in Italy. We have opened our doors to innovative energy sources. We are planning to fund thermal and dynamic energy. We have to improve these, to increase these funding. We need – I'm trying to organise together with professor Rubbia a specific workshop with Italian entrepreneurs. Italian entrepreneurs, not all of them, but many of them, they have got funds that were devoted to solar

energy, to supporting solar energy, to burn fuel in the refinery in the oil processing plants.

It is clear that if the money should have been spent on solar energy, was spent on fossil fuel waste, we are lagging behind with new energy sources. Now things have changed. We should avoid having this traditional sources of energy to come in through the back door.

We have the necessary preconditions. We have the awareness, which is important. I know that I am discussing about difficult subjects, but the problem of not doing anything is much more expensive than acting.

We know that this country normally works on emergency. We normally have to intervene after a landslide. And this costs a hundred times more than preventing the landslide. Resorting to environmental engineering for example, rather than to concrete.

So now I would like to go back to the precautionary principle, which is a healthy one.

The scientific community unanimously recognises that climatic change is heating. The precautionary principle should tell us to do what is possible to prevent the worst scenarios. The precautionary principle means to take into account the worst possible scenarios, because, to quote professor Rubbia, I must say that we are living in a testing site. Tests on climate change are taking place with us living in the test site.

So I think that we have to be really careful and steadfast and we really need to make these reforms. We have to combine national policies, strong national policies – it is not just a matter for the Ministry for the Environment, and I will do anything I can for energy, water efficiency, water management efficiency. I summoned the International Conference on Energy.

I think it is something to be proud of to have professor Rubbia back in Italy, as he had to go to Spain during the previous government. I think it is a great thing to have professor Ferrara back with us, to coordinate the International Conference on Climate Change, which does not exclude the organisation of the Energy Environment Conference.

But we must also consider adaptation. What are we doing in order to safeguard the sea that is radically changing? This winter the Italian sea never went below twenty degrees of temperature on the surface.

Ebner has perfectly described the situation of the mountains, but the Italian sea experienced no winter. The first sight of seaweeds blooming were spotted in December and January. The seaweeds blooming is a problem that has been there for years, but the problem relies in the quantity of seaweeds. The problem gets more and more serious with heat, with the temperature.

We have tropical weeds, seaweeds that might perhaps be studied better and eliminated. We have a problem of hydro-geological balance. We have the problem of foreseeing tides and their

levels. How can we – how should we intervene in defending and protecting our precious natural assets, like the lagoon?

And here I do not want to start a discussion on MOSE, but allow me to say that the regime of the sea has changed and there are more modern and innovative systems to protect the lagoon that can be modulated according to the changing situation.

So far we have not been listened to, but we hope that very soon somebody might listen to us. We want to protect the lagoon, we want an adequate planning, an adequate designing of the protection systems and climate change has to be studied keeping into account what kind of measures are to be taken.

So we have this need. We have the same need for natural parts and natural habitats. Traditional temperatures...

(N.d.t. The speaker is not talking into the microphone)

...we need municipalities, provinces and regions to cooperate to our campaign for the cutting of CO₂ emissions. CO₂ is just a part of the problem. I think that they are planning a workshop on forgotten greenhouse gasses, other gasses we have to start cutting down.

We have a clear need for a future agenda. We need three great reforms and one reform that is already there, but needs to be implemented.

Another fundamental subject is our objective. I've declared the same at the UN. Within 2050 we should stop at twelve billion tons

the CO₂ emissions in the atmosphere, because that's the maximum amount the planet can absorb.

We should explain to the citizens why we have to cut CO₂ emissions. When we say less fifty per cent, they might seem just a set of numbers, meaningless numbers, but we should explain to citizens that by 2050 the emission limit should be twelve million tons of CO₂, because this is the maximum threshold the earth can absorb.

Can we have a global agenda? A global schedule? We should stabilise our emissions, thus we would reach our objective of avoiding a disastrous overheating, not avoiding climate change, because it is already there. We have to implement adaptation procedures and we should be able to reduce the negative effects of climate change.

We have to call for the support of the scientific world and of the world of information. We should let citizens understand the nature of the problem. In two months, during the IPCC report preparation, Italian television and radio stations have been discussing the problem of gossip scandals, rather than climate change and environmental problems. We really hope this will be something that the media will discuss. The Ministry for the Economy has started to face the problem. I must say that our government and the Italian right-wing party ought to go to Paris, where the first declaration of the new President of the French Republic dealt with climate change. He has appointed Alain

Juppe as the Minister with a responsibility for climate change. Why can't we have a same approach in Italy? Why couldn't the right-wing party go to Paris and see how Sarkozy is facing up to this problem?

The issue is going beyond political parties. It is a global problem. And it should be a national problem in Italy. So I think a workshop like this should be organised on many other occasions, because the Ministry for the Environment really needs support and evidence from the scientific world, from the administrators that are aware of the problem, from the world of the media which is aware of the problem about political parties and Italian gossip in general. But the world priority is different. We are a great country and we must take part in the global effort of adopting innovative policies. I think we can do this. We would like to get a section, a division of the International Criminal Court for environmental crimes.

We are also working in order to get the headquarters of the world organisation for climate and the environment. The United Nations have just one program that deals with the environment, UNEP. We would like to organise a world organisation for the Environment. There are a number of different forums, dealing with specific issues. We would certainly need one world organisation on the environment, a single forum where these subjects are dealt with. We have the Secretary General of the UN who is strongly in favour of this approach, so I think that we can twin the two efforts.

A world organisation for the environment and the establishment of a court for environmental crimes. And we are working together with small countries that are the first victims of climate change, the small Pacific islands. All these countries should join us in our world effort, in our world struggle to limit the negative consequences of climate change. I really urge your support. We all have to commit ourselves to reach this objective.

Thank you.

ABRAMI Antonino

Thanks to Minister Pecoraro Scanio. And as for the closing part of his contribution I would like to stress that our academy - since it proposed this international environmental court – has received the support of a hundred thousand people in six months.

What I would like to stress is that (*incomprehensible*) small organisation which has been working on these issues for some time now, now it would like to increase its range of action. Why don't we create a European front – so to say – that could also involve the European parliament, that could deal with the application of the precautionary principle? And we should simply follow the example of Germany and other countries, because if there is an exchange of experiences and ideas on such issues, we can work better.

Then I'll give the floor to professor Rubbia. Now I have to say goodbye to Mr Ebner and also to Mr Bianco. But before giving the

floor to professor Rubbia, that in a political effort (*incomprehensible*) the competence of the International Environmental Court. And this can be proposed by one or more countries that have already subscribed to the articles of the association. I can say that we have the support also of the President of the Italian Republic and also very important Italian politicians have encouraged us. And also (*incomprehensible*) of the Sarajevo Court.

We are now waiting for a positive reply from the Ministry and we are also waiting for the reply to the question of Mr Bianco within the Italian Parliament.

So what can we do after this initiative? We have now received a message from the orthodox Patriarch of Constantinople that supports and approves our initiative. He deserves certainly an applause.

As to International Academy of Environmental Sciences, we were very pleased to be informed of the workshop on climate change in Venice and we thank for the invitation and we would like to send a message to the audience and the entire orthodox church and in particular the ecumenic patriarch of Constantinople.

He pays great attention to climate change and the destruction of the environment caused by an improper exploitation of natural resources all over the world. And this long road – we are moving on a long road – the situation is worsening. *I hope that all the people attending the workshop will receive the light from God so*

that they can make efforts and their efforts will then support concrete initiatives that are aimed at the safeguard of the earth and of the environment for the interest of mankind. Thank you.

I would like also to stress that the university in Thessalonica will open a department of our Academy and now I'll give the floor to professor Rubbia.

RUBBIA Carlo

May I start chairman?

Ladies and gentlemen,

in ten plus five plus some other minutes, I would like to explain the present situation of the evolution of energy towards new horizons, as they were defined by Minister Pecoraro Scanio and the other speakers.

Now I would like to recall the *business as usual* position, that is to say the stance of large industries and of the International Energy Agency. The Agency has published different programmes over the last thirty years and this year we received the report on primary energy.

Here we can see that both OECD and non-OECD countries will remarkably increase the quantity of produced energy. Non-OECD countries, i.e. developing countries will have two, two point five per cent, while for OECD countries the percentage is two, one point five.

And what is the kind of energy that is proposed? Here you can see oil, coal, natural gas, renewables and nuclear energy continue go up exponentially. Natural gas and coal increase more rapidly than the other sources, and we get to a point where renewable energies, in less than thirty years from now, won't play a substantial role, but rather they will be slightly more significant than nuclear power.

If you look at electricity, you can once again see a remarkable increase in the production of electricity in developing countries, which is due to an increased demand in energy. There is a factor of three in the next thirty years, and a two per cent steady increase in OECD countries, that is industrialised countries.

The bottom line of all this is that the CO₂, according to the IEA forecasts, will indefinitely continue to grow by a steady rate of two per cent per year.

We see from this curve that coal consumption is rising faster and therefore we move from the mentioned 20-22 billion tons of CO₂ – that Ferrara referred to - to forty-five, fifty billion metric tons in 2030.

Therefore as for CO₂ emissions, the picture we are facing is a disaster. And these are the forecasts of the intelligentsia, if you like, of the economists that present this issue. This doesn't mean that they are right, it simply shows the difference between what we would like it to be and what will happen if we don't do

anything. Hence what we understand from this, is that there is an extreme urgency to keep on changing things dramatically.

Let's look at the situation in more details, let's look at the year 2004. Coal twenty-five per cent; oil twenty-four per cent; gas twenty per cent; nuclear six point five per cent; and thirteen per cent were renewable energies. Out of this thirteen per cent, we essentially have – as we see in the diagram - ...this is all wood burning, as they do in developing countries, then hydroelectric which is two per cent and the rest is zero point five per cent. The source here is OECD. Let's see what happens here. Out of the zero point five per cent, the main part comes from geothermal energy. Solar energy is 0.039% of primary energy in the whole area. Wind energy is 0.064% of total energy and the sea – the tides – is essentially 0,004 per thousand.

The situation is therefore marked by an increase in the consumption of fossil fuels and the limited, negligible contribution of solar and wind energy.

This, Ladies and Gentlemen, is the present situation and it's the starting point for future changes. It is extremely important that we know where we are starting from. These are the numbers we have as of today.

Another key issue is oil. How much oil do we have? Probably the exhaustion of oil reserves will force us to think of renewable sources. That may be a possibility.

Let's look at the oil situation, as we know it. In this chart we have the oil field discoveries: in 1960, 2000, 2040. This second line is oil production. And clearly, as you can see, the discoveries are now coming to an end and the production is continuing. At the bottom are the possible options we are left with for the future, the options we can envisage. And of course the situation is leading to a decrease in oil consumption and production.

In Europe, you can see that in 2010, 2020 and 2030 oil will almost be depleted. In this column is the main sources of oil, which is Arabic oil, all the others are smaller, as you can see.

So what is the available oil quantity? This is a key question. The available documents on (*incomprehensible*) the World Petroleum Assessment 95 offer a projection of an exponential increase. This is oil quantity varies in time... this is where we are now, then it went up and when we will run out, of course the will be a fall down.

The current oil discoveries correspond to the old data and forecasts dating back to ten, fifteen years ago. They tell us ...the New Scientific Book of 1971 used to tell us this figure and that same figure is still the best one of the IEA PP, i.e. we have 2,2,4,5 of oil available. Therefore there's an upward trend and then – if it continues with a two point five rate, as the guys at the IEA are suggesting it will - in 2025, we'll have problems, because oil will be already run out.

This is the oil production in giga barrels per day and “if everyone used oil as the Swiss do”, there will be a two per cent annual growth, which is the figure put forth by the IEA. This is the quantity of the oil used and this is the ratio at the end of the period. But the result of this in 2030 is that oil will no longer be available.

However there are several alternative substitutes – that are implicit in the IEA stance - which are based on the conversion and liquefaction of coal, which would turn it into a sufficient source for many centuries.

Therefore oil could be produced from liquefied coal – as the Germans did during WWII - and this could last at least three hundred years. Therefore even if there is a formal running out of oil, probably we can still use other option that are linked to it and maybe with a little more money and a further effort, we could keep the current system going indefinitely.

So now, the real question relates to the carbon cycle. What can we do with the coal we have?

Mr Ferrara said that if we had the same value that we had in the seventies, the cycle would be closed, because at the time there was a balance between human activities and the system. And this was until we started to exaggerate in the opposite direction. At present, we have about fifty per cent of coal. Out of the twenty-two billion tons of CO₂ which are released and go up by two per

cent every year, half of that goes into the oceans and half into plant life. This is the current situation.

And if we continue to use fossil fuels without any change in the future years, the earth will dramatically change and of course this change will be adverse.

And what would happen, if we burned five thousands giga tons of coal? Even if developed countries are more technological, there will always be someone in the Third World who will get coal to cook and stuff, so, sooner or later, there's always the risk that someone will use coal anyway.

And using a specific model, called "Pen state model" (??) – there are other 7 models available - I would like to show what are the effects of an injection of CO₂ into the atmosphere. This is the year 1000, the year 2000, the year 3000 and 4000. Here you see possible emissions of CO₂ in a logistic curve and this means that we produce until it's possible and then we'll stop when we run out and possibly go and find something else. The peak is not in 2100, but in 2200 and then it goes down ending up in this area. And what this is, is the famous five thousand giga tons emitted.

But, considered the situation, the industrialised countries can find alternative sources, but developing countries will continue to use coal as they are using it now, and they can continue until they run out of it. So we will continue for eight hundred years burning coal at a much slower pace, but after eight hundred years, there won't be any left.

Let's look at the situation as for atmospheric concentration. In the logistic field, there is an atmospheric concentration going up to about one thousand two hundred ppm in 2400 and then the quantity will diminish, because of the absorption until 4000. and we will still be at five hundred ppm, which is what we are presently with these measures.

But if we consider the constant emission curve, you can see that the result doesn't change very much. And this shows that once the CO₂ is released into the atmosphere, it remains there for thousands of years. And therefore the year 4000 will be as hot as the summer 2003. At present we don't know how we can avoid these consequences.

So much will depend on what we will burn over the next one thousand years. Therefore it is perfectly wrong to say: "Let's take care of the situation until 2100 and then it doesn't matter", because the real problem will appear, when we have burned all the available coal on the planet.

How can we avoid that? This is a prominent issue. One way – or the better way – to eliminate CO₂ is to go into the depth of the ocean. Let's look at this...for example in five hundred years, at three thousand metres underwater, we still find seventy per cent of CO₂. Only thirty per cent has disappeared in five hundred years...so there are geological periods. And the consequences are increasingly more serious: marine organisms disappear, then there is calcification...

Therefore it is clear and apparent that we need to find alternative solutions that can tackle the present situation. And the present situation mirrors this kind of thinking: "*Let's first keep filling things up with oil and then when the oil is over, we can tap coal and turn it into oil and keep moving forward*".

There are different renewable scenarios. First there is the first generation, classical technologies that we all know very well - hydropower, biomass combustion, geothermal power heat. These systems of course have substantial limits. Then there are the second-generation technologies that are starting now. Then there are the second generation renewables which are now taking off the ground, and that is solar heating and cooling, wind energy and photovoltaic. Then there is also biomass from ethanol. An example is given by Brazil and the United States.

Actually these solutions are not enough to improve the present situation. We have to develop other initiatives, that is to say the third-generation technologies, which are still at the beginning now, but I believe they are the only solution to reasonably tackle the problem. One solution - as Minister Pecoraro Scanio already mentioned - is concentrating solar power. And the other is wood-cellulosic-ethanol, an innovative form of ethanol, which allows the production of petrol to be used in transportation. And then the energy coming from the oceans, that is to say the idea to exploit the waves and the wave movement.

Today the IEA base line scenario doesn't include any of this until 2050. In this diagram, this line is coal...and you see that in 2030 it got up to this level and then it continues. Then there is natural gas and oil, direct and indirect. And the space envisaged in the Business as usual approach is the small one, here.

In the 2050, we have: new renewables. hydro energy, biomass – which is depleted and we don't have any left. Therefore taking into account this entire area, only the small portion at the top will be non-renewable in 2050, all the rest will be *business as usual*. These are the forecasts, and this is of course from a very conservative point of view.

But they have alternative scenarios, the so-called ACT scenarios, which I'll show here with different possible solutions. They are all characterised by the fact that coal - with and without sequestration - remains dominant, and as a matter of fact biomass and the other renewable sources are limited to a rate in the vicinity of fifteen, twenty per cent. And again we are talking about 2050. Hence there is no solution.

So the first and second generation technologies cannot offer real solutions to change the present system. And we can suppose that in 2050 at a rate of fifty giga-tonnes per year of emissions we will get only to two per cent until 2050. Do you realise what I'm saying?

So what can we do with renewables? There are different options: essentially I'm talking about electricity, biomass, geothermal,

wind, hydropower, which account for these small percentages. Then there is also solar energy, which is a great opportunity in the Saharan region, not in Europe in particular.

In continental Europe, biomass, geothermal, wind energy and hydro power, solar energy are quite limited. But we should tap these resources if we wish to achieve in 2030 the four thousand watts per hour that we need. And the great solution is given by the opportunity of producing Concentrated Solar Power, coming from Africa.

Here you can see here solar power in Europe. And this blue line is logarithmic and we have a factor of ten, a hundred and almost a thousand. So Africa with Solar Concentrate can produce one thousand times as much energy as Europe with this same type of renewables. This can provide inexpensive, pollution-free electric power. And it will never be limited by resources or by construction materials. And through the High Voltage Transmission it is possible to send energy to Europe. This is the ideal model we have in mind.

In Europe in the year 2050, the blue dots are wind. The hydro energy are the blue dots and biomass is shown in green and then the huge quantity of energy produced from solar sources, which is transmitted through high tension lines to our system.

The forecasts are very optimistic and they say that in 2050 we can even reduce the use of oil and gas and replace them with CSP – Concentrate Solar Power - plants. And these plant will be

mainly concentrated in Africa and then energy should be transported to Europe.

In order to get an idea of the scope of this...this chart represents the amount of solar thermodynamic energy that would be necessary to replace the global or European production of electric power in both 2030 and 2050.

The other possibility, along with CSP, is biomass, which is not ordinary biomass, but innovative biomass. I would like to show you a last diagram, to give you an idea of another great opportunity. These are the traditional biomass: rape, corn, sugarcane, sorghum... And these are innovative plants that have an energy efficiency equal to two per cent of the solar energy they receive.

These are new plants that could be an important, innovative development brought about by third-generation solutions and they could replace oil and coal.

I believe that with these alternatives we can tackle the problem, otherwise it would be impossible. And in the research and development of these sources – which are perfectly feasible and relatively inexpensive – lies the possibility to offer a technological alternative to the risk we run by burning fuels until depletion.

Conclusions. The current trends aren't sustainable in terms of global warming. There is a huge contradiction between what we would like the world to be in the future and what we risk it is actually going to be. We inexorably move to a future society

dominated by coal, which is the worst of all fuels, and would certainly cause serious damage to the environment that would continue for several thousands years, as I've shown in that diagram. We are talking about...the time elapsed from the Romans time is the time we are taking to heal from what they did to the environment. I just would like to remind you that half of the carbon dioxide produced during the great fire ordered by Nero is still up in the sky, absorbing solar radiation...

The present World Energy Outlook reveals that the energy of the future is dirty, insecure and expensive and these are the problems to solve. And these trends will increase vulnerability to severe supply disruptions, because there are few countries that have all resources available. For instance, one third of natural gas is in Iran, one third is in the former Soviet Union and one third in the rest of the world. As for oil, you can see that OPEC is dominating. These trends will also increase the magnitude of the global climate change, whose effects are widely unpredictable.

So this is no sure path, because we are not sure if we neglected a factor that will suddenly spring up to our attention and it will be too late to do anything...we run the risk of bad and big surprises. Then there is another important aspect to be taken into account by policy-makers. There is a big gap between political rhetoric about Global warming and the reality of budgets. This becomes clear when you look at the limited amount money that is invested in renewable energies. And therefore there is still a long way to

go in order to persuade the most conservative parts of our society. Europe is doing its best, but we shouldn't forget that account for fourteen per cent of global energy, while the rest is absorbed by other countries, by the U.S., by China and Japan, which have still to come round to this kind of solutions. And indeed we still have to work within the G8 to convince these countries, to convince them that this is a global problem.

So a new vision is urgently necessary. Only a prompt, powerful effort of research and development of innovative energies with sufficient funds can change this situation, which is coal and carbon-dominated. New research and technology development are urgent and necessary.

This is a tremendous and inevitable responsibility we have towards future generations. For me, actually, it doesn't make much of a difference if there is global warming or not, but for young people, who are starting their life, they really need to know what to do and this is an urgent problem that we can no longer neglect nor can we postpone it.

Thank you.

ABRAMI Antonino

Thank you, professor Rubbia. So we can resume our work. Let us go on with the Minister (*incomprehensible*). We had invited before Mr Garlick to take the floor. We stop now the scientific aspect of the topic, we go back to the legal aspects and then we will have

professor Ruffolo. And then we will have Mr Korndorfer is already ready for the connection. Is the connection working? Mr Garlick I invite you to wait for little bit more. Welcome, you have the floor Mr Korndorfer.

KORNDORFER Christian

Good afternoon, ladies and gentlemen. I'm spoken about the situation in municipalities are affected in climate change in a very complex manner. And here it is the same for German cities. So here I only have ten minutes and I will try (*incomprehensible*) using examples – how are we going to react to climate change in my own town of Dresden.

Next slide, please.

So most German cities are member of the Climate Alliance of European Citiesand obliged themselves to half CO₂ up to the 2010. You can see there is a blue line, but previous climate policy has failed. CO₂ is stagnating even increasing about eleven tons per capita per year. So with regard to the responsibility for climate change, the city has decided to go on reducing CO₂ emission, which is the green line, by at least ten per cent every five years to reach a value of two tons per capita and here it should be a sustainable value.

Next slide, please.

But so climate change goes on shifting the main values of meteorological parameters and widening the variance. Roughly

spoken, our weather will be warmer, more extreme, with droughts, hails, storms and sometimes flooding.

Next slide, please.

In 2002 (*incomprehensible*) flood in Dresden caused four victims and damages of one point three billion euro. In 2003 and 2005 cloud periods never reported before came, since the spring flood of 2006 and hurricane (*incomprehensible*) 2007, with extreme damages. These indicating predict changes.

All German cities will be affected. Hamburg, for instance, more by sea level rise and storms. Stuttgart and Frankfurt by overheating and Dresden by droughts and flooding. (*incomprehensible*) we initiated an interact three-Cs project, EMICA that means adaptation and mitigation and integrated climate policy approach, for exchange of best practices and development of adaptation strategies together with other cities and regions. Venice is partner too.

Next slide, please.

In the following I will show some examples how Dresden is going to respond on climate change, which is even ongoing or it is expected. As predicted droughts become more frequent, lasting much longer as before to ensure water supply and so we protected now a new drinking water protection area and have fixed it in the city of Dresden.

Next slide, please.

In opposite to the risk of floods, especially for flash flood (*incomprehensible*) tool. Here you see a map of the city and all these coloured shapes show our flood protection area, which we have fixed by law, this means that through three thousands hectares of flood protection area now cannot be built with settlements.

Next slide, please.

Where it is possible, decentralised detention reservoirs and polders are established. This here shows a former public (*incomprehensible*) in a public park, which is now changed into a flood polder.

Next slide, please.

For the very, very hazardous rivers coming from the mountain sites into the cities, we have decided to widen the riverbeds and deepen it to increase the cross section.

Next slide.

These town parts – especially the inner city - especially vulnerable are protected by special walls or dikes.

Next slide, please.

We have established a very extensive cooperation with Czech Water board in (*incomprehensible*) and experts from Prague, like EHI (*incomprehensible*). Due to common research project, this project shall give us an answer to the question: which flood incident may occur in the future? Since it is important for our effort

in Dresden, on a comprehensive plan on flood prevention for Dresden in the future.

Next slide, please.

Now back to the more probable drought events. We have established a system of natural rain water management, to reduce surface drainage and to (*incomprehensible*) of precipitation into ground water.

Next slide.

Another topic is the overheating of the inner city. Despite of its own decisions for adaptation management for climate change, Dresden City Council gave order to reconstruct a central place and – as you see here – to seal it completely of its pavements.

Now citizens and tourists call for trees.

Next slide.

This map shows the landscape plan of Dresden, which is now been established. I think we need quite another basic structure of city for the future, a dense network of green areas and belts between dense (*incomprehensible*) areas. Between links have multiple of threatened species, drought, water formation, and – next slide, please – like this here, which has been a former industrial area, which has been transformed into a retention volume, a green belt. This detention volume is protecting the inner city in case of flash floods, but it also works as a pass for fresh and clean air into the city.

Next slide.

We need high-quality buildings, saving energy for heating as well as for cooling. This is a kinder garden (*incomprehensible*).

Next slide, please.

These (*incomprehensible*) which generate extreme need of energy for air-conditioning are – I think – quite a wrong response.

Next slide. Due to hot summers, there is increasing need of energy for air-conditioning. We have been constructing innovating district cooling systems, using ground water and the waste heat of cogeneration from power and heat of our heating systems.

Next slide.

A decisive precondition for such CO₂-reducing technologies is high density of settlements. The ongoing destruction of such CO₂-saving block flats in the inner city – next slide - and the erection of single house suburbs in the outskirts of the city will not lead to lower CO₂ emissions. Our research has shown that life in such suburbs emits significantly more CO₂ more than the apartment houses in the city, due to higher energy need for infrastructure and transport and traffic.

Next slide, please.

We should not push car traffic any more.

Next slide, please.

(*incomprehensible*) and we have to deal with indirect effects. So we have to expect shortage of energy, of import raw material and food worldwide.

The cost for life as well as for construction maintenance and operation of infrastructure will rise in our cities too. The rise of sea level of our ocean, degradation of fertile land will rob millions of people of their homes and livestock. Increasing migration is one of the possible consequences, not stopping in front of comparable richer cities.

More than ever before city planning has to take care of such long-term trends. Our current prosperity has to be used for generating structure and infrastructure for urban life of the next generations and a change of conditions.

German cities have much better preconditions than cities in other parts of the world, due to their capability to take responsibility and play a pioneer role in climate protection. Rapid and consistent adaptations and medication measurements can even improve the competitive strength of German cities. No frontier will keep out these global consequences of the global warming.

Well, thank you for your attention and great thanks to Mr Badolozzo and Luis Paras for excellent preparation.

Thank you.

ABRAMI Antonino

So we are coming close to the end. Now, we'll listen to professor Ruffolo, then to Mr Garlick and then Ruoss Engelbert and then we'll be in connection with Argentina. Please professor Ruffolo.

RUFFOLO Giorgio

Actually I will be brief, since we are almost close to the end of this very important workshop. Professor Rubbia has perfectly presented the present situation, which is quite dramatic, but he also presented the possible solutions and the economic and technical efforts that are required, as well as the political commitment, which is necessary.

Now we are talking about the new action plan that has just been launched by the European Union. And this is the first time that the European Union undertakes such a commitment, so we must welcome it, but at the same time we have some reserves, some doubts about the effectiveness of an action, which is doomed to be partial.

So after underlying the significant threat that we have to face, the European countries should come to a new global agreement. A global agreement hat should involve industrial countries, which are responsible for fifty per cent of emissions.

And this agreement should aim at a thirty per cent reduction of greenhouse gasses, if compared to the values of 1990s by 2020. And in this way, it should be possible to limit the increase of the global temperature by two degrees centigrade and this is compatible with five hundred ppm of CO₂ and with the reduction of emissions by fifty per cent.

And we all know – and professor Rubbia reminded us of this – that we are now moving in a different direction. It is not that we

are reducing emissions by fifty per cent, but by increasing them by sixty per cent and this increase is almost irreversible.

And indeed the only real commitment is that of Kyoto that envisages five per cent of emissions, but this commitment is actually reduced to two per cent, while all the rest are simply words. And the importance of this European initiative should not be neglected, but when an initiative is taken, then we also have to support it and pay for it.

And now the European Union is ... has stated that – irrespective of the commitments of the other countries – is ready to cut emissions by twenty per cent by 2020. And it is even ready to reach a thirty per cent reduction.

This means that the European Union has taken a decision and now the European Union should be more credible and it should have a greater trading power, but there are some reserves, because the European Action Plan also envisages to move until 2050 with a fifty per cent emission cut.

Therefore - before being so enthusiastic about this new initiative, which has to be welcomed anyway - we should reflect on the limits of this proposal. There are three limits.

First of all, the European goals are influenced by the Lisbon strategy, because in Lisbon Europe promised to become the most dynamic and innovation-based economy, but these goals were not attained, because no coordinated policies were developed. And therefore are these goals put at risk by the Lisbon strategy?

Second problem. The second problem is caused by the lack responsiveness of the other countries, because the other industrialised countries didn't commit themselves to the Kyoto protocol and probably the new European initiative will not be accepted by other countries. Some of them even said that they will not undertake any commitment if the nuclear ban – the problem of the nuclear ban - is not solved.

Then the third doubt is that of the emission trading system. And the new agreement should extend this emission trading. And in this framework, the European Union has invited Italy to improve its objectives.

Now we are talking about industrial emissions. And therefore emissions produced by car traffic, which amount to twenty-five to thirty per cent of total emissions, are not included. Then there are also agricultural emission. Moreover the logic of the system can produce distortions, because the less advanced companies are somehow encouraged, because they can buy a greater amount of emissions and this causes a lack of equity between innovative and non-innovative companies. The countries have wide discretion margins, which can create distortions both in terms of competitiveness and the protection of the environment.

Now I should stress an important point. I should remind governments that the instrument of the market is not successful from this point of view, neither from the point of view of prices, nor from the point of view of emission trading.

The only effective instrument is the fiscal one, that is to say energy has to be paid the real price. But the market is not able to fix the real price, because prices are always relative. We know the price of coal or uranium, but we don't know the price of renewable resources, for example. This comparison is not possible.

Therefore the only possibility is that of imposing new taxes on fossil fuels, that they are no longer interesting. And the revenues coming from these taxes could be used to finance investment in renewable energies. But at present the situation is completely distorted, because there are incentives to increase the consumption of the energies that are lacking, but we do not finance research and development in the field of renewable energies.

We are therefore on the wrong direction, so the problem is of political nature. It's a question of political decisions. And in time mankind has to show a great commitment, because the question also has ethical aspects, not only political aspects. So I'm not saying that the action – the EU Action Plan – is not important. Indeed it is an example, but it is not enough to reverse a situation, which has to be tackled with other instruments.

Thank you.

ABRAMI Antonino

Thank you professor Ruffolo. Although I personally think that the policy of the European Union is particularly important, as it is important the proposal made by Commissioner Frattini on the effort that is necessary to avoid the possibility of avoiding responsibility. We want areas – we want to avoid areas without a very careful criminal surveillance.

And another important problem is that of the ozone layer, as well as the illegal shipping of substances that reduce the ozone layer and this is another important step in the European policy. This is a decision that has to be made before any other decision. I thank professor Ruffolo for his very interesting contribution.

The next contribution again on criminal law and the criminal aspects of this subject is by professor Garlick, a person that is very close to us. He has had very important responsibilities at the Criminal Court of Sarajevo. He has worked for the British High Court. He is a real friend of the International Academy of Environmental Sciences. He has the floor. Paul, you have the floor.

GARLICK Paul

Mr Chairman, ladies and gentlemen, distinguished guests, professors, scientists, the Mayor – if he is still here, I think he is – I'd like to thank you for this opportunity to talk, which I will do – I hope – in a very strict time, that is fifteen minutes.

Let me say straightaway that some of the things that I should be saying are intended to provoke and to stimulate opinions. They are not intended to be – in any way provocative, in a rude sense - but I do think that we ought to start thinking about things.

Could I have the next slide, please? And the next slide. Next.

Next slide.

I want to look at the effects of the EU directive on emissions and I want to really ask and pose for us this question: can the EU directive and this EU emission trading scheme prevent this? And we are looking at the greenhouse, we are talking about greenhouse gasses.

Don't get the impression for one minute that I am against the EU directive or the EU trading scheme. Quite the opposite. They're important tenets of our global fight against global warming.

What I am concern about is the rights of the citizen and – it will come as no surprise to those of you who may have heard me speak on the previous meeting of this Academy – I support what the Minister was saying about the Environment Division of the international Criminal Court and I do that for this reason. When you think about society as a whole, you can think about it in many ways. One way of thinking about it, is in terms of the pillars of society. And I look at it in a rather novel way, I suppose.

To the purpose of my argument, there are really three pillars to human society. There's the state and its politicians. That's the first pillar. There are the large corporations that wield almost as much

power as the state and the politicians now. That's the second pillar. And then the third pillar, which usually comes a very very long way down in the scale, is the citizens. And my question is: is the citizen getting a fair deal? Is the citizen being properly protected? Because, I'm not sure he is.

And if we could go over to the next slide, please?

Let's just remember what article two of the European Convention on Human Rights says. Article two imposes a positive obligation on all the member states of the Council of Europe and it's important to remember that there are forty-six member states in the Council of Europe now. It goes way beyond the European Union and it includes Russia. The article two includes an obligation on member states to provide a legal regime that effectively protects life, because the right to life is enshrined in article two.

And this obligation to protect life requires the states to protect individuals from identifiable threats to their life, arising from environmental hazards. It's an obligation on member states. It's not derogable. It's an absolute obligation.

And equally, if you look at the European Chart of Fundamental Rights, which of course does apply only to EU states. Article two, one expresses a similar right. The right to life. And this right to life has been very very much challenged. Look at it in football terms now. We've been shown the red card from everything we've

heard here today and we can't anymore ignore the foreseeable consequences. We have got to do something.

Next slide, please.

So let's just look for a moment at the traditional concept of criminal liability. Because I'm concerned to explore the possibilities of criminal liability. And in common law jurisdictions like mine, or in civil jurisdictions like Italy or France or Spain, there are really four concepts of criminal liability. An *actus reus*, an act that is done by somebody – a person or a corporation – which causes damage, either financial damage or, more importantly, physical damage to people. There's a causation between the act and the damage and there is the concept of remoteness.

Next slide, please.

Now this problem about remoteness and territorial jurisdiction is the real problem that we face.

And it's the thing that it's protected in my submission. Corporations (*inaudible*) properly by criminal law. States escape liability, because criminal law is usually based on territorial jurisdiction. So if an environmental hazard arises in one member state or one state, and then it moves to another state, for example Chernobyl, Bhopal, all those traditional hazards, it's very difficult for one state to prosecute the crime against somebody – a corporation or a person – in another state, because of this concept of territorial jurisdiction.

And the result that we have seen is that corporations cannot be prosecuted, not properly and not equitably at the moment. And the result is that individual citizens have no remedy – no effective remedy.

Next slide, please.

Now, let's just look at the EU directive on emissions. It enforced, it brought about the EU emission trading scheme, which is extremely important in terms of member states' reaction to the problem and plans for the future.

But it's done nothing to force corporations to cut emissions. What it has caused is in fact a huge market in emissions trading, which is now making money for a great number of people. And in reality it is doing little to force corporations to cut down on their emissions. All they're doing is buying tradable emissions from other sources and then trading on them and making a great deal of money. That is not giving an effective remedy to the citizens of the EU or anywhere else.

The EU directive on emissions has created no criminal liability on an international basis for corporations, the very people who are causing these emissions. And no member states - who is a member of the EU - are accountable.

Next slide, please.

The question: is the EU directive actually achieving Kyoto standards? Is it causing member states to achieve Kyoto standards?

Next slide.

Well, this a list of the countries that are not on track for the Kyoto responsibilities. We heard about Italy. And of course just last Tuesday the European Committee cut back Italy's national preparation plan by – I think it was – six point eight per cent.

It's not causing a measurable improvement in the situation.

Next slide, please.

These are some member states that are way off Kyoto tracks. Cyprus and Malta, both member of the EU, don't even have a Kyoto target.

And Turkey – next slide, please – is not an EU member. And this is the next great problem. The EU directive does nothing at all in connection with non-member states. We have looked at Turkey, but what about China and India? Nothing, at all.

Next slide, please.

So is this an effective remedy? I'm just going back to our Charter of Fundamental Rights, article forty-seven: "Everyone whose rights and freedoms, guaranteed by the law of the Union, are violated, has the right to an effective remedy before a tribunal". Well, let's just pause and consider the question: do our citizens have an effective remedy at the moment?

I want to propose something which is quite controversial, but it may be a way forward in the EU. And it's not something which is novel. The EU has a number of framework decisions now, which involve criminal justice and have unified the laws throughout the

European Union. So my proposal, controversial as it is, is that there should be a new international offence, criminal offence. International in the sense of the EU, anyway. A European emission offence. There should be jurisdiction within the European Union, for the Union, for the Commission or somebody to take criminal proceedings in any jurisdiction of the EU against the corporations that, knowingly or negligently, causes unlawful emissions and it should be prosecutable in every member state. No matter where the emission arose.

There should be new European warrant. So that a warrant can be served on corporations anywhere in the EU and investigations can be facilitate properly throughout the EU.

And also there should be a European closure order, so if some corporation does start – negligently or knowingly – causing unlawful emissions, they can be closed down immediately by a European closure order.

And that would link very nicely with the present procedures of the proposal for an European evidence warrant. So we can gather evidence against corporations who hide behind this corporate veil and prosecute them properly.

We can prosecute them by looking at what their managerial decisions were. Looking at what are the risks they take, because we know from experience that there is a big gap between corporate profits and environmental imperatives and usually

corporation favour their profits at the expense of environmental imperatives.

And if you are able to look into the company minutes, the minutes of the Board of Directors of these corporations, you will find the evidence that you need to prosecute these corporations and we need that.

What we need is the mutual recognition of an order from one member state by all member states, so that we can tackle this environmental crime properly, on a European basis.

And that – I think – may have the effect to some extent of preventing corporate impunity for knowingly or negligently causing vicious emissions.

Next slide, please.

Grazie per l'attenzione. Good night and good luck.

ABRAMI Antonino

A typically British conclusion. Thank you, Paul. Thank you for your stimulating contribution. We will have to reflect and make an active ... adopt an active approach on your suggestions.

I'll now give the floor to professor Ruoss Engelbert of the UNESCO here in Venice, and then there will be a very short connection with Argentina. Actually they have been waiting for a long time, but we are not able to be connected with them.

Perhaps there will be a small surprise at the end. We have one or two minutes for this small surprise from abroad. Professor Ruoss.

RUOSS Engelbert

I actually find it amazing how much we know and how huge the political programmes are. And in the same time – and maybe you think the same - it's astonishingly how little we are effectively implementing.

And I think this is one thing for me being thirty-five years in the environmental business and seeing that we are facing still the very same challenges that have been outlined already by the club of Rome and other people.

And we feel paralysed when we look to the needs of the implementation of all these facts we have been presenting today.

Unesco is focusing not only on the environmental issues. Unesco, the UN organisation for education, science and culture is contributing with science, environmental and culture and sustainable development approaches to improve human security through a better management of the environmental and heritage, through capacity building in culture, science and technology for development that seeks to enhance human and institutional capacities with time and technologies to allow the widest possible participation in the knowledge society and to advance policy to social needs.

So our vision is to contribute with creativity in science, culture and education to the benefit of society. Unesco is not the organisation who makes research, who is having itself a policy in culture.

We are almost promoters and brokers of science, culture and education. Our vision is to safeguard cultural diversity, intangible and tangible heritage, as well as resources on our planet, to advance and sharing of knowledge, through application of knowledge to sustainable development, to contribution to science and culture to peace, understanding the role of ethics and science and technology and to promote equity of access to knowledge and benefits.

So the dimension we are talking about today is not just an environmental issue. We are talking about conflicts, about human resources, about social needs. And I wonder if society is doing what policy wants in the future.

Unesco has started already a few years ago to involve a huge part of its programmes into the climate change debate. We have climate science programmes, fourteen. This is going from climate research, to hydrology, eco-hydrology, coral bleaching, fishery, oceans acidification, dry lands desertification, etc.

There are eleven adaptation programmes from (*incomprehensible*) urban water modelling to coastal adaptation in Africa, climate in the world heritage sites, indigenous knowledge, disasters reduction, etc.

We have another six climate monitoring programmes, like global climate observing system, ocean observation panel, integrated global carbon observation strategy, etc.

And we have three mitigation programmes. One is renewable energy, bio-sequestration, conservation and carbon sequestration. You see, the main focus of Unesco is the transfer of knowledge to society, to implementation.

So in the future Unesco will concentrate on adaptation programmes and not so much on mitigation programmes or environment programmes, which area actually to be considered as the duty of the national institutions and national bodies.

As office for science and culture in Europe, we are mainly cooperating with Italy from here, from Venice, as well as with the local governments. And we have the IPCC centre for Applied Physics, we have in future partnership for environment in Trieste. We will have from November the World Water Assessment Centre in Perugia.

And together with the Italian government we intend to contribute to the development of the post-conflict area in south-eastern Europe. And if you look to this area, it is a huge challenge on the one hand to enhance the ability and peace in an area where we have had a lot of conflicts, on the one hand; and on the other hand, develop all of them who want to join the European Union and want to get on the level of development as the western European countries.

And this is very difficult to communicate. So in order to maintain the development and at the same time to save resources, peace and stability of our planet, we observe some major bottlenecks,

which are: we need people with responsibility, commitments and courage. We really miss them. A lot are talking, a few are really acting.

We need clear decisions, based on new scientific results. If I look at Tagliamento, which has been mentioned today, where they would like to implement a biosphere reserve according Unesco, and at the same time we are talking about this *casa di espansione*, or the motorway from Friuli to Veneto, that is something wrong.

We have to decide where we want to go. Do we want to have sustainable development? Do we want to implement the concepts which have been presented today? Or do we want to continue the development as we have done it thirty, forty years ago? We have to decide.

I'm looking to you. We have to decide where Venice has to go. And probably it's not the most popular way to go. And to bring people behind the Mayor of Venice to go will not be so easy.

And we have a lot of research. We know actually already a lot. But what we need is an impact-oriented policy now. We have to implement, we have to do it. And not only to talk about.

We need to cooperate. Everybody is talking about cooperation, but it's not so easy to cooperate, to be involved. The population, the public needs to be involved in whole process from the decision down to the implementation. So we need an increased

solidarity and we have maybe also to improve our communication with society and all the stakeholders.

So we face in the future really a science policy, in order to create a knowledge society. For us maybe in south-eastern Europe, on all levels: ministerial, university, academy, as well as society level.

We will increase scientific studies and training linked to climate change, maybe in connection with integrated territorial development, but also methodologies of conservation and implementation.

And think about how can we transfer all this knowledge – methodological - in order to accelerate the change process? We will focus on capacity building to create a cooperative learning process. We would like to establish cooperative government structures. And we look to south-eastern Europe. It is not yet realised. We want participative processes involving all the stakeholders concerned. We want to contribute to the solidarity process in conflict areas, establish ethics in environment and risk prevention.

And in this convention I would like to mention - actually in contrast to what Minister Pecoraro Scanio has said about this new environmental organisation – we are at the moment starting the UN reform process. We are actually doing the contrary. We bring together all the agencies of the UN system in order to implement a common strategy for sustainable development in each country.

And we have selected eight pilots and one of the pilots is Albania. And we will start, already next Monday, in Tirana the establishment of such a programme, in order to have, in the direction we have seen, not just a programme which helps Albania to join the European Union, but which really helps to establish a sustainable development including climate change issues, environmental issues, social issues, in the whole concept. And we intend to have in 2009 already twenty countries, which will mean that we will have in our area, south-eastern Europe, already four or five nations which will follow the integration of all the agencies from Unicef, from UneP, Undp, etc. including Unesco in one UN system, in order to serve in a more efficient way the establishment of the social issues for tomorrow.

We have a major issue in connection with climate change. We have just issued a case study on climate change world heritage, treating with topics like the melting of glaciers, Kilimangiaro, (*unclear*) etc which will lead to a lack of water resources for nature and water supply, which will lead to a decrease of biodiversity in our heritage sites: great barrier reefs, (*unclear*) etc. damage to the archaeological sites, like Njavi in Peru or the islands in Canada, the golden mountains of Altai, etc. and finally Venice.

As often in Venice we intend to intensively cooperate with Venice, with the Region, with the Ministry of the Environment in order to protect Venice and its cultural world heritage site.

And I invite all our partners to establish a common programme, not only for Venice, but a series of towns, and we have integrated already twenty-eight foundations safeguarding Venice, as well as foundations which are concerned with the future of New Orleans and other towns in similar situations.

And we invite all our partners to contribute for the future, not only to study the lagoon and Venice, but in order to avoid what is written here on top of the journal. I really invite to focus on the implementation, the transfer of knowledge and the involvement of the people in these regions, which are concerned in connection with world heritage sites.

Thank you.

ABRAMI Antonino

We have now the connection with Argentina. I would invite our friends in Argentina to be very short, because it is very late. We are all rather tired. Lilian Corra, Diana Carrero and president Esquivel. Lilian Corra. Is she connected now? Can you hear me?

CORRA Lilian

Yes, a little bit far, but the important thing is that you can hear me.

ABRAMI Antonino

Lilian, a brief greeting of yours and a very very brief report. I really invite you to be very short. You will certainly understand that today we have had some problems in connecting with you.

CORRA Lilian

I will be as brief as possible, because my message is very simple. I thank you for your invitation and I think that what I have to say on the fact of climate change has already been summed up by the Minister when he said that the test on climate change is going on with us inside the testing site.

We have to measure the consequences of climate change in terms of health, of social measures, because the consequences can be very serious and it is very difficult to foresee the consequences for the scenario we will live in.

Two brief remarks.

First. We are not only referring to the climate change, we are also discussing human health and environmental health. We are discussing from multiple stances and multiple effects of the climate change that must become as effective as possible. I am very concerned for the exposure to toxic chemical substances and the lack of an adequate law.

I will stop here after drawing your attention on one last item. It is very important to pay attention to the most vulnerable subjects, that is to say children of less than five years. The theory of the

fact on human health shows that the most affected by the impact of climate are children of less than five years of age. We need new measures to protect them.

We always mention 2020 and 2030. I'm really concerned instead of this year, of next year, of the next two, three years and of the closer effects for our health.

I'll now pass the floor to professor Carrero, if you agree.

ABRAMI Antonino

Lilian? Can you hear me, Lilian? A very brief contribution by Ms Carrero, because we don't have much time unfortunately.

CARRERO Diana

Good afternoon.

(bad reception) Argentina has seen on the media that fuels are neither good, nor bad. They are inevitable. Biofuels are inevitable. What is biofuel? Biofuel...we are producing bio-diesel, that can be obtained from soy beans or sunflower seeds.

What happens? How much does an hectare of soy or sunflower yield with the production of biofuel? The production we have is ten kilos per hectare...a hundred kilos per hectare.

Latin America is the greatest world exporter of soy oil and sunflower seed oil in the world, that are the major sources for the production of bio-fuels. We had a production of ninety million tons this year.

We apologise, but the quality of the connection is very bad. We cannot hear what the lady is saying.

We are important producers of this type of food product. In Argentina we should live in heaven from this point of view, whereas it is not so. Unfortunately. We are experiencing record yields and this is causing some problems for our country. For example the loss of nutrients from the soil. We are losing a hundred and twenty kilos of nitrogen per hectare, ten kilos of phosphorous, forty kilos per hectare of potassium. And this brings us to reflect on the fact that are we extracting nutrients from the soil.

We are losing other fundamental minerals like gold. For how long will it be bearable for the soil, for the agricultural soil to have this type of exploitation? We also have a loss of forests, because from the beginning of the Twentieth century to nowadays, to current days, we have lost seventy-two per cent of our forests.

ABRAMI Antonino

Ms Carrero? Ms Carrero? Can you hear me? We have really serious difficulties in listening to you. We do not see you. I would invite you to stop, because we really find it very difficult to follow you. We thank you for your contribution. We thank you and Ms Corra.

A couple of minutes. I give the floor to someone very special. He's the only European who's been...he has followed Al Gore

courses, he's the messenger of Al Gore in the world to disseminate Al Gore's message on the environment. He comes from Venice, Mr Verà, who will make a brief contribution. He's welcome.

Mr VERRA' (??)

I'm not taking your time now, because everything has already been said.

What Al Gore is trying to do is disseminating the problem to the six and a half billion people inhabiting the earth. He's convinced that unless we make everybody responsible for the problem, we will not solve it. And we have to solve this problem.

So this is the only thing that had not yet been said today. I think that everything else has been already stated. I totally support what professor Rubbia has said, so I will not add anything more. And I thank you for inviting me.

ABRAMI Antonino

The floor now to Massimo Cacciari.

CACCIARI Massimo

The workshop has totally responded to the requirements of the administration that has organised it. A number of emergencies have been stressed: temperature increase, the anthropic cause for these events and we have discussed effects.

As regards effects, the range of the forecasts is very wide and this has important consequences on the measures we have to take in order to face emergencies.

Over and above the long-term policies that have been discussed and I'll not touch upon this, because I think that Ruffolo's appeal to realism is extremely correct.

In my view it is a global political issue and also Al Gore's appeal goes in the same direction. It is very difficult to think of a global policy that has to be at a global level. Thinking in long-terms, in a global scale is very difficult. Policies are generally short-sighted, in particular democratic policies. The policies of the great empires have long times, have long-term objectives, whereas democratic policies are short-sighted and short-term policies.

We need a cultural revolution, as professor Rubbia has stated. If we do, then it must be a global reform, and it gets even more difficult. We should ask China and India to be virtuous, when he haven't been virtuous for centuries.

We need some realism. It is at least advisable to be as realistic as possible. And naturally Venice will never end like this. In order to finish as we have discussed, the level of the sea should rise by fifty metres, not fifty centimetres.

Even if we suppose that there will be a sea level rise of fifty-sixty centimetres in the next century, Venice would not end like this. There are very simple systems that have been adopted elsewhere – in the Netherlands for example – to protect parts of

the world that go beyond the sea level. It is a nonsense to think that Venice will finish like this. It is just a mere, silly way to perpetrate the myth of the sinking Venice.

If the most pessimistic forecast refers to fifty-sixty centimetres, we need fixed dikes, barriers. That's it. Full stop. This is the problem. We need fixed – do we need fixed permanent dikes or what else? This is the precautionary principle, because if the precautionary principle suggests that we have to adopt the worst possible forecast – fifty to sixty centimetres – the most simple system is a fixed system of barriers to save Venice and then we should think of a pumping system to have an exchange of water for the lagoon, even with fixed barriers.

This is the point we have discussed and re-discussed so many times. If we adopt this precautionary principle, so the workshop today – to go back to our own problem – we might say has stressed a number of issues.

First of all. The range is very wide. You say fifteen, I say sixty, I say day and you say night. As far as the policies I have to adopt in order to face the risk, if scientists are telling me that I have to adopt - because we are in the testing site - a precautionary principle with a sea level rise of fifty-sixty centimetres, the system that has to be adopted requires fixed barriers.

What else? Is this logic or not? Because in this country, this doesn't seem to be the correct reasoning. I think this workshop has clarified the ideas on this subject. And the problem of the

rising sea level is not the only problem of the lagoon. This must be part of an overall ecologic approach.

The lagoon is not only affected by the sea level rise as certainly professor D'Alpaos has explained to you. I wasn't here, but I know what he was saying. The lagoon has a lot of other problems. Loss of sediments. It might be turned into a part of the sea, also without sea level rise, because salt marshes are disappearing. It will be turned into sea and it will no longer be a lagoon, because of the erosion process of the loss of sediments. So we should face all of these problems together. Not only high tides and rising sea level are rebalancing of the morphological situation of the lagoon. This is all part of the problem.

And then resources go in the wrong direction. Studies and research go in a certain direction. They do not deal with the morphological rebalancing. So an ecosystem is like the Venice lagoon and if we continue like this, we'll probably be lost.

We need a systematic approach to the problem. I cannot limit myself to focusing on the increasing average temperature and the reflect on sea level. We should approach these issues, these problems on the spot. Let us look at New York, Venice, Calcutta, Shanghai. We should analyse the systems as systems.

I thank all the speakers, in particular Nino for his effort. This workshop is very important for the Municipal administration of the City of Venice and we shall try to act in line with the conclusions you have drawn.

Thank you very much.

ABRAMI Antonino

Thank you, Massimo. The Academy of course is willing to deepen the discussion on such issues and we shall start from the first conclusions.

I will summon the scientific committee within the academy. We will discuss all these issues and we will see what the future perhaps can be.

Now I can see Adolfo Esquivel. Hello? Ok, can you hear me? Well, Adolfo, we have come to the end of this long day and I know that some time ago you took part in a conference on climate change together with Marcello Conti and now together with professor Rubbia, this Nobel Prize winner for Physics, while you were a Nobel Prize winner for Peace and I believe this is a perfect and symbolic combination, because the issue we are discussing today involves several aspects of life, of how life should be lived.

Now I'll give the floor to you.

ESQUIVEL PEREZ Adolfo

And the same to you, Nino. I'm very glad to be able to listen to you and to see you. Unfortunately this year I'm not attending the workshop, but I hope I will be there next year, so that I can share this experience with you and not through this technological instrument.

I would like to greet all the audience. Can you hear me? Are you listening to me? I believe that the system is no longer working. At present I can't hear anything. I believe there is no longer a connection. No, actually you can close the conference together with professor Rubbia.

ABRAMI Antonino

I don't know if you are able to follow our conference, but we came to some conclusions and I highlighted the seriousness of the problem, but also the need to further study specific problems and how to react to the situation at political level.

We discussed the serious and important problem of climate change and now together with professor Rubbia you are invited to conclude our proceedings.

ESQUIVEL PEREZ Adolfo

I would like to greet professor Rubbia. I'm very glad to see him and I'm very happy to be able to share this moment and to follow a small part of this conference.

Actually, it is true what you and the Mayor said that it is important to stress the political and cultural nature of the problem. And from a scientific point of view, it is very important to restore the balance in our environment and nature, because nature has been severely damaged. At present economic power tends to pursue financial

capitals to the detriment of human capital. And this is a serious problem nowadays.

Secondly, these problems affect the entire world, that is to say deforestation, the problem of floods, the depletion of soil and we are also working on the problem of chemical substances used in agriculture, because pesticides are used in an irrational way, even on population. And this is remarkably changing the quality of life of people.

I received information from the United States – for example – that bees are disappearing and they are disappearing because of industrial solutions. Apparently each country has its own problems to face.

And we have to safeguard nature, because we are destroying it. Public policies are necessary, because governments at present are not implementing the public policies and together with Marcello Conte we are working on the creation of a grassland in Uruguay. In Argentina there are eleven plants for the production of paper, but they are polluting this area very much and from a scientific point of view, it should be said that politicians should not exploit facts like this, because now we are trying to solve the problem.

You sent a letter to me some time ago and it has been circulated so that it can be signed by scientists and the government and this letter should be presented to the UN to obtain a commitment for the safeguard of the environment. Because if we do not take care

about our planet, about the Earth, we'll lose our home. And those who destroy their homes, they also lose their culture, their lives and they even jeopardise future generations.

I would like to say to professor Rubbia – well, I would like to ask him what he believes it could be done at cultural level and how can we combine our efforts to solve these problems, because many people are working in this direction all over the world and they are also working to solve the problems of water resources.

But we know that water is much polluted all over the world.

And to conclude I would like to say that I am very worried about the pollution caused by wars. An example is what is happening in Iraq, in Afghanistan, in Colombia, in all those countries where wars are being waged. Conflicts heavily pollute countries and the Secretary General of the United Nations has set up a committee that should deal with the role of corporations, multinational companies, because we care about the territories where they set up their plants.

The Indian person here talked about bio-piracy and patents. These people acquired the patents and now the fact that they hold them is quite worrying. And when dealing with the environment, we have to consider it in a global perspective.

We have to communicate not only with governments, but also with companies and citizens. We have to touch the conscience of all people. We also have to voice your worries.

RUBBIA Carlo

Thank you. I'll add something to the conclusions. This conference was extraordinary.

We discussed a series of problems. We discussed a series of solutions and possibilities and undoubtedly all speakers – those who are here, those who are abroad – they all agree that the diagnosis of the problem is that we are suffering from serious problems. The problems affecting the glaciers and other phenomena, the rise in temperature, extreme events, so there is a long and terrifying list.

And there are no doubts about the seriousness of our present situation and something must be done urgently. We cannot wait until the year 2100 to know what to do. But we have to act tomorrow, or at least as soon as possible.

If the diagnosis is so clear, the problem is therapy.

The politicians, Minister Pecoraro Scanio and Mr Ruffolo and Mr Bianco said there is a tendency by the European Union to take a positive and aggressive stance to try and convince mankind that it is now necessary to carry out a real cultural revolution.

However we cannot forget that fourteen per cent of energy is produced in Europe, while the rest is produced by the rich countries such as the United States, Canada and Japan, on the one hand and on the other hand by emerging countries such as China, Korea, India and then all the other countries. And the

emerging countries have already exceeded the CO₂ emission level of the industrialised countries.

And of course now they have also greater access to natural resources, but these resources are not infinite. Because now every year, we consume one million years of energy that is accumulated in the Earth.

And therefore natural resources are very limited. The most difficult task is to convince the rest of the world that the ideas that are been developed within the EU are valid. And if the European Union was not there, now we would simply be talking about theories.

We need to convince industrialised countries and developing countries that this is a moral responsibility of the whole of mankind. Otherwise we will continue to waste resources.

But however I am optimistic, because I like what has been said also about the Lisbon strategy, i.e. several promises were made, but little has been done. Actually I believe that the European stance has repercussions also at national level. So the European ideas are pilot ideas.

Now we have to start a reform concerning the principles of energy all over the world. So we were able to start this strategy with a certain advance and I am confident that in ten or twenty years, everybody will be convinced that we cannot possibly go on like this.

And the fact that we have already started will bring great advantage to us that will turn into jobs or new technological developments. And the Lisbon strategy will probably be implemented in the field of environment.

I therefore wish that public opinion remains compact within Europe, because, actually, the way the situation is shaping up is that we all have to change, otherwise we will all die.

Thank you.

ABRAMI Antonino

We can close our conference. We thank Adolfo, we close the connection. Actually on the next conference we want you here with us, ok? Ciao, Adolfo, see you next time.