THE WORLD POLITICAL FORUM

ENERGY FOR A SUSTAINABLE FUTURE

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INDEX

Mercedes Bresso, President Piedmont Region; Co-President The World Political Forum, Italy

The World Political Forum has organised this conference to coincide with the forthcoming Copenhagen summit at which the Forum will present a memorandum on energy for a sustainable future discussed and approved by Brussels a little more than a year ago.

The World Political Forum concerns itself with issues of global importance and of the many that we have debated, this one on energy is one of the most important. We are all aware that scientific knowledge and technology serve no purpose unless backed by the conviction of governments and citizens. The battle can only be won by doing what we have expressed with the slogan "Unite your Energies", and that means the full involvement of citizens, business, young people, researchers, the scientific community, public bodies and private institutions, in other words all those who can and must make a contribution to the battle to transform our economy and our way of producing energy totally within the next few decades - we have very little time and we have to move quickly.

The decision to create a link between this session of the World Political Forum and Piedmont's own renewable energy campaign is one way in which the Forum applies the well-known principle of thinking globally and acting locally.

Although there has been some change since the election of President Obama, for some time the green economy has been the subject of caricature by the enemies of authentic progress. Our objective is definitely not pauperism but pauperism would be one of the inevitable results of an energy production model based exclusively on fossil fuels. This was already evident before the crisis when the sudden development of a number of large countries caused a huge increase in energy prices and this itself made a significant contribution to today's crisis.

The energy of the future can definitely not come from oil but from the use of ever more advanced technologies able to exploit to the maximum the enormous quantity of elements already available in nature. These technologies and the resulting energy will form and are already forming the basis of a new phase of prosperity that will be helped by the enormous development of Information and Communication Technology (ICT). This will carry the green economy and the whole sector of renewable energy towards the future and these two closely-linked technologies have the same enormous potential for distribution as the Internet. In our use of the Internet, we have all become producers and consumers of information; we no longer passively absorb news exclusively from the television, but we are gradually learning to be both producers and users and exchange news with others. In the same way renewable energies and the entire green economy will make us both producers and consumers of energy and this is what will connect ICT and

the green economy. In order to be able to do this we will need to use a whole range of technologies.

For the same reason we are convinced that the widespread availability of new forms of energy will reduce social conflict and reduce tensions at an international level; wars fought for oil masked as attempts to export democracy is something we have witnessed constantly in recent years and we know that in many cases the real reason has been to guarantee an oil supply. If energy sources of unlimited quantity, such as solar energy, can supply an entire city in the south of Sweden then the same can be done anywhere in the world and at the same time reduce international tensions.

To return to the theme of energy for a sustainable future, it must be made clear that this expression does not describe a concept that concentrates on the finite nature of resources but rather refers to the theme of sustainability over time. I believe the real challenge is to create an economy that allows each one of us to live well today but leaves the earth intact so that future generations can live well or even better as a result of the sustainable technologies and the potential for a better future that we bequest. Renewable energy is the central point of a green sustainable economy – societies grow as per capita energy consumption grows and therefore without energy there will be no development. The problem is to prevent energy from destroying our environment and so energy must come from that enormous reservoir of renewable resources which in our oil-obsessed age we have referred to so little.

I wish you all a successful conference and would just like to mention that this is the first year of Piedmont's "Unite our Energies" campaign and in coming years we plan to report on the results of the huge investments that are already in place and convince people that we have to unite our physical and intellectual energies not only in terms of energy production but in terms of intelligence and resolve and in this way achieve our sustainable goals much sooner. I hope therefore that our speakers will provide ideas and suggestions because the most important renewable energies are human intelligence and resolve and this is the main objective of this Forum and of Piedmont's energy campaign. If Piedmont can do this then we will reach our target and reach it before many others. By pushing the bounds of the possible, our capacity to return to the rhythm not of gross material growth but of important development will be dramatically enhanced. Development is a complex thing but it is essential that people have objectives and goals and a desire to achieve, without this you go backwards. If we can achieve a common focus on our future then we can do it.

Mikhail Gorbachev, President The World Political Forum, Russia

I am here at Bosco Marengo for an international meeting which tomorrow will celebrate the 20th anniversary of the fall of the Berlin Wall and the great changes which it caused and which are still apparent today.
And I am also here today to open discussion on the energy of the future. It is of course a coincidence but nevertheless there is a connection between the two things and it is here that I would like to share some of my ideas with you.
The rise and fall of great powers, empires and entire civilisations at any time in history have always been connected to the level of their technologies, or rather to crises connected to their technologies at a certain moment in history and in particular the way in which they have been able to procure the necessary energy to develop and prosper and use their technologies and energies.
Crises, and the contradictions between the development of productive forces and the development of social relations and production, which have always been at the root of great social upheaval, revolutions and counter-revolutions, have always evolved from this crucial connection.
If we look just below the surface and below the patina of rhetoric and ideology that usually cover it, it is apparent that even the events of 1989 were closely connected to the energy market. It is enough to compare the price of oil at that time with the price 10 years later and with the price today to be able to measure in almost quantitative, physical and material terms the forces which provoked that change, a change that only appeared to be both unexpected and political in nature. In reality, the key starting point in the process had started a long time before.
This is where I see a connection between the two themes which outwardly appear so different and distant from each other. At that time the Soviet Union under my leadership began (while fully aware of this connection) deep and radical political perestroika which should have led to structural perestroika and to change not only in the democratic relations within society but also in the reorganisation of the entire productive, technological and energy framework of the country. As we know that plan was interrupted and brought to an end by very different developments.
However, we were aware that the same problems should also have been faced by the west, even though their critical nature was very visible to us and somewhat less visible to the European capitals and to America. I said at the time that perestroika was “for us and for the whole world”. However, the west interpreted that great change as its own victory and our defeat and began to manage the fruits of what it believed to be its victory without the slightest attempt to start a critical and auto-critical process on the state of western civilisation.

It was both written and said that we had reached the end of history, and as a corollary western leaders came to the fore whose main political aim was the export of the only model left available. We know that this export process took place with the use of force and bloody wars. And we also know that it has not worked and does not work in Afghanistan for example, where this pernicious idea of exporting a western model is carried forward with an obstinacy worthy of a better cause.

The point is, however, that the crisis which at the time was not perceived by Washington, London, Paris or Rome has now arrived here. We are in the middle of it and according to every reasonable forecast it will last for a long time. And there is no guarantee that we can get out of it without making profound changes to that history, previously believed to have been written once and for all.

Now I frequently read that the crisis is "almost behind us" and that, to take an energy metaphor, each day new reserves of oil and gas are discovered. We are promised the prospect of industrial development identical to that which we have enjoyed for the last century.

Unfortunately, I fear that these promises are not merely a deceit and a form of self-deception but also very dangerous. The simple reason why that type of development cannot be furthered is because of the appearance of "limits". These limits are numerous and insurmountable. I mean that even if there were no dramatic urgency regarding traditional forms of energy (and I believe that this urgency exists) we would still have to face the problem of global warming, the difficulty of finding a solution to which is one never faced in the entire history of mankind.

The Secretary General of the UN recently reminded us that we have about 15 years in which to reverse the emissions of carbon dioxide and other greenhouse gases. And even if we had enough oil for the next 100 years it would not solve the problem. Worse, we are certain that it would aggravate the problem to an irreversible degree, producing catastrophic consequences for the entire planetary ecosystem.

If anyone believes that the situation is not one of dramatic urgency, then I would like to remind them that the culture of the motor car has taken almost a century to establish itself as a part of our lives, to redesign our cities, define our habits and our way of life. Whatever future we are reserving for ourselves, with our decisions but also with our inability to decide, will require a very long time before it is realised. And it will require substantial structural and psychological changes to human society as a whole. These things are not done in a short time frame, they must be begun now and the first step to take, psychological before political, is to realise and to realise quickly that our future cannot be built unless peace is restored between man and nature. The only energy which does not cause conflict between us and with nature is natural renewable energy. We have to achieve this, not for 20% or 50% of our consumption, but 100%. This is the only future possible and the only future without war.

Common Policies towards a Common Goal: Renewable Energies and Energy Efficiency

Maurizio Molinari, US Correspondent of La Stampa, Italy

We are facing a huge issue at a critical moment. As the Secretary General of the UN Ban Ki-moon said a few days ago, we are running out of time if we wish to solve the problems on the agenda at the Copenhagen Conference that will take place at the end of December. The hope is that the World will come together to face the need for a new energy equilibrium to save the Planet, reducing the dependence on fossil fuels. To discuss this and other issues related to this climate-energy agenda, we have among us here in Turin some of the best and the bravest speakers possible coming from distant countries that have different approaches and offer multiple solutions. The importance in this moment is to start a discussion that will take us to Copenhagen and also beyond that, offering us a scenario of initiatives that could be taken on several fronts. The importance in this moment is to go ahead. The arrival of Barack Obama at the White House generated a new situation, with the United States ready to take the lead in the fight to protect the climate and promote new sources of energy. It is a good beginning because Europe, that was isolated in defending the Kyoto Protocol, now finds itself in a much stronger position and the emerging economies, from India to China and Brazil are ready to begin a discussion with the most industrialized nations to take their responsibilities in this common fight. For sure, we still have a lot of problems to solve and a common agreement on what do to - and how much emissions to cut by whom - is still far away but the fact is that, for the first time ever, the West, Russia and emerging economies agree on the principle that everyone has to do his part to save the Planet. That is the point from where we begin today and on this base we can start the discussion.

Ashok Khosla, President IUCN, Co-President Club of Rome, India

*the following intervention was supported by a series of slides to which many parts of the speech refers

I was introduced as President of the IUCN but I also happen to be Co-President of the Club of Rome and it is highly appropriate because the Club of Rome was started by one of the proudest sons of Turin, Aurelio Peccei.
Aurelio Peccei came from this city and started a movement which was quite remarkable because in 1968 there were not many people thinking about the predicament of human kind. In 1968 there may have been some academics, a few NGOs and civil society, people who thought maybe the world was not going in the right direction but here was a captain of industry, one of the biggest industrialists in the world, who convened 35/40 of his friends in his home in Rome (and that is why it is not called the Club of Turin) and he said "Look, we are heading for trouble". It always gives me great pride to come to Turin to be able to pay respect and homage to one of the great thinkers and great leaders of the last century. So I want to thank the World Political Forum for inviting me.
The Club of Rome like the IUCN is dedicated to three propositions: it believes that everything is connected to everything else. Therefore we have to understand that the divisions in the world, as Mr Gorbachev has just said, are not in the interest of finding the solutions we need but there are also divisions among our disciplines, among our sectors, among all the different things that divide one from another. So systems are very deeply entrenched in our thinking and solutions are really not set up to define the problem but to find how to solve the problems that face us. So it is because of Aurelio in some ways that I am here. Turin of course is one of the most amazing places, for me Turin and Piedmont represent many things that are the most precious about Italy. I happened to spend a lot of my time in your country, my father was Ambassador in the 1950's and I think this region represents a great dedication and commitment to tradition but also to innovation and this is a very important combination that very few parts of the world have and it is dedicated to the spiritual as well as to the national. These are things that are going to be very important in what I want to present to you now.
I have been invited to talk about energy but energy by itself is meaningless. We need energy to do other things, we need energy to move materials, we need energy to pump water, we need energy to light our houses and buildings. Energy by itself is meaningless, it is because it makes many things possible that we are so concerned about where we are with energy.
The basic idea that I want to start with is that we are all connected together by the atmosphere, the ocean currents, by political systems, by trade, by the sharing of products and services all over the world we have no way to get away from each other. This woman (in the slide) may have next to nothing but she does have television and she knows everything, she knows everything that you and I know. She knows how well people can

live, she knows what possibilities life holds but she does not have them and what is worse her children do not have them and they ask why should we not have the same as anyone else and you know what that leads to? It leads to alienation and angst and then violence and then terrorism.

Today we have two major crises: one is the crisis of poverty, you see that women there? (in the slide) That woman has all her belongings in that picture; in fact, her whole world is in that picture and this woman is cooking in a typical kitchen with what is called bio fuel. And do you know what the number 1,500,000 means? According to the World Health Organization that is the number of women who die prematurely at the age of 35/40 every year because of the smoke that they breathe in the kitchen, they call it euphemistically indoor air pollution. Basically every year we lose 1,500,000 women and children for no reason at all.

And the second crisis of course are resources, their depletion, scarcity and the environment. This is the scene in a place where I work (in the slide): deserts in the world are growing at the rate of 50,000 km^2 per year and our climate is changing, our species are becoming extinct and our water is disappearing. This is a scene (in the slide) in a village where I work in the middle of India where for six years there has been a drought and 700,000 people out of a population of 1.2 million - more than half - have gone away. They blocked up their houses, they could not even afford locks so they used thorn bushes and went away. Refugees from eco-systemic disaster. And our food production, of course in Turin you know all about this, our food production systems are completely crazy. This is the chart (in the slide) which I have just taken from Ernst Von Weizsaecker's book *Factor Four* which was produced some years ago. On the right hand side there is agriculture that produces maybe 400 or 500 calories of food energy for one calorie going in. By investing one calorie to make agriculture work you get 400 or 500 hundred calories out. On the other hand, this is what you get in your supermarket: in order to get one calorie out of food we put 400 or 500 calories in. Now with that kind of nonsense, how can we not have an energy crisis? So whether they are our industries, our agriculture, our transport systems, or our building systems, all of them are designed to lead to gross inequities.

This is the champagne glass (in the slide) that the UN Human Development Report puts on its cover every year. The champagne glass represents the amount of wealth that the top 20% get, which is now close to 90% compared with the bottom 50% who only get about 6% and if we do not worry about the bottom 60% they will come and make life difficult for us too. That gap by the way is widening every year.

So are we really living together? Is this really one planet? This family in Chad (in the slide), in Africa, has its entire food for the week in front of it and they have spent about one euro to get that food. This family in South Carolina (in the slide) has this much food in a week, luckily for them they do not get to eat much of it because they waste 30% of it otherwise they would be even bigger, but basically that is the food they buy every week.

And this is where the first lot of families end up: in slums; and this is where the other side lives: in houses like this. This is a waterfront picture of Dubai (in the slide). It has got very nice beautiful towers and things, this is one house in the Gulf (in the slide), just next door to Dubai, one house for one family. This is not a hotel, this is not a shopping mall, this is a house. That is one of the 70 bathrooms and those are a few of the cars. That

looks like a silver-coloured Audi, well, it is not just silver–coloured, it is silver. So there are people who live this way and there are people who live that way and I do not think that we are going to have a sustainable world if we go on digging the energy out of the ground and giving it to a few people to live outrageously.

The ecological foot print of the world is now 1.4 that means we are using 40% more resources than have been produced sustainably on the planet and it is growing. The foot print becomes bigger every year. Frankly, I do not think the champagne glass works any more and already 40 years ago Aurelio Peccei and his colleagues wrote a book called *Limits to Growth,* which was like a nuclear explosion in people's thinking. It basically started the environmental movement and it showed that maybe things are good and they may get better next year and the next but at some point they will collapse. It was called "overshoot and collapse" and no matter what you do your population will keep growing if you have these disparities, if you go on with business as usual and your resources and your pollution and everything else goes the other way. So I am concerned about the half of the world that lives below the poverty line, below two dollars a day, they get caught in a trap they cannot get out of. They are poor so they take resources from the land, they deplete the land, they have no markets and they become more and more poor it is a cycle which they cannot get out of. And these are people, real people, 1.3 billion people - twice the size of Europe - who do not have clean drinking water. There are people like this woman (in the slide), 2.5 billion people, who have no commercial energy and live on wood and cow dung and whatever they can find. Forget about electricity. There are women like this one, 2 billion of them, who have no toilets and we are actually designing a world through the eyes of economists who think these are not important issues.

I believe that we have to turn the whole mental mindset about what is a good future to look at the problems of someone like this girl. Everything we have done so far is to make the rich richer: what is good for the stock market, what is good for foreign direct investments, how will we attract more industry. But what we really need to do is to look at the life of this girl who is one of three billion people who got left behind, that is the only way we can have a sustainable future. This graph is very important, if you look at her life you will come to the green line and that shows you the population will basically stabilise. If you look at the life of the rich only you will create more and more poor people and you will end up with billions and billions of people.

I would like to share with you one of the ways to conserve energy. This map (in the slide) is drawn in a very special way, the area of each country represents even America as small and Italy as small but countries like China, India and Africa as big.

I am going to show you some very dramatic maps. Here is a map (in the slide) of the countries where girls do not go to primary school; here is a map (other slide) of the countries according to how many girls do not go to secondary school; here is a map (other slide) according to how many illiterate young woman there are; (other slide) here is a map which shows you how many illiterate woman there are; and here is a map (other slide) which shows you the number of babies they have. The maps are almost identical: where there are girls and women who are uneducated there are lots and lots of big families and in contrast where you have gender empowerment or women's income or old age security what you see is the opposite. It is the opposite because the ones that have

the least of these have the most of those. Statisticians call it anti-correlation. So no matter where you look, urban slums, infant mortality, child labour, human poverty, everything is pointing to a growth of population.

Now one of the factors in using a lot of energy is the number of people. So the first thing to recognize is that if you draw these curves (and they are taken from the World Bank), these numbers (other slide) show each dot is a country and each dot represents how many children a woman has versus the GDP per capita. This one shows how many children a woman has versus the energy consumed per capita. It does not take much to see that there is a terrific correlation and you can see that no matter where you are, this curve shows that basically if you could improve the lives of people a little bit their fertility comes down dramatically. And do you know which is the best example of that in the world? Italy. Italy is now below replacement in terms of population growth, in this country and even in Spain more or less as many people die as are born, so we can see that improving the life and prospects of a better future is very very closely linked to how many people you have. This diagram (other slide) shows that if I make a little bit of improvement to the life of a Vietnamese woman, within a few days and then a few years she will start behaving like a woman from Thailand because with an improved life she has many better prospects, she could get job, she could teach, she could learn.

A whole new world comes up. I have done a lot of sophisticated mathematical modelling on this, and what happens is you see that the number of people in the year 2050 who would not be born if we made the lives of those young women and those girls better would be three billion, three billion fewer people in the year 2050 if all we did was to provide schools and jobs for girls, women and anybody else too. There are other people in this world than just women, but that is what we have got to do.

So the case I want to make is that more energy creates more possibilities, more electricity, better farms, better houses, better jobs, better education, being able to read and study at night at home and with all this you essentially end up with a motivation for smaller families which is very cheap to get.

I am not saying that all the problems of energy and climate change lie at the feet of the third world, the bulk of the work has to be done by people like you and me, by people who are using large amounts of energy, who live in energy intensive houses and use SUVs and travel by jet. We have to do the bulk of the work, 90% but even the poor can contribute if we give them a chance by reducing all this. Now ultimately that champagne glass has to become a glass of beer - there is no way that we are going to be able to continue such gross disparities in the world and there are ways in which we can do it, windmills, solar power, LEDs, and there is a great variety of other things.

Maneka Gandhi, former Minister of Environment and Forests

What I want to talk about is something that you can do and right now. This will have as much or even more impact as a policy decision. We must understand that methane is as important to global warming as carbon dioxide.

We all know that global warming is one of the most serious threats to the environment, yet when we focus simply on carbon dioxide we fail to take into account published data showing that other gases are the main culprits behind the global warming we see today. As a result we neglect what might be the most effective immediate strategy for reducing global warming and that is turning vegetarian. You can talk about carbon dioxide but there is little you can do about it. But you can reduce methane emissions today. Each person who eats meat eats 300 animals a year on average – that is the amount of methane each one of you contributes.

The environmental community has focused its efforts almost exclusively on abating carbon dioxide emissions. Now we are talking about raising fuel economy standards, capping CO2 emissions from power plants, investing in alternative energies, getting fuel efficient cars but data published by Doctor James Hansen, who is the director of NASA's Goddard Institute for Space Studies which says food as the main pollutant and the main greenhouse gas is methane has been ignored.

The focus on carbon dioxide is fuelled in part by misconceptions. It is true that human activity produces vastly more CO2 than all the other greenhouse gases; however, this does not mean that it is responsible for most of the earth's warming. If we wish to stop global warming we must look at strategies to address non-CO2 emissions and the strategy with the most immediate impact is vegetarianism. The most important gas to concentrate on is methane. The number one source of methane is animal agriculture. Methane is 23 times more powerful as a greenhouse gas than carbon dioxide. It is a powerful heat trapping agent holding infrared radiation near the Earth's surface. The Global Warming Potential (GWP) of various greenhouse gases is a measure of their warming effects over time. Over a period of 20 years, the GWP of one kg of carbon dioxide is 1, while that of methane is 11! Methane concentration has more than doubled over the last 100 years. In contrast carbon dioxide has not risen as sharply.

Methane is produced by a number of sources but the number one source worldwide is animal agriculture which contributes 37%. Animal agriculture produces more than one hundred million tons of methane a year. Global meat consumption has increased five-fold in the past 50 years. In fact ,sadly, last year (2008) the largest amount of meat was eaten in the history of mankind. 85% of this methane is produced in the digestive processes of livestock. Much of the world's livestock are ruminants--such as sheep, goats, camel, cows, and buffaloes--who have a unique, four-chambered stomach. In the chamber called the rumen, bacteria break down food and generate methane as a by-product in the stomachs of livestock. On average, a dairy cow belches out 500 liters of methane every day. Cattle methane accounts for 16% of the world's annual methane emissions.

The collective effect on the environment of hundreds of millions of livestock animals worldwide is enormous. The conclusion is simple, the best way to reduce global warming in our lifetime is to reduce or eliminate our consumption of animal products simply by going vegetarian or vegan as I am. We can eliminate one of the major sources of emissions of methane, the greenhouse gas responsible for almost half of global warming.

Livestock production is a source of both carbon dioxide and nitrous oxide. It creates 65% of nitrous oxide which has 296 times the warming potential of carbon dioxide, and livestock are its leading human-caused source. Then there is the transportation of animals, farm supplies and feed plus the heat and electricity used by farms and slaughterhouses. The impact of animal farming on global warming worldwide is greater than that of the entire world transport sector – land, air and sea combined! Yet politicians and even environmentalists seem to ignore its existence. Most of the national debate about global warming centers on carbon dioxide and its major sources — fossil fuels. But cattle and other ruminants are walking gas factories taking in fodder and putting out methane and nitrous oxide, two greenhouse gases that are more dangerous heat trappers than carbon dioxide.

What are the advantages of vegetarianism over carbon dioxide reduction? First, there is no limit to the reduction of this source of greenhouse gas that can be achieved through a vegetarian diet. In principle even a 100% reduction could be achieved, with very little negative impact. In contrast, similar cuts in carbon dioxide are impossible without devastating effects on the economy.

Secondly, a shift in diet would lower greenhouse emissions much more quickly than shifts away from fossil fuel burning technologies that emit carbon dioxide. The turnover rate for most ruminant farm animals is one to two years, so that decrease in meat consumption would result in immediate drops in methane emissions. But turnover rates for cars and power plants, on the other hand, can be decades, even if cheap zero emission fuel fossil were available today it would take many years to build and slowly replace the massive infrastructures that our economy depends on.

Third, efforts to cut carbon dioxide involve fighting powerful business interests like the auto and oil industries. Environmental groups have been lobbying for years to make fuel efficient SUVs for instance, or to phase out our power plants that do not meet modern environmental standards but vegetarian food is available and cuts in agricultural methane emissions are achievable at every meal starting with dinner tonight.

Polls show that concerns about global warming is widespread and environmental activists like you and I often feel helpless to do anything about it. Unless they happen to be buying a car most people wanting to make a difference are given little to do aside from writing to legislators and turning off the lights when they leave a room. If you reduce or eliminate meat consumption, it is something that you can do every single day which will show an immediate effect.

The reduction of these greenhouse gases would have many beneficial effects on the environment. Less methane results in less tropospheric ozone, a pollutant that damages human health and agriculture. The same factory farms responsible for those methane emissions also use up most of your country's water supply. Creating rangeland to feed western nations' growing appetite for meat has been a major source of deforestation and

desertification in third world countries. As Dr Ashok Khosla said, 50,000 square km have become desert. Today, every 7th kilo of meat in Europe, is created by the third world growing food for your animals, soya bean. Not to mention the fact that India and China are to become the largest meat exporters, something unfortunately that India has probably achieved because we supply all of the Middle East with meat. Brazil is Europe's largest supplier and has cut down its forest to give you meat. Factory farm waste lagoons are leading sources of water pollution.

Animal agriculture has a high demand for fossil fuels. The average American diet for instance is much more carbon dioxide polluting than a plant-based one. It takes 60,000 calories to produce one kilo of meat - can we afford that? It takes less than 600 calories to produce the same kilo of vegetables. You should advocate vegetarianism as a part of the global warming campaign.

A UN report in 2006 said that cattle rearing generates more global warming greenhouse gases than transportation. An FAO report states that the meat industry is "one of the most significant contributors to today's most serious environmental problems". According to David Brubaker of the Johns Hopkins School of Public Health "The way that we breed animals for food is a threat to the planet. It pollutes our environment while consuming huge amounts of water, grain, petroleum, pesticides and drugs. The results are disastrous."

The meat industry has responded by saying that smarter production methods should include improved animal diets to reduce enteric fermentation, this is one of the strangest things I have ever heard. Of course it will never work because you cannot manipulate the animal's body more than the tiniest amount. But we can manipulate our own desires and our tastes.

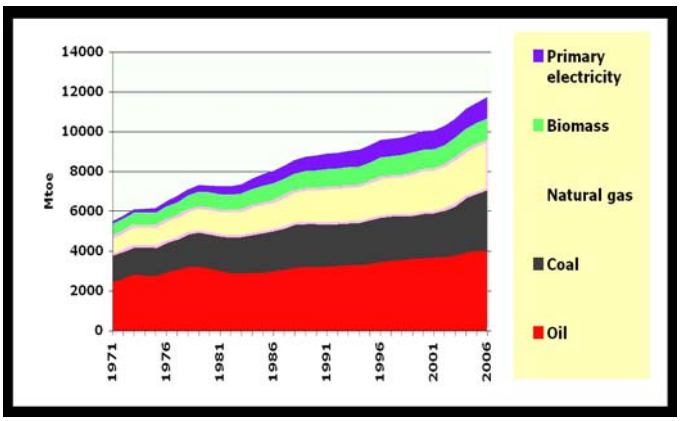
Today methane concentrations in the atmosphere are more than twice as high as they have been for most of the past 160,000 years. If they are not dealt with , there will be a global warming vicious cycle. Warming thaws permafrost soil that has been continuously frozen for thousands of years. Thawed permafrost releases methane and carbon dioxide. These gases reach the atmosphere and help trap heat. The trapped heat thaws more permafrost and so on . There is also a large, but unknown, amount of methane in ocean floors. Global warming could release this methane, which could cause a further sharp rise in global temperatures. Such releases of methane may have been a major factor in previous major extinction events.

Livestock is one of the most significant contributors to the most serious environmental problems today, and urgent action is needed to remedy this. It is the major source of land and water degradation, it is the major source of methane and one of the major contributors to global warming. If you decide that you would like to put methane on your agenda you can start being vegetarian from today. It puts more power in your hands, it allows you to become better informed, it allows us, as the prime minister said, to become a gentler, happier, more ethically-aware society. What is good ethically, what is good morally, is always good economically and environmentally. I think we should remember that.

Bernard Laponche, Expert on energy and energy efficiency policies, Global Chance, France

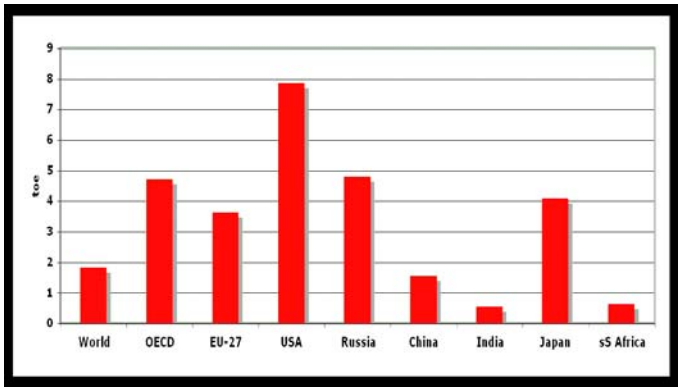
I will say a few words about the global energy situation and, following on from the previous presentation, its difficulties and constraints and a path to try to solve present problems.

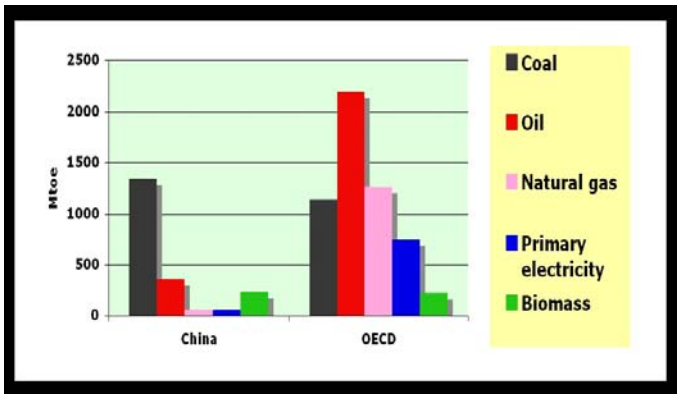
This graph shows the evolution of world energy consumption for the last 35 years and you can see that in spite of the alarms of the Club of Rome and more concretely the oil shocks of the 70s, that first, energy consumption has continued to increase over 30 years; second, fossil fuels represent around 80% of world energy consumption; and third, and this perhaps is more surprising, oil is still the main energy source consumed at a world level. The distribution shows 80% for fossil fuels; 10% for biomass (this is important but is mostly the traditional use of wood or waste in poor countries); and only 10% of what is called primary electricity, roughly 45% nuclear and 55% of electricity production from hydro and increasingly wind energy (but you can see that in fact it is small).



There are some fluctuations, in particular in the 70s with the oil price increase and subsequent tendency to stabilize or lower consumption but immediately it begins to increase again and after the second oil shock and the counter-shock of 1985 consumption increases. What is of importance is that this increase was proportional to the increase in population until year 2000. This means that the rich countries have high energy consumption pro capita but they managed more or less to stabilize it and so it increased it with the population.

However, the vision of world energy consumption is very misleading and I refer to what Mr Ashok said. There are enormous differences in energy consumption between countries: you have 8 tons of oil equivalent for the USA, about 5 for the OECD countries, almost 5 for the European Union, 1.5 for China and 0.5 for India. This has to be understood. Many people make comparisons and say, well China is growing and so the energy consumption of China is terrible and so is India's and in fact it affects world consumption because the others already have very high consumption.





This slide shows something that is not very well known: the comparison between China and the OECD. You should not compare China with USA or China with France or Italy, we have to compare it with its equivalent, namely the rich countries of the OECD, both with populations of 1.3 billion . So this comparison has a meaning, and you see that even coal consumption, the great evil for the climate people and China the main culprit, is almost the same for China and the OECD. But for China it is the main and almost the only resource and China consumes seven times less oil and twenty times less natural gas. We have to understand the situation before accusing China or India or others of being the cause of our difficulties.

There are very complicated models for forecasting future energy consumption, in particular the International Energy Agency make forecasts about increased consumption and warn that if we go on with the business-as-usual scenario, it will be too expensive, we do not have the resources and CO_2 emissions will be higher whereas we should be decreasing them by a factor of four. In fact you do not need to have very complicated models to understand the situation. OECD countries had per capita energy consumption of 5.5 tons of oil equivalent in 2007. If the economies of China, India and the other parts of the world continue to grow, which is normal and legitimate, they have to try to have more equity. If they increase at the same rate as the OECD countries, in the future we would see OECD per capita stabilizing with the adoption of efficiency measures, but by 2040 or 2050 you would have 9 billion people consuming 5.5 tons of oil equivalent. If you multiply 9 by 5.5, you get 50 billion tons of oil equivalent. At the moment we are consuming 12 billion and we know that we already have problems with resources, with climate change and poverty in many parts of the world. So we would need four planets and this is impossible. This is very important because it means that whatever the energy sources: fossils, nuclear, hydro or renewable, we do not have the resources to continue at present rates. The only way would be for the rich, the OECD countries, to remain rich and the others to remain poor. Unfortunately, and I think fortunately, this is not happening: China is growing, India is growing, Brazil is growing and the only solution is to drastically reduce the energy consumption of the OECD countries, and then with this reduction by the rich, the other countries can try to reach the same target by adopting a “sustainable” model of development. But you cannot tell them to keep to the same model of energy consumption and expect them to make all the effort, this is impossible. So the fact is that we have to make the reductions, which means that the first priority is reduction through energy efficiency which does not mean reducing all our energy needs but reducing the quantities you use for each need.

Energy efficiency has been under development for 30 years now and so we know more or less what can be done. The fundamental concept is that energy is not a direct need in the way that water is, for example. You need comfort in your apartment, you need to be able

to go to work or to school, you need education, you need health and you need products and of course for these needs you need energy, final energy. Energy needs depend on climate, this is clear, and they depend on behaviour, that is, are you a confirmed petrol adict or can you take the tram? In Turin it is easy to take a tram, in many cities you do not have them, so you see the importance of urban planning. Is your house insulated or not? Is the light an old incandescent lightbulb? And so on. The experience we have, based on what has been done in the past, is that you can easily gain a factor of 2 : energy consumption divided by 2 for the same use. For example, comparing houses built in 1973 or 1975 before the beginning of this dramatic situation with houses built now, with regard to heating we consume 40% of the level of the 70s.

There is a big change in people's attitudes to energy, too. Previously, energy was oil, coal, nuclear, and hydro and it was in the hands of the energy companies, now at least 50% of the problem is on the consumption side and concerns building companies, regional powers and transportation systems, which is something outside the energy system. This means that you have new sectors of activity and this is important for the answer to the economic crisis: more people can participate at each level, they can participate as a family or as an individual, they can participate at municipal level, they can participate at regional level and so there is a re-appropriation of the energy problems from the summit to the base which means also new responsibilities and an important role for local and regional communities.

The three crises. First, the crisis of energy security, that is the fact that 90% of transportation is linked to oil products. Of course we are totally dependent on oil for transport so if you do not act on transport, if you do not achieve energy efficiency, you do not develop tramways, collective transportation, bicycles and so on, you are in a permanently insecure situation: insecure as regards the supply of oil and insecure as regards energy prices. Second, energy efficiency is the first answer to the climate change problem because through energy efficiency you have an enormous potential to reduce energy consumption and therefore to reduce CO2 emissions. Third, you have to keep in mind that for any government and for any country, social and economic development is a necessity and so if you cannot provide through energy efficiency a lot of new activities and new employment which are at the same time good for energy security and good for climate change, but principally they are very important for people because you cannot accept very high levels of unemployment and say "No problem, the main problem is climate change". No, the main problem is unemployment, so if the solutions you propose are not providing activities and employment, speaking about climate change alone will not be understood.

There is huge potential, we have 30 years of experience in the EU and we have seen that compared to the situation if we had had the same way of consuming energy since 1990, the energy saved in 2007 is more than the oil plus the coal consumption in Europe, so it is enormous. It is perfectly realistic to have a target of 20% for Europe at year 2020 on primary energy consumption, comparted to the business-as-usual scenario.

I have worked in many other countries outside Europe and in developing countries and recently in China. The potential is much higher in developing countries than in our countries because in our countries most of the buildings have already been built. In the developing and emerging countries everything is new due to growth and so between an

American model of building a new city or an European model the difference for China for example is absolutely enormous. But it is not easy because it is the opposite of the normal way of thinking that you have to produce more and more and in this case you have to save and improve the use, which means you need, as the President of the Region said, a strong political will at all levels because in general energy problems are the property of the energy companies and in fact very often you have to fight them in order to achieve energy efficiency.

Second, you need regulations, institutions, people in charge, you need information and training, financial incentives, you need industrial policy to develop efficient buildings, efficient houses, efficient equipment and you need specific financial mechanisms for investment because the banking system is not geared to energy efficiency, it is better suited to financing a power plant than financing the insulation of a lot of houses in Turin because it is a lot more complicated. This means that considering the big picture, it is not so much a technical problem but a problem of capacity building, in other words understanding the problem and finding a solution in each country. I have heard that the obvious solution for the supply of energy is renewable energy but we have to understand that if there is enormous growth not even renewable energy will be able to answer the question and people will expect to have fossil fuel and nuclear fuel.

So the prerequisite for a good development of renewable energy is a parallel decrease in energy consumption so that the share of renewable energy becomes increasingly important. If not, renewable energy will always be trying to match energy consumption.

Martin Lees, Secretary General of the Club of Rome, United Kingdom

We have understood from the excellent statements so far that accelerated investment in renewable energy and in energy efficiency is vital to the future of humanity and to the future of the planet. I will present a broader prospective in which strategies for energy policy and investment must be formulated.

Today all of us are concerned about climate change. We all know there will be a very critical conference in Copenhagen in December but I would underline that climate is only one of the threats which we face and it is closely linked to many others which I will quickly outline.

In the Club of Rome we recognize the fundamental importance of the connections between climate, energy, ecosystems and water just simply in the environmental area and we cannot solve any single one of those problems if we ignore the others. At the 40th anniversary of the Club of Rome in June 2008 we launched an international program, to define what we call a new path for world development. This program engages brains from the whole world to focus on a systematic view of the problems we face. We have broken the big issues into five clusters of issues which you can see up there. As the first step in this program, last November we convened a conference of experts to look at the linkages between climate, energy security, eco-systems and water and then in April of this year we related these environmental problems to issues of financial system reform, globalization and economic restructuring. All this is simply to point out that we are confronting problems in three broad areas: development, where more than 2 billion people are now not included in global development; environment and resources, which is an issue we are dealing with here today; and peace security and justice, and we are not going to achieve sustainable progress unless we manage these three broad areas and of course you will understand that they are linked together.

Let me now summarize a few key conclusions from this analysis that we had the honour to present to senior legislators from the G8 and the G5 in June of this year in Rome.

This slide simply points out that we are in a place where nobody else has been before and therefore there is no guarantee that we can carry on as we have in the past. In spite of all the negotiations, the Kyoto protocol, all the discussions, all the goodwill, climate change is still accelerating and moving faster than it did before. Scientists are beginning to fear the risk of what they call runaway climate change, which is where climate change escapes from our influence, and this is to do with the fact that we are dealing with complex systems which behave as they wish and not as we wish and we therefore cannot assume that global warming will be a steady gradual process and that we have lots of time to think about it and to act - we could confront sudden change.

This simply shows you an example of what is happening. Namely, the Greenland Ice Sheet is now behaving in ways in which scientists three or four years ago said were not possible and of course if the Greenland Ice Sheet should begin to melt that has implications for sea level rise. I would like to make one point. The focus of the negotiations in Copenhagen will be to maintain the rise in global average temperature to two degrees, not more than

two degrees. But two degrees average means four degrees at the Greenland Icecap so we are confronting some pretty serious problems.

In addition to this, as you will all know, water is now stressed all over the planet. The people who are suffering most are, of course, the poor as usual, but this will affect everybody. It is in this context that we have to look at the energy issue and we are coming to the end of the era of what is called cheap oil. There are vast needs for energy today and in the future and the price of oil will rise with impacts on the poor and also encouraging a switch to coal. This shows you energy projections to 2030 and if you look ahead even further to 2050 you discover that the world will require double the energy that it is using today but at the same time it must reduce its emissions by somewhere between 50% and 80%. This is indeed a serious challenge. All this is to meet the needs, of a growing world population. In fact we are gambling with our future and the future of our children.

In 1972 the Club of Rome raised the alarm exactly about these problems in a book called "Limits to Growth" and the problems today are more severe and more immediate than they were 40 years ago. We need new models, new strategies for economic growth, for development and for globalization and above all we need to find a new balance between man and nature. The most simple truth in this whole area is that the climate problem, the eco-systems problem and environmental problems are a function of our choices, our patterns of growth and our impacts on the planet. The logical conclusion of that is that we cannot solve the climate problem or the eco-systems problem unless we change our strategies and our behaviour, which is very difficult.

What therefore has been the policy response at the global level to the problems I have quickly outlined. The first response, last year at least, was to give priority to the reform of the global financial system and to invest trillions of dollars in stabilizing the financial system . It was then pointed out to ministers of finance that they must also take account of the environment and we started to talk about green recovery packages, that is to say, to add environmental issues into recovery packages. And then the argument moved on to where we are today, which is to talk about moving towards a low carbon economy which includes major investments in new and renewable energy resources. What we must do is to redirect and restructure our economies onto a different path.

This slide, simply shows you the implications if we continue on our present path. We are now using 135 % of the available biological resources of the planet each year. If we carry on as we are now we will need two planets to provide what we need. The current policy to deal with this is to double economic output of the world economy by 2030 - this is the received wisdom that the world economy will double in size by 2030. I think it is evident from what I have said that if that should happen the environmental systems of the planet will simply not be able to handle it.

So that is a very swift review of where we are now and I will now just jump ahead quickly as we were asked to say something about a practical example of what can be done. I will say a few words about China because everybody is extremely interested in this subject. The Chinese government, in my view, has understood everything that I said to you in the last 12 minutes. They have established a strategy to deal with climate change which is remarkable and you can read it on the web. They understand that energy efficiency is

central and the man responsible for this whole field is the vice-chairman of the National Reform Commission for Climate Change and Energy Efficiency - that is a critical link for China. The issue of climate is not dealt with by the Minister of the Environment but by a group of ministers, seventeen of them under the chairmanship of the Prime Minister. China has made remarkable progress in reducing energy intensity but because it is doubling its GDP every ten years the problems still are getting worse. They are now almost the largest producers in the world of solar panels and wind energy and they have in short decided to green their economy so that is their response to climate change. The second policy they have adopted is to change the direction of the whole Chinese economy onto a new path which will be less environmentally damaging, more socially equitable and better balanced in terms of welfare. The strategic goals in China are the ones illustrated in this slide and you will see that they are moving in directions which we all should moving in order to change the direction of their economy.

Let me conclude by simply saying what can be done now about this whole set of problems. First, we are still in western countries subsidising a lot of activities which are making it very difficult for new and renewable energy to be competitive. This has to change. Secondly, moving into new areas does not just mean public finance, it can be achieved by targets and incentives. In 1973 the Japanese government provided incentives to industry and broke the link between economic growth and energy growth. We can also disseminate existing technologies on a substantial scale, and this will be a key issue in Copenhagen. We have the technologies today, if we made them available we could make a major impact very quickly but we cannot solve the long term problems with marginal improvements. We will have to undertake basic research to develop radically new solutions and this requires a much higher investment in basic research and development.

As I have said we must restructure our economies, move away from consumption and waste and we can recuperate degraded lands and increase the forest cover which provides not only employment but it also reduces the carbon in the atmosphere. Finally, public understanding and behavioural change will be critical. All the steps I have mentioned could be done tomorrow, we do not need to wait for Copenhagen, we could start tomorrow. We are in fact at the beginning of a new era of qualitative growth employment and innovation if we have the courage to seize the opportunity.

Ruud Lubbers, Chair of the Supervisory Board of the Energy research Centre of the Netherlands (ECN); Chair of the Council of the Rotterdam Climate Initiative, The Netherlands

My friend Mikhail Gorbachev with me and some other friends, including Ashok Koshla produced the *Earth Charter*.

The *Earth Charter* is an ethical document and you may think that ethics are not important and that we need real action. I differ from you. I think an ethical basis for our actions is key. As regards Copenhagen the key point is to hand it over to the politicians because this is a negotiation between states. The essential dimension is to make fundamental ethical choices in the first place. And from my perspective, it is very clear that this document was the result of intense dialogue with civil society all over the world and at this very moment that multinational companies are aware of their corporate social responsibility then this dimension has to be brought to Copenhagen.

A few words about the content. The first point is that we are all in the same boat, the diversity of human kind and nature and the fact that we belong to one family with one common destiny is understood by people and we have to translate this basic notion into modernity.

The second point is that we are now aware that solidarity is not only needed for our brothers and sisters today but it is also intergenerational for our children and grandchildren. In fact we are making use of their earth, their nature - this is the second point.

The third point is that we are living in a rich diversity of cultures of which we should not be afraid but we should recognize it as something positive. The fourth dimension is about governance. I was 21 years in politics so I know something about governance, and I am convinced that governance, changing things for the better means addressing climate change. Government will only be effective and Copenhagen will only be a success if politicians learn to work together with business and civil society. In other words, there is no future without the governance of civil society and without multinational companies working with government. This, in a few words, is the *Earth Charter.*

You might ask yourself how this man can be so crazy to think ethical dimensions are key so let me tell you a few things. Ashok Koshla referred to Aurelio Peccei and the 60s, in those days I was a young business man with three young children and I realised that their lives would be more difficult than mine and I had grown up in the same area of Rotterdam and already at that time there was environmental degradation with refineries and chemical industries coming into the area. So my first mission in the public sphere was to find how to combine development and the economy with quality of life and ecology. It was a bit egocentric, I did it for my children but that was a good reason. So by 1973 I was a young Minister for Economic Affairs but also for energy. This was the year of the first oil crisis and I took the initiative to change the research efforts of the Netherlands, which in those days was all about nuclear energy, and add to that conservation efficiency as it was then called and renewables. I am not talking about this year but about the year 1975 and the first energy note in the Netherlands white paper was about this. I was friends with Gro Harlem Brundtland then prime minister of Norway who co-wrote this wonderful book *Our Common Future* and in it defined the meaning of sustainability. This is the intergenerational solidarity I mentioned and so it went on until it became a reality.

Is it only about ethics? No, it is about work too. As the moderator said, I am chairing the Dutch Energy Research Institute. Conservation efficiency, renewables and nuclear energy and there is a fourth category, clean fossils. You saw in the earlier presentations that at least until the middle of this century the world will use enormous quantities of fossil fuels and we have concluded that we need clean fossils. What are they? Take the CO2 out of the fossils and put it back into the earth from where we have extracted the fossils. Why? To preserve nature and our climate because the immensity of CO2 emissions has to be stopped.

My thesis is that we cannot allow ourselves to focus only on efficiency and renewables. We have to practise CCS even though it is difficult and costly but we think it is possible. I would make the prediction that before the end of the coming decade fossils will be used only when they are clean. We have some advantages in Rotterdam because I was the former minister of the Dutch gas fields so I know the situation in the North Sea - we have the transport system and we are going to do it by working together with others. I do this in a research capacity but also in a very practical capacity. As a citizen of Rotterdam I became chair of the Rotterdam Climate Initiative which promised the outside world that we would reduce emissions by 50% by 2025 and two-thirds of this reduction or mitigation will come from CCS. So I am a pretty off-hand man even at my age and I combine the ethics with these practical things.

I would like to say a few words about China and Copenhagen. Copenhagen is negotiation, negotiation and negotiation. But my advice is not to spend the entire time negotiating and instead trust the developing countries and in particular the countries that are developing fastest. As Martin Lees said: trust China. Tell China that they are doing wonderfully, and get them to explain what they are doing and be prepared to do that every year. This in itself is enormously important. So Copenhagen is about common but different shades of responsibility, we have to be aware that we live in a world in different stages of development and we have to capitalize on the opportunities and on the goals of the countries themselves. So for me Copenhagen is not about negotiations but it is about motivating and inspiring each other and getting some speed into the whole thing.

The world of the superpowers has finally come to an end. First we had two then we had one, now some people are again dreaming of two superpowers, the USA and China. Forget it, it is not a good idea,. What we really need is a multi-polar world, we need to take India as seriously as China and the USA and include Brazil and South Africa. We need a multi-polar world and maybe that is the most essential point. A multi-polar world is ethically driven by the people and I assure you of one other thing: both science and the economy are key but there is more than that, there is a revival of spiritual thinking in humankind all around the world and we should honour that dimension, we should capitalize on it. This is a fantastic opportunity.

So I would like to end on a positive note. Here is a relatively old man hoping to see before he passes away that these hated fossils are used only when clean . Secondly, I would love to develop the renewables - I myself drive a fully electric car. I am aware that this is only good for the environment and nature if the electricity that you need is generated in a friendly way therefore I need wind energy.

I spoke about my children and I am now a grandfather - we have to connect to one another and to everybody all over the world, we are not merely listeners, we have to make our own efforts,. You can make the difference, every one of you.

Gunter Pauli, Social and ecological entrepreneur and founder of the ZERI Foundation, Japan

*the following speech was supported by a series of slides to which many parts of the speech refers

Can you see this bottle? It says here “bottiglia ecosostenibile” , this is a joke, this is an absolute joke. This bottle is made out of corn, genetically modified corn. This bottle requires genetically-modified enzymes to make it. A triple chemical process and they call this “bottiglia ecosostenibile”.
This is why we are not getting a sustainable world, because we are being cheated on all the time, this is a cheat, this is green wash and unless we wake up and say “rubbish” , get rid of it, how are we going to get any sustainability in this world? Never.
You know, I have to put on a tie and a black suit, so I can say this because if I wear my shorts and my T-shirt then, they do not listen any more. We have to realise that if we do more of the same, nothing is going to happen.
You have heard a lot of analysis and in 1991 when I wrote the first article on zero emissions I was considered crazy because it is impossible to have zero emissions. If you do not go to the toilet at least once a day and do your emissions you are dead or very sick. The problem is not that we do not have emissions, we must have emissions, the problem is we do nothing with them.
Let us look at this beautiful picture of the Iguassu Falls in Brazil (in the slide). When I look at the Iguassu Falls I realize no-one is unemployed, everyone is working. This is nice, everyone is contributing to the best of their abilities and nothing is wasted and guess what? No extra energy is needed. All the energy required for the ecosystem to work is generated by the system.
We have a problem, that the economic model that we were proposing is a model where you pay more. They make you pay more for this plastic bottle made from corn so that you feel good. What is this all about? Paying more to save some money so you can pay it back is an economic model from the past. It is an economic model for the rich, not an economic model for society in crisis. Ecosystems operate in a completely different way, ecosystems operate on the basis that you can always invest less, generate more revenue, build up social capital and everyone contributes by doing their best.
Let me give you concrete examples and not theory. Every project that I present is a project in which I have been involved and which I think is very important. We need to wake up the entrepreneur in all of you, the young at heart, the young souls who want to change things now because the situation is so bad that we cannot ask anyone to be patient. Look at this flue gas from a coal-fired power station in Brazil. Coal has been castigated as being the problem. Coal is not the problem, our poor brains that cannot think creatively is the problem. Because what we do in Brazil is we take the flue gas including the 13 % of CO2 and we produce spirulina algae. In order to make it better we actually inject the flue gas with the vortex which is only using the law of gravity into the water. So we have a critical distribution of CO2 in the water so we can generate four times

more algae than any laboratory here in Italy. I presented these technologies to ENI twelve years ago, they know it, why do they not do it? If I were to look at the world through the eyes of my son who is now 8 months old, when I look at the world through the eyes of a child I will not accept inaction by companies, I will not accept inaction by politicians, I will take initiatives. 600 jobs have been created solely by taking CO2 out of the air of one coal-fired power station.

Why their common myopia and common blindness and why do we not want to see that CO2 produced from coal-fired power stations is ideal for producing Spirulina? . Who said coal is a problem? And we have so much Spirulina that a third of the production is used as a bio fuel. We will convert the lipids into bio fuel and we still have waste left over and these are esters and the polyesters that are produced are being used in cosmetics. If I look at the coal-fired power station I see cash flow: first, from carbon credits, cash flow from food, cash flow from bio fuel, cash flow from polyesters and who is telling me that coal is a problem? Those who want to pump CO2 into the sea and rip off billions in subsidies from the European Union. I do not understand it. What I think is important with this one simple example is that we can go from scarcity to abundance. If we have abundance we do not need the economists any more. Economists only survive on the premise that there is scarcity.

The second case. Here (in the slide) is a beautiful whale jumping out of the Pacific ocean. This whale generates 12 to 16 volts of electricity, no wires, no batteries, “senza pila” . Well, no batteries how do we do it? It is important that we have translated the inside of how the whale succeeds in generating conductivity that is 1,000 times better than a copper cable. And now you can make electrocardiograms that can read your heart for 24 hours “senza pila”, no cables. Interesting! The Fraunhofer Institute in Germany has just introduced the cell phone “il cellulare senza pila” and how is this energy generated? Very simply by having your phone close to your body, your body is 37°C, a little heat exchanger and you power your cell phone. When you start talking you consume more energy so they have installed a piezo-electric piece into your cell phone and your voice, which generates pressure, the pressure of your voice is converted into electricity and the longer you talk, the longer you have electricity for your phone call. We are dispersing 40 billion batteries in the environment every year, we are intoxicating ourselves and we can eliminate a battery - like this! Of course Varta, Panasonic, they do not like the idea and we cannot think that it is possible to have a cell phone without a battery. I think it is time that we think about a world where we do not need mining or smelting. Batteries are not only intoxicating our environment, they are consuming massive energy. These batteries are consuming so much energy.

These two gentleman from Polaroid have succeeded in crushing 400 million tons of electronic waste that we have accumulated in Europe. You crush it and you separate it one by one into individual metals and perhaps you did not know but your cell phone has a higher concentration of metal ore than any you can get out of a mine but we throw it away. Where are the entrepreneurs? Where are all the people that take these other business models out of business because that is what we need.

We need plastics. You may remember the famous movie “The Graduate” when Dustin Hoffman was being told by the father of his girlfriend that, “The future is in plastics”.

Which plastics? The plastics that are made in natural systems are never made out of petroleum and certainly not out of corn starch. Plastics are made out of amino acids.
Now here I am going to give you a very simple case of what it means to think in a system. It means designing new products and what you perhaps remember is that there is this moth that generates silk but the spider actually generates the strongest silk in the world. It is a silk that is so strong, it competes with titanium. So we can see ways of substituting titanium with silk. Titanium is processed at 3000°C and requires argon gas to be able to be implanted in your teeth. This is the way it can be manufactured: a team of German engineers has designed the way to produce silk, exactly the same way as the spider does. Professor Fritz Vollrath from Germany that has invented it and it is operational today. And here comes the culprit. The model of unsustainable consumption, the Gillette Titanium Mach Three. Who uses it? One person, two persons, three persons, yes, four persons, well can you imagine we are throwing away a hundred thousand tons of titanium every year because of this apparatus? Now you cannot get more stupid as a consumer society than throwing away titanium. Our team designed the silk shaver. Silk does not cut your skin, it only cuts the keratin, the hair. Nice, smooth as silk. The beauty of this is that you actually have a silk razor that only costs half the price of what we normally need to pay for titanium. It is cheaper but that is not all. You are not going to use the metal, you do not use petroleum, but at the moment since there are only 90,000 tons available, we would need one hundred thousand tons if we want to substitute the razor. But if you produce one ton of raw silk, you produce nine tons of fertilizer, top soil. Imagine the following: the Chinese 5,000 years ago started planting mulberry trees, the silk tree, and they planted the silk tree not for the silk, they planted it to recover the top soil of dry and eroded land. By coincidence the empress was sitting under the tree and a cocoon fell into her cup, she started pulling it out and she had three hundred meters of silk and the silk industry was born. Silk is the by-product, top soil regeneration was the objective. Now, imagine the following: that we substitute one hundred thousand tons of titanium with one hundred thousand tons of silk, it would mean that we need 250,000 hectares of dry infertile land and turn it back to fertile land and in the process we generate 12,500,000 jobs. That is sustainability, that is consumption the way we should be doing it, that is the society of the future. By the way, silk is one third carbon dioxide sequestered, and the trees generate topsoil which is carbon dioxide.
We have been working on this project for 26 years, it was reported on CNN and it is the regeneration of the rain forests in a savannah that was created by 400 years of cattle farming. And what we succeeded in doing was to convert the savannah into rainforests. Eight thousand hectares done. We were told by the scientists that it was not possible and sometimes you have to tell the scientists, “Too bad for you”, and do it.
We succeeded in generating a rain forest but the rain forest is generating all the bio-fuels. We do not need to have a bio-fuel strategy, we have a strategy to regenerate forests and within the forests there is the bio-diversity that includes bio-fuels. If you buy, over 25 years, the bio-fuel generated by these forests you actually finance the planting of an additional eight hectares. Imagine, you are driving a car and by using a bio fuel from the forests you generate more forests. Interesting. Normally that is not the way we do it. We pay Exxon, ENI, we pay shareholders and they pay their executives nice bonuses. You

plant 1100 hectares, you need to take 70% of the trees out, that means that by driving the bio fuel you are financing the production of wood with which you can build a house, make paper or you could even have a barbeque. You are fixing a 144 tons of CO2 every year by driving bio fuels. And after three years you generate an additional 4,000 litres of bio fuel per year.

Now, how is it possible that we make an issue about energy when this is proven and documented and available for everyone to see? Why do we want to create problems where there are no problems? Why do we not want to see creativity and breakthroughs? Why do we want to make life difficult? On top of that we generate two full time jobs and when you have rain forests you generate water and the water is available for free to the local population. Water is a commons, water should not be paid for, water should be made available to everyone. 10% of the production of water is sold in Bogotà at a very high price because there are people who enjoy paying two euros for a bottle of water, so let them enjoy paying two euros for a bottle of water so that can pay all the cost of making water available for free. There is nothing wrong with the commons on one hand and the market economy on the other hand. We can exploit the stupidity of the market economy as well.

And here (in the slide) is a revolution, we are the first in the world (and we showed it to Amory Lovins, the President of the Rocky Mountain Institute when he visited us one month ago) to produce bio fuel from pine resin. It is turpentine and we purify the turpentine and you can use it in a regular gasoline car and we use the turpentine for the diesel engine. One of the greatest inefficiencies in our present society is that we have a fuel which is diesel and we have a fuel which is gasoline and we have two infrastructures for both, we have broken down that division, we have one fuel for both engines. That is innovation, reducing costs.

This land was acquired in Colombia 25 years ago at the cost of $1 per acre. The land today, 25 years later is worth $3000 an acre. In 25 years it went from 1 to 3,000, that is better than if you had invested in Microsoft for the first IPO. If you had invested in Microsoft in 1984 for the first public offer of the share and you had held on to the share for 25 years, you would have a lower return than the people in Colombia who planted trees. That is the new economy, that means investing less, generating more, building social capital in practice.

How viable is this? I need to go to my mentor, I had Aurelio Peccei as my mentor here. But in Japan I have a mentor whose name is Soichiro Honda. Mr Honda told me that some people dream to escape from reality, others dream to change reality forever. I am here to dream and change reality forever.

Wolfgang Sachs, **Wuppertal Institute for Climate, Environment, and Energy, Germany**

In Germany we have a saying that the last one will be bitten by the dog, so we will see what happens to me after these illustrious speakers. I think I should take the motto of this meeting as my guideline - “Uniamo le Energie” - and I would like to turn our conversation to the realities and conflicts of energy policy, regenerative energy, in particular in Europe and I would like to do that by offering five thoughts that attempt to answer five questions.
The first asks what is the historical moment? The second, how does technology affect people? The third, what is the major conflict today? The fourth, why do even renewables need to be linked to moderation? The fifth, what should a green New Deal go for?

What is the historical moment?
If I could just rephrase what Gunter has just said, I would put it this way: his message is that sustainability is not just about reducing the damage, it is about creating something new and making regeneration possible. It is not just about changing these curves, with the bad things such as oil and pollution going up and bringing them down. That would be a short-sighted view. The point is to create systems that regenerate themselves, something new and not just less of the bad. I guess we are at the dawn of a second solar age. What is the difference between an industrial and a solar age? Take a metaphor: a tanker for the industrial age and a sailing boat for the solar age. The tanker crosses the oceans and for each kilometre it uses up the stock of fossil fuel and after the tanker has crossed the ocean that oil is no longer available and it has caused pollution as well. The sailing boat links into a flow of nature, wind, without destroying it. The wind is still around and the sailing boat can go pretty fast, a sailing boat can go even faster into the wind than with the wind because it brings two things together: on the one hand, the art of tapping into natural flows without taking away the stock; and second, human imagination and human ingenuity to create conversion technologies like the sails and a clever enough boat design to be able to reap and harvest these natural flows. This basically is what the solar age is as opposed to the industrial age. It means reaping solar income directly instead of diminishing the stock of fossil fuels.
Why did I say the second solar age? Because we already had the first solar age up until 1800 as for centuries each economy lived on biomass and so on. Now we have had two hundred years of the industrial age as we robbed the earth of its fossil treasures and that age is coming to an end. We again have to enter a second solar age. However, the second one will not be the same as the first because admittedly we have matured, we have technology and a knowledge of chemistry, plant biology, meteorology, bio-mimicry and all kinds of other processes to enable us to have a knowledge-based solar age as opposed to the agrarian solar age of 200 years ago.

How does technology affect people?

I would like to call your attention to a crucial technological difference between fossil systems and renewable systems. Fossil systems, in particular gas and oil, are distributed in only a few locations in the earth's crust: Russia, Saudi Arabia, something in the North Sea. However, the consumers are everywhere, so you have a big problem, how to get energy from the place of production to the consumer. You need pipelines, transmission lines, tankers, refineries and power plants. Long supply lines have created a particular economic structure, namely a centralized highly capital intensive and international economic structure because otherwise you could not have exploited fossil resources because long supply lines call for centralised structures. It is different when it comes to renewable energies because basically the wind, water, sun and plants are everywhere, certainly at a lower density but they are everywhere and that makes it possible to shrink the distance radically between the place of production and the place of consumption.

As Mercedes Bresso said, nearly every location can be turned from being a purely consumption unit into a production unit. So I would venture that with renewable energy it is not enough to speak about the material, we also have to speak about economic structures. The idea we have in mind is to go towards an economy, and particularly an energy economy where we would no longer have a few giant energy producers but hundreds of thousands even millions of small producers and small points of production that are interconnected by the electrical grid.. Small but interconnected – that is the configuration of a system of distributed energy production.

What is the major conflict today?

I would say the major conflict is between a fossil centralized path and a solar decentralized path. Everybody knows that we have scarcity and climate crises, that is no longer the issue, the issue is how to deal with it. There is the fossil centralized path that aims at expanding supply, nuclear, maybe moving from oil to gas, maybe going for industrial biomass, big plantations, maybe going for new coal power, clean coal. I know the Dutch are obsessed with cleanliness, and our Dutch friend praised clean coal but I think the Dutch idealism for cleanliness is misplaced there. It is if you want a cover-up in order to keep the coal industry and coal power generation going into the future. That is part of the fossil centralised path reinforcing the heritage of centralised structures.

On the other hand, there is the solar and decentralized path and that is attractive to many people - small but interconnected. First, of course the voracity for energy must be reduced and small and interconnected units have to be adopted. This distributed energy generation can follow the same model as having many personal computers substituting one big mainframe computer. Many small energy producers on roofs, bio-generators in fields can substitute a gigantic power plant. So that is basically the idea of the decentralised solar path and today these two paths are in conflict at many different levels.

Why need renewables to be linked to moderation?

Some of my “renewable” friends appear to adhere to the illusion from “fossil times”, namely that you can have an infinite energy source. That will not be true for renewables either, renewables are basically finite like anything else. Biomass is linked to land and land is very scarce and many things can be done and should be done with land. As regards wind, we know the objections about spoiling the landscape and about the noise. As regards water, we know about the objections to dams and that the ecosystems of water courses might be disturbed. As to solar energy, we know that conversion technologies like solar panels or photovoltaics require energy and highly sophisticated materials. For that reason I would like to submit that renewables cannot liberate us from the need to move from an age of excess to an age of moderation. It will only be possible on an intermediate level of performance to really use renewable energies. Dematerialization on the one hand with a resource-light economy and moderation on the other hand with all the intermediate aspirations are the necessary complements for regeneration.

What should a Green New Deal go for?

At this moment we are throwing money after the old stuff, most of the anti-recession programmes in the financial crisis are reinforcing the old fossil centralised structures. So it would be necessary to do four things. First, massive expansion of distributed energy. You know there is already a silent revolution happening, there are now 80 regions and localities in Germany that have decided to become hundred percent renewable. There are many villages and towns talking up the idea and distributed energy generation in many places is becoming a silent revolution.

Second, Germany’s most important export article of late has not been Mercedes but the simple idea of the feed-in law that basically says that if you are a small producer bringing solar based energy to the electrical grid, three things will happen. The electrical grid is expected to accept your offer and has to buy it from you; second, the price is fixed, above the cost of generation; and third, that higher price is distributed among all the electricity consumers in the country. So today each German household pays one euro a month to make the expansion of renewables possible. That simple legal device has been the crucial engine for making the famous renewable revolution in Germany possible .

Third, we need a super smart grid. The electricity grid today is deficient in terms of renewables because the grid is not built to deal with all the fluctuations that renewables cause - sun, wind and biomass all fluctuate to a greater or lesser degree. In order to balance supply and demand you need an intelligent grid that uses information technology to balance the interconnection of many producers. We do not have such a thing yet. We might also need a super grid because there might be too few small producers and so a centralized structure might be required to act as a back bone like offshore wind or the claims some people make for electricity from the Sahara.

Fourth point: sustainable energy utilities, or in other words, locations and regions. Last week I was in Dobbiaco in the South Tyrol, and Dobbiaco shows how it should be done. It has achieved a form of autarchy in terms of heat and electricity, because Dobbiaco has built a biomass-based long-distance heating system that produces heat and at the

same time produces electricity. By and large, Dobbiaco and San Candido are autonomous in their energy. That has happened in South Tyrol in 63 municipalities over the last 10 years. Nobody even noticed this but the effect of their efficiency policy means that today Southern Tyrol imports 60% less oil for heating than 10 years ago. That means you need to create structures like cooperatives as they have done in Dobbiaco, where people can share and participate in taking charge of their own energy sources and use the locality in a particular way to make that possible.

Maybe if we can find a way to encourage social cooperation and promote the idea of an energy commons - somebody mentioned the re-appropriation of energy by citizens - then we will get a vision of the future where you can see that energy has much to do with democracy and much to do with the local economy. If we follow that path then as the German philosopher Ernst Bloch said: “Technology comes into its own only when it enters into an alliance with nature” and that is our task for this century .