WHY IS TODAY’S ECONOMIC BREAKDOWN THE ECOLOGICAL CRISIS OF TOMORROW?

Further answers for ministers and children
Why is today’s economic breakdown the ecological crisis of tomorrow?
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Susie and her Grandma are sitting in the waiting room of a train station. They are on their way back to the city. Susie is a big girl now: almost eleven. She still enjoys being with Grandma, so she spends some weeks in the summer with her in the countryside. She was enjoying this holiday a lot, too. She still remembers what she learned on her way to Grandma on the train a few years ago. She still keeps in touch with Peter; they are great friends.

This summer she spent most days in the garden playing with Rex, Grandma’s friendly dog. In the small village it was exciting to see the things she now knows so much about. She also enjoyed looking at the bugs in the small kitchen garden, some of which, as she knows now, safeguard plants from pests. She observed the bees, which pollinated the flowers on the apple trees in the spring. She already knew that pollination is a type of ecosystem service, which nature gives free of charge. She walked out to the fields with her Grandfather and looked at the crops that people have grown for hundreds of years in that region. Grandfather agreed that it is much better to grow crops in a way that is suitable to the local environment than change local conditions to suit the needs of crops. They discussed why it is so: it requires less pesticides, irrigation or fertilizers. It also helps protecting the abundance of animals and plants around.

But now the holiday is over and she is going home. Her parents missed her a lot! She has been waiting at the train station with her Grandma for half an hour. The trains were delayed because of a storm last night. She is already bored with the book she has brought for the trip so she looks around with curiosity when she hears the radio, which is on in the restaurant nearby.

… compared to the same quarter of the previous year, seasonally adjusted the gross domestic product increased by 1.7 percent in the EU27 during the second quarter of 2010, according to flash estimates published on Monday…
Susie: Grandma, what is gross domestic product?
Grandma: Hm, it is also called GDP. This is a number which somehow shows the performance of the economy. Do you know what economy is?
Susie: Yes, I think. It is the factories, which produce stuff for people.
Grandma: Yes, you are right. Economy includes factories, small businesses, banks and much more. But it is so complicated. Ordinary people like me cannot even imagine that.

The conversation draws the attention of a boy of about twenty who is sitting opposite them. He is holding a university textbook in his lap, but he is not reading it. He seems to be bored and eager for a talk.

Student: If I may interrupt, maybe I can help you. Economy is the common term for the economic system, which is the structural framework of the production, distribution and consumption of goods and services in a society. It is economy when a farmer grows wheat, a baker bakes bread, a merchant sells it, a doctor advises about a healthy diet, but also when all these professions are thought in schools. All these things are part of the economic system. Do you understand?
Susie: Yes, I think so. So everything that people do is part of the economy, right?
Student (a bit embarrassed): Er, I would not say that… Only if it is related to production, distribution or consumption. Do you see the difference?
Susie: No.
Student: Look, this topic is not for a small girl like you. You are too young for this.

Susie (seems to be offended): I am not a small girl anymore! Grandma, what does he mean with this production, distribution thing?
Grandma: Yes. They are responsible for production and distribution. But you are also an economic player. Can you imagine how?

Susie: I see. So the adults who work make the economy.

Susie: (surprised): Me? How?

Old Man: You know economy is the interface, or simply speaking relationship between humans and their environment. People have needs such as food, water, shelter and clothing. They also like culture, travelling and leisure, such as going to cinema and theme pools.

Susie: Yes, I also like going to the theme pool! I like the high slides the most!

Old Man: You see economy helps you to realise this. A lot of things are needed so you can go to a theme pool. People to build and run the building and the pools. Water from nature to fill the pools. Wooden furniture for the lockers in the changing rooms. Bricks and tiles from clay to build the pool and slides made of plastic and metal. These entrepreneurs, also called economic actors, interact with the natural environment in many different ways and they use natural resources. But they also get in contact with numerous other people, other economic actors who are also part of their environment. They know how to produce tiles, bricks, slides and have the machines for the production. What is more, there are also companies that do not produce but only transport things from one place to another and this is how they realise distribution. They don’t provide goods but services. But they are also in contact with the natural environment by using roads or generating exhaust gases. Indirectly, they also use natural resources.

Susie: I see. So the adults who work make the economy.

Old Man: Yes. They are responsible for production and distribution. But you are also an economic player. Can you imagine how?

Susie: I have already been to the theme pool several times but I did not know that.

Student: In your approach we can say that economy is a tool to meet society’s needs.
Old Man: Yes, you are perfectly right. Economy is a tool, not an aim, as nowadays many think. It is dangerous when politicians put the increase of economic performance as the main goal of national policies and ignore that environment is a precondition for any economic activity. The natural environment will survive without economy but no economy will survive without nature.
GDP is the figure that sums up the value of all products and services produced in a country in a year. If it decreases, it means that less economic activity has taken place and more people have become unemployed. Also less money is paid to the state in the form of taxes, which are to finance hospitals, schools, state institutes or pensions.

Susie: I see. So when the GDP is dropping that is bad, if it is growing, it is good.

Student: Only if it was so simple. There are several problems with this explanation. For example, it does not make a difference between the construction of new schools to teach more students in better facilities and rebuilding schools and houses because they were destroyed by a flood. Do you remember how many villages were flooded this year? Thousands of people became homeless.

Susie: Yes, I saw it on TV. It is terrible when people don't have a place to live.

Student: Well, reconstructing these houses will contribute to GDP even if it is a tragedy for many people.

Old man: When people, for example clear-cut forests, drain wetlands, burn the peat or produce chemicals that eventually pollute and damage nature, they destroy ecosystems, but when we count the GDP these are benefits and not losses.

Susie: But nature gives us such presents all the time! Like food, water or the bugs that protect the carrots and cabbages in the garden! Destroying them is bad for us, not good!

Student: Yes, that is why the GDP in itself is not a good measure of economy and there are economists, who are working on alternatives to GDP.

Susie: So maybe it is not even bad that there was a recession? If GDP is not good, then maybe it is not bad that it was dropping.

Grandma: I am sure that this recession was awfully difficult for many people. Do you remember your friend Julie, who could not join you for the summer holiday last year with her family because her father had lost his job? There are many others in a similar situation. And there are a lot of people who find it impossible to pay back their bank loans.

Student: Actually, I heard that the whole crisis started with the bursting of the US housing bubble followed by a mortgage crisis. People took loans that they couldn't pay back later on when the housing prices plummeted and the interest payments increased. Similarly, banks carried out risky transactions that depended on insecure income.

Old man: Ahem. And do you know how the financial crisis relates to the ecological crisis?

Student: The ecological crisis? What do you mean? Clearly some kind of fuel and food crises happened in 2008 but I wouldn't say there is ecological crisis.

Old man: Indeed, people are less aware of an ecological crisis threatening us. This ecological crisis affects the whole biosphere and there are already some signs that warn us. Can you count the storms and floods which have happened in the last years?

Grandma: I surely don't remember so many summer storms and such devastating floods from my youth. The climate seems to have gone wild.

Student: OK, I accept that the weather has become more extreme. Scientists predicted this in the past. But governments know about this problem, you can't accuse them of ignorance!
old man: I'm afraid we cannot be satisfied with government efforts to fight climate change. Scientists suggest that a much larger emission cut would be necessary than what politicians suggest. But there are also other environmental problems. Susie, do you know what biological diversity is?
susie: Yes, I do. It means the diversity within species such as broccoli, cabbage, cauliflower and Kohlrabi all belonging to the same species. It also means different types between species, like different animals and plants. And mushrooms which are not plants. Did you know that?
student: No, I didn't know it. Are you sure?
old man: Yes, indeed. Mushrooms are not plants.
susie: But there is also a third thing about biodiversity, which I forgot.
grandma: You mean ecosystems, don't you? A forest, a field or a pond is an ecosystem, where different living creatures grow and work together and make up ecosystems functions.
susie: Yes, now I remember! And these ecosystems give us presents like food to eat, water to drink and fibre for our clothes. Ecosystems also make sure that the fruit we eat contains a lot of nutrients and makes us healthy.
old man: Oh, you are a well-informed young girl! These "presents" are called ecosystem services, which nature gives us for free. But there are many more presents less easy to see! Ecosystems regulate the climate, produce clean water and air. They also support other ecological processes through soil formation, pollination and evolution. Not to speak about the educational, recreational or spiritual role nature plays in our life.

student: That is fine. We need these services for sure. But what about biodiversity?
susie: Without so many different types of plants and animals there would be no ecosystem services.
old man: You put it quite plainly, but eventually it is true. We cannot predict how much biodiversity can disappear from an ecosystem before it fails to deliver one or more of its services. Definitely there are several species in ecosystems playing similar roles. So when some decrease or disappear, it doesn't seem to disturb the functioning of the ecosystem. However, when the environmental conditions change, this abundance might become essential. Maybe one species doesn't seem irreplaceable today, but later, once the environmental conditions have become unfavourable for other species with a similar function, they can become indispensable in delivering ecosystem services.

grandma: You mean when the composition of a forest changes, but it delivers similar services as before.

old man: Yes, that's a good example. This is also part of resilience in other words the ability of ecosystems to withstand and to regenerate after disturbances such as fires, droughts, gales, insect invasions or forest clearing. That is why we can consider biodiversity as insurance for humanity for the future. Nowadays this is crucial because global environment is under growing pressure and evolution. Not to speak about the educational, ecological processes through soil formation, pollination and evolution. Not to speak about the educational, recreational or spiritual role nature plays in our life.

student: I am still not convinced why we should worry about this today and not tomorrow.

old man: Scientists say that even today may be too late. In the last 300 years the world's forest area has shrunk by about 40 percent, and forests have completely disappeared in 25 countries. But it's not only forests: half of the wetlands have been lost globally in the last century and 35 percent of mangroves have disappeared just in two decades. Today 100 to 1000 times more species disappear each year than would do so without human activities.

grandma: It sounds so much…

student: But from how many species? Millions? It might not be so many from that great number. Do we know at all how many species there are?

old man: You are right, we don't even know that. It might be somewhere between 5 and 30 million. But how could we know for sure that we will never need all these species if we don't even know about their existence? Some scientists say that we should stay on the safe side and allow maximum ten times more species to die than would happen naturally, without humans. And even then we would deeply transform our natural environment.

grandma: When you say that a ten times higher extinction might be all right, my calculations tell me we are way over that limit by about a hundred times. This makes me scared.

student: Yes, it sounds scary but I think that if we were in such big trouble, we would know it by now. If biodiversity is necessary for ecosystem services and biodiversity is much too disturbed already, ecosystem services should already be disappearing.

grandma: And isn't it already happening? The climate is changing, the air is not so clean and refreshing as it used to be. We need to travel further and further to see natural landscapes like the ones in my childhood. I remember my family bringing the water from the river every day in a mug when I was a child. We used to drink and cook with river water. It was much tastier than water from the well. Today nobody would dare to drink it.

old man: That is right. According to a survey about 60 percent of ecosystem services are degraded or used in an unsustainable way. Two types of services cannot be sustained even at current demands, much less future ones: fisheries and fresh water. It was clearly proven that the decline of these services seriously affects humankind's well-being. To tell you an example, when the Newfoundland cod fishery collapsed due to overfishing in the early 1990s, tens of thousands of people lost their jobs. Altogether it cost at least two billion US dollars.

We have been fishing down the marine food web. Susie, do you know what food web is?
susie: Yes. It describes what eats what in the food chain. We learned about this in biology. The plankton are at

student: Isn't it too early to worry about this?
susie: Don't be so crude! I do care about plants and animals! They also belong to me! I don't want others to harm them!

old man: What Susie is talking about is called environmental justice. It's not fair that a smaller group of people decides about the fate of natural values, which are the common assets of humankind. It is especially unfair towards children and those, who will be born later. They can't yet take part in today's decisions, but will be forced to deal with tomorrow's problems. When we greatly intervene in natural processes, we should think about our children and grandchildren and pay at least virtually for the ecological insurance.

student: We learned about this in biology. The plankton are at
old man: You got it. Overconsumption of ecosystem goods is similar to taking a loan. Societies get an advance for the consumption of natural resources, while the planet hasn’t yet created the cover for these loans. At present our global ecological consumption deficit is about one third of the planet – in other words we are currently using 1.3 planet instead of just one.

grandma: In my opinion people should start thinking about this before it’s too late. I’m afraid we are not so well-informed to see these connections between loans and consumption and our planet’s resources. I think that governments should do more to educate the people about this.

old man: That might be true. Unfortunately governments take similar decisions.

susie: The governments? They can take loans?

old man: Yes, they can. In the European Union, where we live, the government debt was 73.6 percent of the...
GDP for the 27 countries in 2009, rising in just two years by 4.8 percent due to the financial crisis. At the same time the government deficit was 6.8 percent of the GDP, which means that the governments of the 27 countries collected less revenue than what they have spent. And no government had more revenue than expenditure.

SUSIE: Then these countries are getting poorer and poorer...

STUDENT: Not according to economic theory. If the economy is growing, they are getting richer. This is what we learned at university.

OLD MAN: Well, that might be right within reasonable limits. But my point is that all these processes show that natural resources are overconsumed both now and in the future. The growing economy is already using more and more energy and resources. But when governments take loans to stimulate the economy they commit themselves to higher production also in the longer term so that they are able to pay their loans back. Of course, governments also have an interest in economic growth in order to secure their budgetary income, like paying health care, schools and pensions. This is how in a growth-centred economy natural debt becomes ecological debt. For which we are already paying the price by our declining well-being.

STUDENT: But why do you think the use of natural resources is necessarily growing? People do more and more for higher efficiency and energy saving.

OLD MAN: Yes, that’s also true. The problem is that in-...
look at the question of development from a biological point of view. Susie, do you know what bacteria are?

*SUSIE:* Of course. They are very simple and very small living things. They are so small that you can’t even see them – not even with a magnifier.

*OLD MAN:* I can see that you are paying attention at school, very good! Bacteria are simple organisms which can be found everywhere. They live in the deep sea, up in the air, in the soil, in plants – even in the human body. Oh, don’t look so scared, most of them are harmless, and what’s more, a few of them are even good for your health! So bacteria are very simple, they don’t even have a nucleus, like plant, animal and fungus cells. However, they are widespread in all kinds of environment. On the other hand, there are very complex organisms that developed complicated organs. Just think of the eye of a fly or the complexity of the human brain. But when it comes to survival, bacteria, flies and humans alike are faced with the same challenge: can they adapt to their environment? If they adapt successfully, they will survive. If not, they will die. So complexity, technology and knowledge are one thing, but whether these help us to adapt to the environment and survive still remains a question.

*SUSIE:* So development means better adaptation to the environment?

*OLD MAN:* That’s right.

*SUSIE:* It sounds very boring to me.

*STUDENT:* It doesn’t make sense to me, either. We’re not animals anymore living in the wild and fighting mammoths and cold.

*OLD MAN:* You do not think so? Well, I think we are doing that exactly, only our means have changed. We are fighting cold with the help of houses, clothes and the heating system. We are fighting heat with sun shades and air conditioners. In addition, we have changed our lifestyles so we don’t need to be outdoors all day. We fight for food not only with tractors, fertilizers, pesti-
OLD MAN: No, I didn't mean that. Technology can help us to recover from the economic and financial crises through better adaptation. But then another crisis will come. And another. Problems can be solved only if we tackle the underlying root causes—adapting to them won't help. A well-insulated house and warm clothes may keep you warm but they don't take away the cold itself. A sun lotion protecting you from the ultraviolet radiation doesn't repair the ozone layer. The real causes of environmental problems, such as climate change, biodiversity loss or pollution are cultural, institutional and structural drivers. I give you an example. Susie, have you ever seen a whinchat?

SUSIE: I'm not sure. What is it?
OLD MAN: It is a small bird with brown upperparts, apricot underparts and bold white eye stripes. You can mostly see it on posts or the top of low bushes.

SUSIE: No, I don't know them.
OLD MAN: Unfortunately whinchats have disappeared from many places. They breed in open rough pastures but many of these small farmlands have been lost in the last decades.

SUSIE: Why?
OLD MAN: Because intensive agriculture pays better to the farmers, many marginal farmlands have been either intensified or abandoned. Intensive use of the fields means that farmers use more fertilizers, pesticides and heavy machinery, the fields are irrigated and large fields of monoculture are established. These practices don't adapt to local ecological conditions but try to change them to produce higher yields or bring new areas or crops into production.

SUSIE: Yes, I've heard about intensive agriculture before. It is cheaper, right?

OLD MAN: Yes, it is. The production of fertilizers, pesticides, machines, fuel for the machines is still affordable enough to make intensive agriculture more profitable in comparison to extensive production. Consumers also favour cheap food which is easily available in big supermarkets. If farmers maintain traditional farming techniques, they are forced out of the market.

SUSIE: But nobody wants to help farmers to do the kind of farming also good for birds?
OLD MAN: On the contrary, there are many attempts to support them on EU, national and local levels. These are called agri-environment schemes. But these programs can hardly compensate for all the disadvantages.

SUSIE: But why don't they work?
OLD MAN: Agricultural production happens in the wider economic framework with many interacting sectors, policies and market forces. For example there is the chemical industry, which uses seemingly unlimited cheap raw materials and energy. Then there is transport, which is based on cheap fuel. This enables the long-term transport of both the raw materials and the produced food products. Trade exploits the differences in the social and environmental standards within the global economy and suppresses the prices. Finally the taxation policy makes human labour expensive in comparison to natural resource use.

SUSIE: And don't politicians want to change these things?

OLD MAN: Student: Even if we accept that development means better adaptation to the environment, technology helps to adapt, you also said it yourself. Then why do you doubt that technology is useful in recovering from today's crises?

STUDENT: Even if we accept that development means better adaptation to the environment, technology helps to adapt, you also said it yourself. Then why do you doubt that technology is useful in recovering from today's crises?
OLD MAN: Well, some of them try but not hard enough. And you know, changing all these connected issues is not possible with separate sectoral measures. This means that the ministers of trade, transport, finance, agriculture, economy, interior affairs and many others need to agree to introduce such measures, which would greatly change their fields of work and also change their own importance. Complete, so-called holistic economic measures are needed. For example, controlling the resource input of the economy would make a good start. This is what we called “putting a cap on resource use”.

STUDENT: We were talking about this a short time ago. But this would imply a huge change not only in the economy but also in the minds of people, right?

OLD MAN: Definitely. You can only change the way how economy works with a holistic approach and strong political will. But of course these are closely linked to the values of society, what people find important and what they don’t. Do people value healthy ecosystems, safety, personal relationships and health as contribution to human well-being? When your answer is yes, it will be the right time to introduce a different economic framework.

GRANDMA: My God, you arrived from the whinchat to the values of people in a minute. I can hardly follow you.

OLD MAN: As you can see, everything is related to everything else. There are many factors influencing the whinchat population – but only few of these appear physically in the farmed fields. The majority of drivers are woven into economy and society, establishing causal links between bird population trends, financial regulations, the approaches of decision makers and the values of society. These are the structural, institutional and cultural drivers behind the problems.
mental pressure. And it’s not only the loss of natural habitats that matters. If a road cuts through a forest, it affects the forest species living there in many ways. It causes disturbance through noise and the turbulence of cars driving past, which scares animals. It creates a new edge in the forest, which changes the temperature and other microclimatic conditions along the way, so new species appear while others move further into the deep of the forest. A new road also separates animals from each other who can no longer meet so easily to mate. This process is called the fragmentation of habitats and it has severe negative effects.

SUSIE: When they kill the animals or cut down the trees.

OLDMAN: This is called pollution. Do you know other ways?

SUSIE: When they throw harmful materials into the rivers and oceans. Or throw the garbage away in the forest.

OLDMAN: This is called using natural resources. You are very clever. Can you think of anything else?

SUSIE: When we drive a car to school or to the shop instead of cycling or walking.

OLDMAN: Well, that is also pollution if you think of the exhaust gases. But road transport also harms the environment in another way.

SUSIE: You mean by killing animals on the roads?

GRANDMA: Or by clearing the fields or forests for the roads?

OLDMAN: Both of you are right. Using a piece of land like converting natural habitats to roads, cities, agricultural fields or factories is the third type of environmental pressure. And it’s not only the loss of natural habitats that matters. If a road cuts through a forest, it affects the forest species living there in many ways.
causes food prices to rise. But also in this latter case new fields are brought into the food production later. This is a perfect example of shifting environmental pressure: in order to decrease pollution we increase land use pressure instead, so environmental degradation continues.

**Student:** And I can imagine that the growing production of biofuels and food also needs additional fertilizers, pesticides and so on.

**Old Man:** Exactly. Without setting absolute limits to the energy resource and land use, we just shift the problems somewhere else without solving them.

**Student:** I can’t even imagine what needs to happen in the world so that such reforms are finally made...

**Old Man:** You can bet your bottom dollar that sooner or later some kind of reforms will happen.

**Student:** Why are you so convinced?

**Old Man:** Because natural resources such as oil will become scarce one day. With rising scarcity fuel prices will shoot up and that will affect our economies, which heavily depend on natural resources.

**Student:** Maybe you shouldn’t worry so much, if it is going to happen sometime anyway.

**Old Man:** The problem is that until then we are destroying our ecosystems, degrading the ecosystem services and compromise our well-being at an alarming speed. And ecosystems can’t be repaired in a day. Many of these changes are irreversible. This is the crucial difference between an ecological and an economic crisis.

**Susie:** Yes, I understand that. If there are no more whinches, we cannot put them back on the trees.

**Old Man:** Exactly. There is another argument to introduce such reforms today instead of tomorrow. Today we still have time for a smooth transition period. We could still develop large scale programmes for implementing reforms carefully. With this we could ease the pressure on those who are the most vulnerable.

**Student:** Who do you call vulnerable?

**Old Man:** Poor people both in our marginal regions and in the third world. But if we wait until resources become very scarce, the reforms will have to be drastic and the social costs in addition to the environmental costs will be extremely high.

**Radio:** ... The EU commissioner for research and innovation announced yesterday nearly 6.4 billion euros of investment in research and development to be spent by the end of 2011. The package, described as Europe’s biggest ever investment drive in the sector, aims to increase European competitiveness and help tackling EU priorities such as climate change, energy, food security, health and the ageing population.

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**Radio:** So a company can become more competitive if it uses green technologies. This saves resources and helps solving those problems of nature.

**Old Man:** This is what you would expect, right? Unfortunately, higher competitiveness leads to higher environmental pressure.

**Susie:** Why?

**Old Man:** It is quite logical. Let’s suppose you own a toy factory. What would you do, if you made such good toys that you could sell more and more of them?

**Student:** I would make more toys.

**Old Man:** Right. But producing more means using more resources, even if you need fewer and fewer resources for each and single toy. So on one hand being more successful usually leads to higher environmental pressure directly. But there are also indirect effects. The state gets more money from higher production and consumption because everybody has to pay taxes. These taxes are partly spent on supporting the economy and making the people wealthier. So people can afford to consume more, which also increases environmental pressure.

**Susie:** So being more successful means that we are destroying nature even more?

**Old Man:** Yes, it does mean that. If there are no limits of resource and land use, increasing our competitiveness can only lead to more environmental destruction.

**Susie:** And because we increase environmental destruction, nature is giving us less and less presents.

**Old Man:** Exactly. Degrading ecosystems deliver less and less ecosystem services.

**Student:** An important thing just crossed my mind. I read it somewhere that we can protect ecosystems by recognising the economic value of the services they provide. This article I read said there were studies about this. When we recognise that ecosystems and ecosystem services also have a value, even if that price is never paid, this can help to protect them.

**Old Man:** Yes, there are such studies. A recent comprehensive study on the issue, titled The Economics of Ecosystems and Biodiversity, has provided certain evidence for that.

**Grandma:** They put prices on seas and forests?

**Student:** Well, not in all cases, but this is basically the point.

**Susie:** And how can this help?

**Old Man:** The consequences of biodiversity loss are felt on the ground but these costs can go unnoticed at national and international levels. These costs are missing from economic decisions, indicators, accounting systems and prices on the market. I already mentioned that the GDP doesn’t take a look at the degradation of ecosystems, which is also called natural capital.

**Student:** And how can we save what the price of a forest is?

**Student:** For example it can be calculated how much higher price people are willing to pay for a house that is in a natural environment, like next to a forest. Then from this price difference it’s possible to determine the added

**Old Man:** And because we increase environmental destruction, nature is giving us less and less presents.
cultural value of the forest for the residents. It can be also analysed how far people are willing to travel for an excursion in a beautiful forest and calculate how much they are willing to pay for that through the travel costs.

OLD MAN: In these cases the aesthetic and recreational services are valued. Forests can definitely provide such services. There are other ways to calculate this. In questionnaires or interviews people can be asked to say how much they would be willing to pay for certain ecosystem services based on a hypothetical scenario. Actually, this is also used when endangered species are valued. When people in the US were asked how much they would be willing to pay to protect the squawfish population, they said they’d pay 8.42 dollars per household. But they were willing to pay 95.42 dollars for the Northern spotted owl!

SUSIE: A squawfish is worth less than an owl? How can that be?

OLD MAN: Well, definitely not from an ecological point of view… This approach of economic valuation builds on the preferences of people. This of course doesn’t necessarily reflect the importance of the species – or of an ecosystem service for that matter. This is a significant shortcoming of this approach for sure.

STUDENT: But there are other approaches of evaluation. I heard that it is also possible to calculate how many services, such as timber, herbs, mushrooms or berries, a forest provides. We just have to use of the market prices of these services. But it is more difficult to calculate the regulating and supporting services of ecosystems although they are usually higher than other types of services.

SUSIE: Higher than providing food or a nice place for hiking on the weekends?

OLD MAN: Yes, exactly. Higher than provisioning services such as providing food, fresh water or healing herbs, and higher than cultural services such as recreation, inspiration or education. When the different services of a coastal wetland in North Sri Lanka were assessed, they found that the role of the wetland in flood prevention was the most substantial benefit for local people and economic actors. The second most important ecosystem service was the cleaning of domestic and industrial wastewater, while providing food and firewood was valued as less than one-tenth of the flood prevention service.

GRANDMA: I just cannot imagine how they can possibly calculate such things...

OLD MAN: Well, in some cases they take the cost of the replacement of the given service. It is possible to calculate how much it would cost to build and operate a wastewater treatment plant. Or we can sum up the costs that can be avoided with the help of the ecosystems, such as by flood prevention. In addition, it also works to use existing value estimates from studies completed for other locations.

GRANDMA: Still it seems to be very complicated and a lot of work!

STUDENT: Yes, it is. But this area is developing quickly so we know more and more about the economic values of ecosystems! With the help of such information we can make better decisions in the future about the use of ecosystems!

OLD MAN: Knowing the value of certain services by ecosystems can be useful for politicians and other economic decision makers. But we will never know the true value of any ecosystem for sure.

STUDENT: Why are you so sure?

OLD MAN: Just imagine that dozens of different services should be valued for each ecosystem, which deliver ben-
If the deforestation of the Amazon forest exceeds 20–30 percent, the remaining forest could go through a widespread dieback and shift to a savanna-like vegetation. This would cause a decline in agricultural production, increased carbon emission and massive biodiversity loss.

Students say it is almost certain that such tipping points will happen sooner or later.

What tipping points?

Old man: I already mentioned the possible collapse of coral reef ecosystems. If the deforestation of the Amazon forest exceeds 20–30 percent, the remaining forest could go through a widespread dieback and shift to a savanna-like vegetation. This would cause a decline in agricultural production, increased carbon emission and massive biodiversity loss.

Old man: I really wonder what the deforestation rate is now in Brazil...

Old man: Above 17 percent.

Grandma: I really wonder what the deforestation rate is now in Brazil...

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Scientists say it is almost certain that such tipping points will happen sooner or later.

What tipping points?

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Old man: First of all we could apply the principle of precaution and reduce total environmental pressures such as resource use, land use and pollution. This is what we have been already talking about.

Old man: Good. Do you think we could measure this service of ecosystems?

Student: I do.

Old man: Good. Do you think we could measure this service of ecosystems?

Student: No. This can not be measured. So you don’t think that economic valuation is a good solution.

Old man: I’d say it can be a good way to attract the attention of political and economic decision makers to the importance of biodiversity. But then decision makers should keep the limitations of this method in mind and they should stick to some key principles. Most importantly we should only use economic valuations on concrete ecosystem changes in a concrete context and not use them to calculate the “total” value of ecosystems because it leads to false results.

Old man: So there are ethical questions. And there is also the problem of irreversibility, thresholds and combined effects. When a forest is cut down it is an irreversible act. Or it may bring a threshold and combined effect so it starts a chain of consequences that nobody could have foreseen. Not even the most careful valuations can count with these secondary effects. For example, increasing deforestation and fishing along tropical coastlines seems sensible from an economic point of view but only until a certain point. There is a threshold when coral reef ecosystems will collapse because of sediment deposition arising from inland deforestation, overfishing and other human impacts like climate change and pollution. The problem is that such thresholds can be rarely predicted and taken into account, and it is especially difficult when several human pressures interact on different scales. What is really worrying is that these sudden ecosystem changes can also happen at regional or global scale with long lasting and potentially irreversible impacts. These irreversible events are called tipping points. It is also typical of tipping points that we realise the impacts a long time after the pressures occurred.
As I was listening to the difficulties of economic valuation, I start to doubt myself if we can use it without taking too much risk.

Well, ecological processes simply cannot go hand in hand with economic thinking. I think it’s a totally wrong approach to integrate ecosystems into the economy. We should adapt our economy to the environment instead. Take the example of discounting. When economists compare current benefit to future benefit, they discount any future benefit. They do it because they assume that people will become wealthier in a growing economy so today’s benefits will be relatively less valuable in the future because today’s benefits will represent a smaller share in people’s income. Applying a conservative discount rate of four percent over 50 years means that any of today’s ecosystem services will be worth only 14 percent of their current value for our grandchildren.

But why would a forest be worth less in 50 years?

Oh of course, from an ecological point of view, this idea is wrong. Discounting would be logical only if we could derive more and more ecosystem services as time passes. But the contrary is true: as you know ecosystem services are degrading so they can’t be used to the amount we can use them today. So despite all economic theories it is just not right to use positive discount rates for ecosystems. We have to accept that economy must be adjusted in many ways. A first step can be to recognise the value of ecosystems. You might have heard about national accounts, which include the various assets of countries.

Yes, I know what it is. I also read about efforts to integrate the natural capital into the national accounts. This would give a more realistic picture about the performance of economy as not only the human-made and financial capitals would be accounted, but also natural capital, which is vital for any economic activity.

You are right. And recognising the value of ecosystems can also help introducing payment for ecosystem services schemes. Those who benefit from the ecosystem services should pay for it.

But who can they pay to? Not to trees, insects and birds, right?

Sure not. But those who take care of local ecosystems should make sure they can continue providing these services also in the future. At the moment local people, who maintain a wide range of ecosystem services through extensive land use, are often not rewarded. Even though it is frequently more attractive to intensively exploit these resources and obtain a higher profit on the short term, while also shifting the environmental costs to the whole society. We were already speaking about this related to the whinchats. Do you remember? When governments pay incentives for more biodiversity-friendly land uses within the so-called agri-environment schemes, they also pay to farmers for maintaining ecosystem services and compensate them for the higher profit they miss.

But you said that these things don’t work!

I said that they couldn’t be widespread and deliver extensive ecosystem benefits as long as the boundary conditions remain the same.

I bet you think about capping resource use again!

(smiling): Exactly. We realise that we need to spend money on maintaining ecosystem services in order to safeguard human well-being. The problem is that today we finance these schemes from the profit of activities that destroy the environment. You see, this profit, as the whole economic system, is based on cheap resources, and unlimited use of these resources generates lots of

It would be a good idea to limit the annual use of non-renewable energy at the current level. Then this amount could be reduced bit by bit each year, let’s say by one percent.
environmental pressures. I do not think we have hope to safeguard human well-being when we maintain eco-
system services in one place and at the same time spoil them in other places. Limiting resource use would help.

**Grandma:** You mention this so many times. Do you have any ideas how such limits could work?

**Old Man:** Well, we could start by limiting the annual use of non-renewable energy at the current level. Then this amount could be reduced bit by bit each year, let’s say by one percent. This one percent could be easily substituted by renewable resources or saved if we used more energy-efficient technologies. In other words, we would have an overall non-renewable energy consumption cap and quotas for achieving it.

**Student:** But who would have those quotas?

**Old Man:** First of all, individual people. Each person would get the right to use exactly the same amount of non-renewable energy in the form of those quotas.

**Susie:** Non-renewable energy? Like oil?

**Old Man:** Yes, it would include the petrol for your car, the electricity generated from gas or nuclear energy, or the gas for heating.

**Susie:** Then each and every person could use the same amount of non-renewable energy? It sounds so great!

**Student:** How much would that quota be?

**Old Man:** It could be determined using the average level of consumption per person. Then it would be reduced a bit each year.

**Student:** But what happens, if, for instance, somebody lives in a village, and needs to use the car much more than somebody living in the city with a well working public transport system? It would not be fair to forbid them to go to work by car.

**Old Man:** Of course it would not mean forbidding any-
thing. People shall make the right choices to reduce their non-renewable energy consumption in one way or the other. They can save energy by using their car less, making their heating system more efficient or switch-
ing to renewables. An advisory system would aid them to learn the system, make use of its advantages and change their lifestyle. But of course it could still happen that some people use more non-renewable energy than their personal quota. Then they need to buy extra quotas to cover their excessive energy use.

**Grandma:** And what if somebody uses less?

**Old Man:** Then they could sell it to get “quota money”. Quotas for energy savings – with their “quota money”. But people of course would still need to purchase energy for national currencies, when they go to the petrol station or pay their electricity bill. It would not change.

**Student:** Then I do not understand. Why not using normal money, why would you want to have “quota money” when selling the quotas?

**Old Man:** If we have such “quota money”, we can make sure that energy savings are only used for purchasing goods and services that support the preservation of eco-
system services. Quota money could only be exchanged to certified products and services, for example locally produced organic food or insulation of buildings for en-
vironmental goods, such as organic food or the most energy efficient household appliances. This way they can improve their living standards.

**Grandma:** A secondary market? I have lost the thread.

**Old Man:** It is called secondary market, as people can only use the quota money on this market. Another im-
portant point is that even the poorest can get access to these environmentally friendly goods and services on this market, which they could not afford before.

**Susie:** How?

**Old Man:** If they live a modest life and use relatively lit-
tle energy, they do not use all their quota, right? Then they can sell it for quota money, for which they can buy environmentally friendly goods, such as organic food or the most energy efficient household appliances. This way they can improve their living standards.

**Student:** I see. But what would happen to my parents who live in an old block house? They use a lot of energy for heating, as well public and private consumption groups, and the whole economy would have their quotas, as well as all the countries in the EU. They could also trade using the “quota money”. But people of course would still need to purchase energy for national currencies, when they go to the petrol station or pay their electricity bill. It would not change.

**Student:** But I am very much worried about. What if somebody cheats?

**Grandma:** A secondary market? I have lost the thread.

**Old Man:** Yes, that is the problem with them. It is nice, when the state, or the EU for that matter, funds energy efficiency programmes from their usually tight budget. But they can never meet the real needs of people or the business, because they simply do not have enough mon-
ey for that. And if they provide grants, then they need to fill up the fund year by year, which is a real burden. In addition the people still need to finance the major-
ity of the investment as their own contribution, which many of them could not afford. But with the revolving fund the logic and the working mechanism is different. As there is no own contribution required, everybody could realise the energy efficiency investment, even in the poorest households. However, the full loan must be paid back to the revolving fund. Also, the quotas are decreased by time, this is why it is called revolving. And not only the state would be providing the funds for it. When over-consumers buy extra quotas to meet their excess-
ive energy need, the price of the quotas would go into the fund in the form of quota money. This could be a really significant sum.

**Student:** And work like a negative feedback...

**Old Man:** Exactly. The more energy people use, the more they contribute financially to the revolving fund, which in turn assists people and businesses in reducing their energy use. So the whole system helps to achieve the final target: to reduce the total non-renewable en-
ergy use of the whole economy.

**Grandma:** There might be such programmes, still I could never get a cent to change my old draughty win-
dows. They do go neither to my heating bill, nor to my joints….

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**Grandma:** That sounds good, but there is one thing I am really much worried about. What if somebody cheated with the quota money? For example somebody could buy quotas of many other people.
OLD MAN: It would not be possible to buy quota from other people directly. Under-consumers could only sell their remaining quota to the quota managing organisation and get “quota money”. Similarly, over-consumers could only buy extra quotas from that organisation for national currency.

SUSIE: And who will keep account how much quota is left?

OLD MAN: The same quota managing organisation. Each energy consumer would receive an electronic card with a PIN code. Whenever somebody pays energy bills, or buys fuel at a petrol station, energy providers would register how much is purchased. This information would go to the quota managing organisation, which would regularly send out consumption statements to the energy users. Almost everybody uses bank cards and gets bank statement nowadays, it would not be much different. In addition, this interest free alternative currency would only exist electronically.

STUDENT: It sounds very interesting, though I am not sure if I fully understand it.

OLD MAN: Well, this might sound complex at first for sure. These four pillars, namely the quotas, the revolving fund, the secondary market for environmentally friendly goods and services, and the advisory service, mutually reinforce one another and form a complex scheme. All these together are able to start radically transforming the production and consumption patterns of the economy and change the values of the people at the same time.

STUDENT: Pretty ambitious. I would love to know more about it. I think this could be even a topic for my thesis at the university.

OLD MAN: You should find out much more about this system then. Contact the Resource Cap Coalition, where lots of experts and organisations discuss this and work for the promotion of this idea. Their web address is: www.ceeweb.org/rcc.

STUDENT: I will certainly contact them. What I like about this scheme the most is that while limiting energy use we could also curb the exploitation of other natural resources.

OLD MAN (smiling again): I hear you thinking aloud about this scheme and I am full of joy, because we need many thinkers and supporters if we want to make this world a better place. For example, we need politicians devoted to the preservation ecosystems and sustaining human well-being on board. The nature and people can only survive if we can reduce the total consumption of the natural resources.

GRANDMA: I wish politicians realised this!

SUSIE: I wish I could also enjoy beautiful nature when I am old...

GRANDMA: Look, Susie, our train is here! Come, we must hurry to catch it!

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Available at www.ceeweb.org/publications/english/Ministers_eng.pdf
Why is today’s economic breakdown the ecological crisis of tomorrow? How is modern economy related to the lives of ordinary people in far-away countries? What are the main directions of political decision makers and why are these not sufficient? These are complex and difficult questions – especially when an eager 11-year old wants the answer to them right now. Susie, a curious youngster already knows so much about biodiversity and still – she is full of questions about simple facts. Her grandma tries to answer her dilemmas but she soon finds out: there are few who can... A young man and an old professor come to her aid. Their discussion brings to light the most important relationships between the forces that shape our lives. Become part of this discussion and be one of the few who see the deep causes behind the economic and credit crunch and the degrading state of our natural environment.