

Episode 33

Carbon Taxes and the Green Paradox

**Script: Shri Kaustuv Chaudhuri
Science Communicators' Forum**

Title and Theme music ...

Characters: Harish, Ram, Chatur, Beni, Raghu (village youths), Arafat, Madhab (middle aged village farmers), Nita, Soma (college students female), Sudip, Bimal, Samir (college students male), Sir (college professor middle aged male), UNDP Administrator (male, 50 years), Miss Pamella (female, 45 years) and Narrator.

Scene - 1

Location: In some remote village in northern India. 4 friends Harish, Chatur, Ram and Beni are talking among themselves, sitting under a large banyan tree in a hot summer evening. Sounds of birds chirping and subtle music to be given.

Harish: Oh, the day is too hot!

Ram : Hmm ... Harish. I have heard in the radio, today the temperature soared 44 degree Celcius.

Chatur : My God! 44 degrees!! Ram, have you heard it correctly?

Ram : Yes ... my dear Chatur. Not only has that, forecast for heat waves been sounded. The Temperature may go high as 47 degrees.

Beni : (Angrily) Then how will we survive? We will just get perished in the heat.

Ram : That's right Beni. We have no electricity to run a fan.

Harish: Even the wells are drying up. Soon there will be no water to drink or bath.

Beni : Yes, that's true. Our luck is really bad. But did you notice one thing Harish?

Harish: What's that?

Beni : In our childhood temperature didn't soar that high. But recently ...

Chatur: Exactly. For the last few years, it has become unbearable.

Ram : Yes. That's true. I have also noticed. But what may be the cause?

Beni : Pollution dear, pollution.

Chatur: You are right Beni. Yesterday I was listening to a program on global warming on the radio. There the experts were discussing something like carbon pollution, greenhouse gasses and so.

Ram : That's means it is a global problem.

Beni : It seems so. Government has to give proper attention to this.

Chatur : Hmm.... Government and attention ... this speaks a lot.

Ram : That means we have no hope.... At least in our lifetimes...

(Everybody laughs at this.)

Harish: Hey, have you noticed... Raghu has not come yet.

Ram : Yes, yes ... its already 7pm. What makes him late so much?

Beni : I have heard his brother is not well. May be...

Chatur: Get up friends. Let's go to his house.

Ram : Ok, fine. Let's go. May be he is in trouble. We can help him at least.

Others: Let's go... lets go...

**(Everybody stands up and started walking. Sounds of multiple footsteps to be given.)
(Reaching at Raghu's doorstep)**

Harish: (In a shallow voice) the door is closed. No lamp under the Tulsi plant. Has something happened?

Beni : Let's call him... (Loudly) Raghu, O Raghu ... are you at home?

Ram : (Yelling) Raghu, Raghu..

(Suddenly the door opens up. Raghu comes out. Sound of opening door to be given)

Chatur: What happened Raghu? Why you haven't come in today's gathering?

Ram : Has anything happened to you? You look down dear.

(Suddenly Raghu bursts into tears. Sounds of his cry to be given here.)

Beni : Raghu, Raghu ... what happened? Why are you crying?

Raghu : (In a crying tone) My brother died in the morning.

(Momentary silence of shock and grief engulf the place.)

Ram : What? What did you say? Your brother ... means Mani... died?

Raghu : Yes Ram, yes. He is no more with us. (crying)

Harish: But how? Beni was telling us that he was not well.

Raghu : (Wiping tears) Yes. For a couple of months, he was complaining of breathing troubles. We went to the local health centre of the village. Doctor told us that he was suffering from acute lung disease and advised to do Pulmonary Function Test. But you know ...

Ram : Nearest hospital is around 60 miles away in the town.

Raghu : Right. Doctor told us the test is not possible here. So, we hired a car last night to send him to the hospital. But ...

Beni : But what? But what Raghu? ...

Raghu : But the problem intensified in the morning and he started to gasp. Oh God! What a pain that was! He kept wriggling for the air. We lifted him into the car and started to move to the hospital. But barely we had gone 10 miles ... he breathed his last on my lap.

(Raghu started sobbing.)

Ram : Cool down my friend. Cool down. We all can understand your grief.

Raghu : (Sobbing) Doctor told us severe pollution might be the cause. And you know, Mani worked in a sponge iron factory outside the village. If the factory had an efficient pollution control system, then my brother might not die in this way.

Beni : That's true. But what we can do. Last month, local heads of our village send a letter to the panchayat office about these factories. But they flatly expressed their inability to...

Ram : To what? Beni, to what?

Beni : To control such factories.

Chatur: But why? Do they cite any reason?

Beni : Yes. They cited political factors.

Ram : All are excuses.

Beni : Yes. But for now let's remain with Raghu.

Harish: Yes, yes ... we can discuss all these things in tomorrow's gossip.

(Scene drop music)

Scene - 2

Location: Somewhere in the Arctic Ocean. A baby polar bear in chat with his mother.

Baby : What are you looking for, mamma?

Mamma: I am looking for a seal.

Baby : That we will eat?

Mamma : Yes dear. A seal has much protein and fat. If I can kill a large seal, both you and I can feed it as well.

Baby : It will also keep us warm, isn't it mamma?

Mamma: Yes. I am looking here. You can go to the other side of the ice shelf to get a kill.

Baby : Mamma, I know how to kill a seal.

Mamma: Is it?

Baby : Yes mamma. I learned it from you. As soon as a seal will lift its head, I will have to deliver a severe blow on its head with my paw.

Mamma : You are absolutely right dear. Try on that side. Better you should try to kill a baby seal.

Baby : Ok Mamma. I am going to that side. (Shouting) mamma look, I am so far from you....
mamma....

(Suddenly a huge cracking and splashing noise is heard. A large chunk of ice has broken down)

Mamma: (Frightening note) Oh my God! Our ice shelf is cracking apart. (Shouting) baby, baby, come to me quickly. We are going to be separated ... baby, baby ...

Baby: (Crying) What is this mamma? Our ice shelf has broken in the middle. Mamma, please come to me.

Mamma : How can I?

Baby: Mama, mama why are you still standing there?

Mamma: Look dear, I am standing on a floating ice sheet. Where I will go?

Baby: But mamma, you are quite far from me. Please, come to me, mamma.

Mamma: But how can I dear? Initially we were on the same ice sheet. But suddenly a huge chunk between you and me tore apart.

Baby: (Crying) But why mamma, why?

Seal: (Suddenly popping out its head above the water) Ha ha.. polar bears ... waiting to kill me? Ocean temperature is rising and the ice will melt. You all will get to be drowned soon. Ha haha ...

Mamma: But isn't that dangerous for you too, Mr seal?

Seal: Yes. I am also feeling threatened. I didn't find it comfortable either.

Mamma: But why is this happening?

Seal: Global warming ... its due to global warming.

Mamma: Global warming? What's that?

Seal: Oh my God! You haven't heard it yet? It means the average temperature of the Earth's Biosphere is rising.

Mamma: Oh! I see! But what is the cause? I mean... I mean ... what makes the temperature to rise?

Seal: Do you find me a learned person? How can I know? I only overhear the scientists who \ come here for the research.

Baby: (Crying) Mamma, what are you talking about? Please rescue me ...

(Suddenly a huge sound of ice shelf cracking is heard.)

Baby: (Shouting) mamma, save me ... save me ... my ice shelf is cracking again ... I am going to be drowned ... (Shouting) ...

(Scene drop music)

Scene 3

Location : The village roads.

Narrator : Few students from the geography department of a college have come to the village for carrying out household surveys for their projects on pollution and global warming. While roaming across the roads, they run across a small stone erection in the midst of the paddy field.

(Chirping of birds, students' voices and background noises to be given)

Soma: Ufff ... it's terribly hot. I can't bear it long.

Sudip: What to do Soma? We are on a survey based project. So we have to go to each and every house.

Nita: It's was Soma's plan.

Soma: What plan, Nita?

- Bimal:** Yes, it's your plan Soma. You first submitted the proposal to carry out a household survey to know about the villagers' side of the story.
- Soma:** Story? Is it a story?
- Nita:** Yes, their say about air pollution, global warming and climate change.
- Soma:** Bimal and Nita, don't talk nonsense. What else I can do? Sir has told us to do a project on "Carbon footprint, Pollution and global warming" on the special paper of Social Geography.
- Samir:** Will you please stop this blame game? Soma's idea has shown us the grim reality. Would it be possible to gain this experience without the household survey?
- Bimal:** Samir will always on Soma's side ... (laugh)
- Nita:** Oh Bimal ... please ... Samir is right. I am just ...
- Sudip:** Hey ... sssshhhh ... sir is coming ...
- Sir:** Hey students ... what are you doing? I hope the survey is complete?
- Soma:** Yes sir.
- Sir:** How many houses you have covered altogether?
- Nita:** Almost 50 houses, sir.
- Sir:** Very good. Let's sit under that tree and have a talk.
- (Sounds of students moving and chatting)
- Sir:** Well, now tell me about your findings.
- Samir:** Sir, out of the 50 houses, 45 houses have no gas for cooking. Again, out of these 45 houses, 30 use coal as cooking fuel. Rest use wood fire.
- Sir:** And rest 5?
- Nita:** These 5 house owners are comparatively rich. They manage gas cylinders by giving large bribes.
- Sir:** I see. And what's about electricity?
- Soma:** Nil. Nearest electric pole is about 40 miles away in Kumarpara village. That is the last village in this district that is electrified.
- Sir:** Hmmm ... but doesn't they use solar power?
- Sudip:** Very few sir. Only 5 rich people installed solar panels and batteries in their houses.
- Bimal :** They light two bulbs and two fans at the night. The fans run continuously for 5 hours.

Sir: Oh ... I see.

Samir : Sir, I have a question.

Sir: Yes Samir ... come on. What is your question?

Samir: Sir, from the survey it is clear that most of the houses burn coal or wood to meet their energy demand. And we all know such fuels pour out a lot of greenhouse gasses. My question is, does that mean those houses are loading more carbon into the atmosphere

Sir: Partly yes. Coal not only produces carbon dioxide gas, but also loads the air with a lot of carbon particles. While carbon dioxide contributes in global warming, carbon particles are notorious for health.

Bimal : Sir, with the ever increasing global population and technology, the demand for energy is rising every day. Does this increasing energy demand have a negative impact on global climate?

Sir: That's a good question. Recent studies by International Energy Agency reveal that it might not be true.

Nita: Not true? But why sir?

Sir: Hmmm ... to understand this, you have to learn what the modern energy is.

Soma: Modern energy? What does it mean sir? Energy is eternal, as far as I know.

Sir: No Soma. Modern energy means the energy derived by harnessing the natural resources in a less polluting way. Such as ... cooking on coal fire versus gas ovens. While both are using natural resources for the same purpose, technology increases the efficiency while limiting the emission and pollution in the latter case.

Sudip: Now I get you sir. Do this have health benefits too, especially in the global scenario?

Sir: Sure.

Sudip: But how we can measure it? After all health is not a measurable commodity.

Sir: This is done in a different way dear. Estimates of the current health impacts of household pollution are based on the effects of solid fuel dependence today, whereas future estimates are based on the detailed access scenarios and account for forecasted demographic change and trends in background disease and mortality levels as estimated by the World Health Organisation. In 2005, total deaths attributed to solid fuel combustion in traditional stoves were about 2.2 million, and more than 41.6 million Disability Adjusted Life Years were lost.

Soma: Splendid sir. You explained in a nice way. What government can do to check such emissions??

Sir: Soma, Government can do many things. They can enact rules to force the companies to comply with the emission norms and to implement for pollution control devices.

Samir : Sir, I have heard something called carbon taxes.

Sir: You are right Samir. Carbon tax is a fee imposed on burning of fossil fuel with the aim of reducing and eventually eliminating the use of fossil fuels whose combustion is destabilizing and destroying our climate. In other words it forces the users of carbon fuels to pay for the climate damage caused by releasing carbon dioxide into the atmosphere. If set high enough, it becomes a powerful monetary disincentive that motivates switches to clean energy across the economy, simply by making it more economically rewarding to move to non-carbon fuels and energy efficiency.

Soma: That means it is a form of carbon pricing.

Sir: Yes. That's true.

Samir: (Curiously) Sir ... do we have this carbon tax here in India?

Sir: Certainly. On July 1, 2010, India introduced a nationwide carbon tax of 50 rupees per tonne of coal both produced and imported into India with an aim to reduce the amount of carbon dioxide released per unit of gross domestic product by 25% from 2005 levels by 2020. Currently the carbon tax stands at Rs 400 per tonne.

Nita : Sir, what's about the other countries?

Sir : Other countries have also their carbon taxes. And in some, these are more complicated.

Bimal : Complicated? How sir?

Sir : When first introduced, industrialists in many countries, including ours, opposed the tax as they feared it would negatively affect their business by rising the market price and inflation. In the US, the issue had gone to such an extent that the environmentalists had organised a national movement called Citizens' Climate Lobby to create support across parties to put a national price on Carbon.

Nita: Oh my God!

Samir : Sir ... What is that? Seems like a milestone.

Sudip : It's not a milestone idiot. It must be some plaque or gravestone.

Nita: Sudip is right. It probably marks the place where somebody died.

Soma : Something is engraved on it.

Sir: Read it, if you can.

Samir : Sir it is written that "This plaque is erected in the memory of those villagers who died due to pollution and ill treatment."

Sir : Oh, my God! It is ridiculous. Isn't it? I have never saw something like this one.

Bimal : Oh ... look... a local farmer is passing by. Let's ask him about it. (After a pause, shouting) Hey ... do you hear me? What happened here?

Arafat : Sir, do you asking me?

Sir : Yes yes. Namaskar. What is your name?

Arafat : My name is Arafat. I am a farmer of this village.

Sir : Good. Can you tell me what happened here?

Arafat : That's a very sad event sir. For the last few years several villagers died due to respiratory problems. So, some environment friendly youth erected this stone in their memories.

Sir : Oh ... I see ... But why?

Arafat : Sir, there are several sponge iron and asbestos factories outside this village. Many villagers work there. But those factories do not pay heed to emission control norms. We have seen thick black smoke bellowing out of their chimneys.

Soma : Oh ... that's very bad.

Arafat : Yes bahinji. The workers fall prey to these smokes.

Sudip : Not only the workers. You villagers also inhale that smoke.

Arafat : You are right babu. Due to prolonged inhaling, some workers developed respiratory diseases. To make the matter worse, there is no hospital in the locality. The only primary health centre is virtually a crippled one. Due to want of electricity no diagnostic tests, scans, x ray etc. can be done here. As a result most of the diseases remain untreated. Last year three persons died due to this.

Sir : So sad. But who erected this tone?

Arafat : Sir, there are some learned youths in this village. They told us that these factories emit carbon particles and carbon dioxide along with some other poisonous gasses. These gasses pollute the atmosphere on one hand and contribute to the global warming on the other. They also tend to change the climatic pattern. So, they erected this stone in the memory of the deceased and as a token of protest against the pollution.

Sir : This is sad and unique at the same time. Ok ... let's move. Good bye Arafat.

(Scene drop music)

Scene- 4

Narrator 1: The poorest countries are characterized by very limited access to modern, cleaner and affordable energy options. In addition, the majority of developing countries are characterized by inequitable access to cleaner energy options, where the rural poor suffer similar deprivations. Over 3 billion people cook and heat their homes with solid fuels in low-efficiency stoves.

Narrator 2 :Back to India, the major reason for this inaccessibility to the energy sources is due to the financial conditions of the poor people, coupled with the fact that there exists a perpetual demand supply gap in this overpopulated country.

To address this problem, United Nations developed a United Nations Development Program, commonly called UNDP having participants from the member countries. Under this program, United Nations extend monetary and other related amenities to the developing and under developed countries to help them to get rid of these agonies. One such issue under UNDP is the access to modern energy, carbon emission and pollution.

Location: United Nations' Headquarters, New York. Spokespersons of the member countries gather in a meeting. The sound effect of the meeting, auditorium and background noise to be given.

Admstr: Respected spokespersons of the member states, I, the Administrator of United Nations Development Program, welcome you back to the post lunch session of the energy meet. As you all know, the main theme of this discussion is the Lowering the carbon dioxide emission in the developing countries. Before the lunch, we have covered countries upto 'H.' Now to start with 'I', I will request India to come up first. On behalf of India, we have Miss Pamella Chauhan who has earned great respect for her work at India sub-sector of UNDP. She will now acquaint us with some of the works that India is doing in the energy subsector to make clean energy accessible to all. Miss Pamella please ...

Pamella: Thank you sir. UNDP's partnership with the Ministry of New and Renewable Energy dates back to 1994. Since then, we are working together to identify and pilot renewable energy technologies and to expand energy access in off-grid communities. Finding and supporting business models that promote renewable energy technologies has also been a high priority.

Admstr: Very good. Can you please highlight the initiatives that you have taken for your countrymen in a chronological way?

Pamella: Yes sir, why not. Just a minute sir. (After a brief pause) yes sir, here it goes: UNDP's projects with the Ministry of New and Renewable Energy include: 1) Optimizing development of small hydro resources in hilly regions of India (1994-2003); 2) Development of high rate Bio-methanation processes as means of reducing GHG emissions (1994-2004); 3) Decentralized energy systems for the integrated development of Komna block, Nuapara district, Odisha (1999-2002); 4) Demonstration of community based solar energy for sustainable development (1999-2002); 5) Energy services for rural industrialization in Angara block, Ranchi (1999-2002); 6) Renewable energy for rural livelihoods (2003-2008); 7) Global solar water heater project (2009-2012) 8) Access to clean energy (2009-2012)

(Everybody claps at this.)

Admstr: Well, well very well. UNDP India is doing a nice job. What's about the current jobs?

Pamella: Our current focus is on green energy segment. In this sector we have undertaken the following jobs: 1) Removal of barriers to biomass power generation in India (2007-2016); 2) Market development and promotion of solar concentrator based process heat applications in India (India CSH) (2012-2017); 3) Increasing access to renewable energy for microenterprises in rural India (2014-2017).

(Everybody claps at this.)

Admstr : Well, this is our plan ... I mean your plan ... or better to say, UNDP's plan. But what the Indian Government is thinking about it? Regarding the green energy segment, Miss Pamella, we have heard that the majority of the Indians still rely on the solid fuel for cooking and have no access to the cleaner fuel.

Pamella : Yes sir. This is true. Over 800 million people – 75% of the rural households and 22% of the urban households – still rely on solid fuels for cooking and heating. Despite aggressive policies to subsidize and expand LPG access in the last two decades, only 12% of rural households, who are in the highest income quintile, use LPG. Looking forward, the Ministry of New and Renewable Energy of the Government of India has launched a new initiative on biomass cook-stoves. The goal of the program is to sell 150 million stoves in 10 years. Under this initiative, a series of pilot-scale projects are envisaged using several existing commercially-available and better cook-stoves and different grades of processed biomass fuels.

Admstr: Nice job indeed. But how do you achieve this? After all this should be a very tough one?

Pamella: Yes sir, you are right. But through a concrete and well-structured plan, we have achieved impressive progress in the solar water heater sub-sector where the market size tripled. This has been achieved through a combination of financial incentives, customer education, training of equipment installers and strengthening municipal capacities. Options for low cost solar power in remote locations have also been demonstrated. And of course by imposing a carbon tax.

(Everybody claps at this.)

Admstr: You really need to be appreciated. Miss Pamella, we are now eager to hear about your future plans. I mean to say ... what the UNDP and the ministry are going to do in near future through their strategic partnership venture to control carbon dioxide emissions.

Pamella: Under its on-going partnership with the Ministry of New and Renewable Energy, UNDP will help to reduce carbon dioxide emission by: 1) Developing pilots on solar thermal and waste-to-energy in support of smart cities and access to clean energy 2) Strengthening capacities in MNRE institutions including the National Institute of Solar Energy by establishing solar concentrator test centres and training scientists on testing protocols 3) Identifying technology packages for renewable energy based rural livelihoods and enterprises and demonstrate them as viable business models in Assam, Orissa and Madhya Pradesh 4) Supporting biomass power investment projects to strengthen the tail end of the electricity grid and promoting sustainable business models.

(Everybody claps at this.)

Admstr: Well done India. You are really going well and have done nice work for the citizens of India. I must congratulate both the ministry and the UNDP India chapter for this progress. Thank you very much. (After a brief pause) Now I will come to Iran to hear their ventures. Iran please get ready and

(The voice of the Administrator will merge into the music.)

(Scene drop music)

Scene 5

- Location:** The village. Sounds of heavy construction to be given here.
- Arafat:** (Shouting) Madhab bhaiya, Harishbhaiya...
- Madhab:** Arafat ... what happened?
- Arafat:** Do you see all these works in the factories? And the white clothed gentlemen supervising the works. Who are they? What is going to happen there?
- Harish:** Arafat ... they are from pollution control board.
- Arafat:** Pollution control board? What they are doing here?
- Madhab:** Haven't you heard anything? Government has decided to force every factory to install emission control devices and check air pollution.
- Arafat:** Really?
- Harish:** Yes, my dear. Government has announced that every people should breathe clean air and use clean energy.
- Arafat:** (In joy) Really? Then I will not have to cough by inhaling black smokes.
- Madhab:** Yes, These people are devices to check emissions. Just wait for few more days. After that ...
- Arafat :** Look look ... Beni is running ... (shouting) Hey Beni ... why are you running?
- Beni:** Chacha, no more black smokes, no more breathing troubles ... I am going to give the news to the others on the field.
- Arafat:** Ok. Go go ... go fast. It's really great news.
- Madhab:** I am thinking of those who died due to this pollution. Had they been alive today, just imagine how much delighted he would be by seeing all these.
- Arafat:** Yes yes ...
- Harish:** I have also heard that the government has increased the carbon tax.
- Madhab:** That's a good step Harish. It may slightly increase the fuel price, but will put a pressure on these companies to shift to renewable energy sources. This will drastically scale down the pollution.
- Arafat:** And prevent climate change too. Look, last year we didn't get enough rains to water our fields. As a result much of my crop died right away. I have heard that pollution and global warming is at the root of this climate change.

Harish: Right you are. We have right to breathe clean air and enjoy natural climatic pattern.
Hope good day will come soon.

(Short Interlude music)

-X-X-X-X-

Additional Notes: These notes can be used for additional information only

1. Financial impacts of access policies:

It's true that the changes in final energy demand due to various access policies will also have implications for greenhouse gas emissions. But the climate impacts of achieving universal access to modern energy carriers and technologies are negligible or might even be negative, even in the case where access is provided entirely from fossil energy sources. This is because transitioning to such fuels will displace large quantities of traditional biomass use. Current technologies that use traditional biomass are associated with significant emissions of non-Carbon dioxide Kyoto gases like methane and nitrous oxide and aerosols due to incomplete combustion. The International Energy Agency estimates that achieving universal modern energy access by 2030 would raise Carbon dioxide emissions as compared to their current practices scenario by only 0.7%. Without any access policy, total greenhouse gas emissions increase by 65%, to 4.7 gigatonnes of carbon dioxide-equivalent in 2030 compared with 2.9 gigatonnes of carbon dioxide-equivalent in 2005. As a consequence of implementing access policies, greenhouse gas emissions decline marginally, having a negligible impact overall. South Asia has the largest absolute contribution, followed by Africa and then Pacific Asia. Assuming a future carbon price of 30 euro per ton carbon dioxide-equivalent in Europe, access policies in 2030 could result in financial savings too, albeit negligible.

2. Assessing the cost of health impacts:

Estimates of the current health impacts of household pollution are based on the effects of solid fuel dependence today, whereas future estimates are based on the detailed access scenarios and account for forecasted demographic change and trends in background disease and mortality levels as estimated by the World Health Organisation. In 2005, total deaths attributed to solid fuel combustion in traditional stoves were about 2.2 million, and more than 41.6 million Disability Adjusted Life Years were lost, with the impacts felt mainly by women and children. Although substantial uncertainty is associated with these estimates, policies that improve access to modern cooking fuels have the potential to avert between 0.6 million and 1.8 million premature deaths, on average, every year until 2030, in the three regions of sub-Saharan Africa, South Asia, and Pacific Asia. These include between 0.4 million and 0.6 million deaths per year of children below the age of five. Deaths attributable to acute lower respiratory infection (ALRI) among children under five are expected to decline between 2005 and 2030 even in the absence of any access policies, but deaths due to chronic obstructive pulmonary disease (COPD) and ischemic heart disease (IHD) in adults are expected to increase during the same period. These trends are in line with those reported by Bailis et al. in 2005, who find that the observed decline in childhood ALRI mortality over time is a result of additional factors, whereas the upward trend in adult incidence of COPD is mainly due to population aging. Alternatively, in the absence of any new policies to enhance access to modern cooking fuels or devices, it is estimated that in 2030 there could still be over 24 million Disability Adjusted Life Years lost due to household air pollution.

3. How carbon tax is levied:

It is a type of indirect tax as opposed to direct tax. It is also called a price instrument, since it sets a price for carbon dioxide emissions. In economic theory, pollution is considered a negative externality, a negative effect on a party not directly involved in a transaction, which results in a market failure. To confront parties with the issue, the economist Arthur Pigou proposed taxing the hydrocarbon fuels, which were the source of the negative externality that is, carbon dioxide so as to accurately reflect the cost of the goods' production to society, thereby internalizing the costs associated with the goods' production. A tax on a negative externality is called a Pigovian tax and should equal the marginal damage costs.