Europaplattform: Wien – Brüssel
Policy Crossover Center: Vienna – Europe

Working Paper 1/2021

Climate Policy goes Mainstream

A new priority distinct from laissez-faire, which supports welfare and equity

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Abstract

The paper analyzes the long pathway of environmental issues from their start as a highly specialized field to becoming part of mainstream economics. The visibility of global warming and the Paris goal to limit global warming have supported this process, along with concepts ranging from externalities to public goods and cost-benefit analysis. However, we see that most countries are not on track towards reaching climate neutrality early enough to prevent disastrous increases of temperature, due to market and policy failures. Instruments to curb global warming, along with their limits and advantages, are analyzed. Strategies in sectors and countries will have to be different. International cooperation must limit negative spillovers, and it has to support learning processes while enforcing synergies. The article concludes that the problem has become mainstream in economics, but nevertheless requires an interdisciplinary approach.

Keywords

externalities, public environmental goods, tragedy of the commons, Paris climate goal, COP26, environmental economics

[1] We are grateful for suggestions and critique by Heinz Handler, Geoffrey Hewings, Daniela Kletzan-Slamanig, Stefan Schleicher, Gunther Tichy. We thank students at the Vienna University of Business and Economics, participating at a brainstorming, session, and a panel discussion of the Think Tank "Policy Crossover Center: Vienna-Europe". We acknowledge the research assistance of Irene Langer and Kesira Yildirim.

1. Aim and outline of the paper

Environmental concerns began as a very specialized issue, first in the natural sciences, then as a field in economics. Those acting first were engaged citizens, indigenous tribes and spiritual leaders, who defended original cultures and a clean environment as outsiders. They were pushed aside by the majority of the population, in both Europe and the Americas.

In economics, environmental policy received attention as a special case of long-term externalities. Firms and consumers disregarded their own impact on clean air, rivers and forests, since damages were not priced and cleaning up was not rewarded. Pollution is also a stock problem, starting with a small amount of damage and accumulating over time. Environmental economics initially highlighted the "Tragedy of the Common (Hardin, 1968) and the phenomenon that a non-privately owned resource will be overused and gradually destroyed. This can be limited by responsible behavior or good institutions (Ostrom, 1992). National accounting ignored the damages to nature and health and even included repair costs as a contribution to higher GDP before methods like capital depreciation were developed to assess them. Later, they were separated by side accounts (green accounting). Cost-benefit analysis became an important tool in environmental economics.

The first studies by the Club of Rome highlighted the limits of growth that originated from the depletion of resources, such as the availability of oil or minerals. Decades later we know that fossil resources can be rather abundant ("peak oil" was shifted through new technologies), if we dig deeper with more efficient methods, which are, however, often also more dangerous. The finiteness of the planet is now defined by emissions, which are filling up the limited absorptive capacity of the atmosphere. Economics responded to this challenge by proposing Pigou taxes that internalize externalities and, additionally stress the necessity to provide public goods. Both will shift decisions nearer to the so-called Pareto-Optimum. A further step towards mainstreaming is the integration of climate change into classical economic models by William D. Nordhaus.

Economists now acknowledge the goals of a clean and healthy environment (and sometimes biodiversity) as part of a whole set of goals. The term "sustainability" served as a bridge. Sustainable growth was popularized by the World Commission on Environment and Development (1987), followed Solow (1993), who defined intergenerational fairness, meaning to enable the next generation to achieve at least as high a standard of living as the current one.

Climate issues are given higher priority by citizens in rich countries, though environmental damage reduces quality of life more for the poor. Preventing global warming is no longer the agenda of green activists alone; the issue has arrived in the mainstream parties.

In the next session we report how our knowledge has changed, with respect to climate change, due to the visibility of its negative consequences. We now have a consensus of more than 190 countries in the 2015 Paris Agreement (COP20), stating that global warming should be limited to 1.5-degree Celsius[2], a pledge monitored at the COP26 in Glasgow in November 2021. The third section reports the progress and failure of countries in following this promise, as measured by the now dominant indicator of Greenhouse Gas Emissions (GHG). The actual reduction of emissions since 2000 is compared to that required by the Paris Goal. Section 4 reports the policy options of pricing, provision of public goods, regulation, and innovations recalling concepts in economics which justify them in market economies. The next section presents three concepts to limit emissions, discussing the advantages of each and the

[2] 3.7 degrees Fahrenheit.

pricing of environmental non-market goods. Section 6 carves out what strategies may work best for different sectors, and section 7 concludes.

One overriding message of the paper is that we should not design an isolated climate policy but follow a strategy looking for synergies between economic, social and climate goals. A second is that only international cooperation and learning from each other will be an efficient strategy, regardless of whether "efficiency" is measured in narrow economic terms or includes health, quality of life, and choices for the next generations in its "output" (Aiginger and Colcuc, 2021).

The neoliberal Washington consensus is now no longer the strategy demanded by international organizations like the IMF, UN, World Bank, and OECD (Sachs, 2014). We may look for a new label like climate-active international policy, in which governments, firms, and citizens take on an active role. It may be called a fact-based policy steered by SDGs, or a climate-social policy by Kohlenberger et al., 2021). Following the European policy under Ursula von der Leyen, we might call it also the "Green Deal World".

2. Visibility and facts leading to the Paris Goal

It is now evident that global warming is real and caused by humans. Ten years ago, a considerable number of people and smaller number of scientists maintained that our planet had previously experienced some periods of increased temperature to the extent seen today, followed by phases of cooling. Today, only a tiny minority of scientists compare the development since the start of the industrial revolution with long prehistoric waves.

The impact of global warming – temperature has now already risen by about 1 degree Celsius relative to the beginning of industrialization – has become visible and signals the upcoming dangers for human life and biodiversity. We are experiencing successive periods of heavy rain and long droughts; temperatures several day higher than 40 degrees Celsius and in special cases close to 50 degrees have occurred, not just in Sicily or South America, but also in Canada. Glaciers are melting, the North Passage will become ice-free. More people are dying due to heat than because of traffic accidents[3].

Mainstream political parties in Europe increasingly agree that climate change is an important topic, though some populist parties still deny this (often these are the same parties that deny the pandemic and oppose vaccinations against Covid). In the US, the majority of the population are demanding a more ambitious climate policy[4], albeit not the majority of voters.

The international consensus that we need a coordinated policy is also mounting. Almost 200 countries have signed the pledge to limit global warming to less than two degrees by the end of the century, and even better to less than 1.5 degrees Celsius. Progress is monitored through ongoing "Conferences of the Parties", such as the COP26 Glasgow Meeting in November 2021. The conference has the aim to discuss the National Determined Contributions (NDCs) of the countries and their operationalization via national energy and climate plans.

Climate policy is social policy and social policy is climate policy. Low-income people have contributed less to climate change but suffer more from its consequences (Nordhaus, 2021). Rich people can change

[3] For example, in Austria, see Wegscheider-Pichler et al. (2021).

[4] As president Trump announced the plan to leave the Paris Treaty, leading firms and regions promised to maintain its goals.

where they live and take longer vacations. These differences extend to the international dimension; poor nations have contributed less to using up the absorptive capacity of the planet and lack the technologies for climate neutrality. In addition, the pollution produced by highly industrialized countries might produce damages and costs for emerging countries, trying to catch up. This is acknowledged by the pledge of rich countries to finance investment in poorer countries. And it proves that rich countries must take the lead in fighting climate change.

Actions and instruments to be used will not be identical across all the countries that have signed the Paris Treaty, since problems, technological capacity and political priorities are different. Most countries are not combatting climate change to the extent promised, but chances to upgrade climate policy exist, due to better knowledge and higher visibility of the negative consequences of warming. Bridges to mainstream economics may enforce this process, even if blockades or populistic counter arguments reduce progress[5].

3. Emissions since 2000: facts versus the Paris Goal

Nationally determined contributions published ahead of the Glasgow conference, even if put into operation quickly, are predicted to lead to a rise in temperature of 2.7 to 3 degrees Celsius by the end of the century[6]. The actual temperature has already risen by one degree in comparison to pre-industrial levels, and the current trajectory implies 0.2 degrees per decade.

The indicator used to measure the anthropogenic sources and the fulfillment of the Paris goals is "Greenhouse Gas Emissions, GHG", measured for a year. Emissions contributing to global warming are weighted together in CO2 equivalents. An overall indicator makes the ambitions of countries comparable, though it is important to also know the types of emissions and sectors responsible.

Table 1: Global greenhouse gas emissions, 1990 – 2019

	1990	2000	2015	2019	1990-2000	1990-2019	2000-2015	2000-2019	2015-2019
	Million tonnes				Percentage changes				
World	20,516.0	23,241.2	32,365.5	33,400.0	13.3	62.8	39.3	43.7	3.2
EU-28	4,024.3	3,786.4	3,219.4	2,993.5	-5.9	-25.6	-15.0	-20.9	-7.0
EU-27	3,474.9	3,265.8	2,825.4	2,651.3	-6.0	-23.7	-13.5	-18.8	-6.2
Germany	940.0	812.3	729.7	644.1	-13.6	-31.5	-10.2	-20.7	-11.7
France	345.4	364.7	304.9	293.9	5.6	-14.9	-16.4	-19.4	-3.6
USA	4,803.0	5,729.8	4,928.6	4,744.4	19.3	-1.2	-14.0	-17.2	-3.7
Japan	1,053.9	1,147.9	1,155.6	1,066.2	8.9	1.2	0.7	-7.1	-7.7
China	2,123.0	3,138.1	9,178.3	9,931.1	47.8	367.8	192.5	216.5	8.2
India	530.1	889.8	2,036.1	2,310.0	67.9	335.7	128.8	159.6	13.5

Source: IEA (2021).

[5] Blockades can come from lobbyists or groups not really against policy change but demanding it to be done later and that other highly-emitting countries start while we wait for new technologies (see Rogenhofer and Schlederer, 2021; Aiginger and Colcuc, 2021).

[6] 1.5 degrees Celsius is equivalent to 3.6 Fahrenheit.

Table 2: Per capita emissions, globally and in regions

	1990	2000	2015	2019	1990-2000	1990-2019	2000-2015	2000-2019	2015-2019
	Tonnes per capita				Percentage changes				
World	3.9	3.8	4.4	4.4	-2.6	11.6	16.1	14.5	-1.3
EU-28	8.4	7.8	6.3	5.8	-7.7	-31.0	-18.7	-25.2	-8.1
EU-27	8.3	7.6	6.4	5.9	-7.6	-28.3	-16.8	-22.4	-6.8
Germany	11.8	10.0	8.9	7.8	-15.8	-34.5	-10.4	-22.3	-13.2
France	5.9	6.0	4.6	4.4	1.0	-26.5	-23.5	-27.2	-4.8
USA	19.2	20.3	15.4	14.4	5.7	-24.8	-24.3	-28.8	-6.0
Japan	8.5	9.1	9.1	8.5	6.1	-0.9	0.5	-6.6	-7.0
China	1.9	2.5	6.7	7.1	32.8	280.1	169.6	186.2	6.2
India	0.6	0.8	1.6	1.7	37.7	177.0	84.5	101.2	9.0

Source: IEA (2021).

Total emissions are on the rise in practically every year. On the positive side, the growth of emissions has declined, despite a growing world economy; on the negative side, there are very rare signs of absolute decoupling (meaning that emissions decrease while GDP is increasing). And where emissions decrease, the reduction is far below what is needed for climate neutrality up to 2030 or the middle of the century. The data reveal that countries in economic crises with high poverty or deep unemployment give even less priority to curbing emissions (Greece, Argentina, African countries with internal conflicts and those with neighbors). Crises shift priorities away from environmental concerns and reduce the financial leverage, therefore degrowth is not a remedy. "Green growth" could combine rising incomes with a decrease in inequality and emissions.

Absolute world emissions measured in CO2 equivalent amount to 33m tons in 2019. China is the world´s most emitting country in absolute terms; it is responsible for 10m tons of GHG. The US emits a little bit less than 5m tons (this is 15% of the total) and the EU 3m GHG, which is slightly below 10%[7].

In per capita terms the US is by far the highest emitter with 14.4 tons per inhabitant in 2019, and China rose to second place with 7 tons per capita, surpassing Europe with less than 6 tons. Thus, Europe (whether defined as EU28 or EU27) is by far the best performer of the large regions. Among the European countries, Sweden has the lowest emissions, demonstrating that a high income and welfare society can follow ambitious strategies without losing price competitiveness, if it invests in research and development at the same time. Other low-emitting countries are the Baltic countries and Croatia, plus eastern European countries with low per capita incomes, still trying to catch up with Western Europe, after changing towards market economies (e.g. Romania) and eager to attract any kind of investment.

Over time, total GHGs rose worldwide by 44% as compared to 2000; this is less than GDP growth and could be called "relative decoupling" but at a disappointing rate. In the EU, the emissions dropped by 21% and in the US by 17%; emissions tripled in China relative to 2000 (+216% 2019/2000)[8].

Per capita emissions have decreased by 29% since 2000 in the US, which is not much when seen from the perspective of the extremely high per capita level at the start of this century. In the EU the decline is lower (25%) and given that this started from a level of a little bit more than one third of the US, that is to be assessed as relatively better. In China, per capita GHG has tripled.

[7] This holds for the EU28; for EU27 emissions amount to 2.7m tons.

[8] Data for 2000-2019, emissions dropped in 2020 due to Corona lockdowns, but increased again in 2021.

4. Concepts and instruments on the road to integrating climate into economics

Awareness of ecological problems started with a focus on forests; timber harvesting was to be limited to an amount that could be taken out while leaving the future harvesting potential as high as it is. For a broader view, see Pinchot (1903), who analyze the value of forests along three lines: (i) their market services like availability of timber and tourism, (iii) non-market services for humans like recreation, erosion control, water storage, and (iii) the intrinsic value of species or nature (Nordhaus, 2021).

Integration into core economics may have started with "the Tragedy of the Commons" (Hardin, 1968). This describes the tendency that a common resource available free of charge leads to its overuse and consequently the impossibility of the resource to regenerate if no rules limit individual egoism. Altruistic feelings, fairness and good institutions (Ostrom, 1992) can in principle substitute user fees.

A related but different problem is the ambiguity between short-term solutions at the cost of later problems. Examples of this are fertilizers and pesticides, which can eliminate or at least reduce the negative effects of diseases or epidemics at the cost of other more severe later illnesses, requiring the increased use of chemicals or medicines. The overuse of penicillin or antibiotics is an example: it saved many lives, but if these medicines are applied for small illnesses over and over again, this reduces their effectiveness. This also happens when antibiotics are used abundantly for animals, which are later eaten by humans.

Among the principles and pillars of a green society, we can name managing problems through legislation (today we would call this regulations or Command-and-Control). Another path is to develop markets for private goods or to promote efficiency of the Adam Smith type. Public goods are goods which are either non-exclusive (if a good is provided, its use cannot be restricted to payers, like lighthouses) or the setting a price is inefficient because costs do not rise if a bridge is used by one additional person as long as traffic is low (non-rivalry)[9].

Efficiency thinking is a cornerstone of economics; however, there are many types of efficiency, ranging from the lowest input of resources to the highest outcomes in a broader sense. Labor efficiency, resource efficiency and total factor productivity all improve the generation of income incomes, but with different emissions.

Innovation is regarded as unambiguously positive in economics; the natural sciences will be more skeptical since innovations may lead to positive or negative effects, including lethal weapons. Cheaper transport of oil and coal boosts emissions, while nuclear plants destroy lives in the short or long term and governments have to take the risk for accidents. Costs increase strongly if security standards are taken seriously, while the costs of clean energy tend to decrease over time through radical innovations.

[9] Genuine public goods are defined by one or two of these criteria, other public good (merit goods) exists if the society or political parties wants to change private preferences e.g. in order to prevent later problems (like old age poverty in case of insufficient savings during working age).

5. Pricing emissions and control costs

Pricing is one of the central economic instruments for internalizing external effects or changing preferences. This section surveys some variants, their advantages and control costs.

5.1 Cost-benefit analysis

The main instrument used to analyze the desirability of pollution control policies is the cost-benefit analysis (Tietenberg and Lewis, 2018). Benefits range from improved health to higher living standards; however, control is costly, so that the expected net benefits have to be determined. This yields efficiency that includes results and not only costs.

To get an estimate for the benefits, the Revealed Preference Approach makes use of actual behavior, while the Stated Preference Method focuses on surveys to determine the willingness to pay for non-market goods, and both can be direct or indirect, as shown in the table below[10].

Table 3: Economic methods of valuing environmental goods

Methods	Revealed preference	Stated preference
Direct	Market price	Contingent valuation
	Simulated markets	
Indirect	Travel cost	Choice experiments
	Hedonic property values	Conjoint analysis
	Hedonic wage values	Attribute-based models
	Avoidance expenditures	Contingent ranking

Source: Tietenberg and Lewis (2018).

There are three approaches targeting cost estimation. The Survey Approach asks the people for their expected control costs (costs to follow the rules). The problem is that the answers might not be truthful, as producers have an incentive to overvalue those costs. Another approach is the Engineering Approach. This method uses general information of technologies, these might vary from one firm to another. The third approach combines these two approaches (Tietenberg and Lewis, 2018; Barret, 2003).

5.2 Pollution Control Policies

Three methods exist for controlling pollution: emission standards per firm, emissions charges, and Cap-and-Trade (emissions trading under a politically determined maximum "cap".

Emissions Standards or limits are a legal approach to control pollution. Here, the government sets emissions limits for an individual pollutant. This approach is called "Command-and-Control". Governments can reduce emissions even when they have no information about the control costs. A drawback is that there is no limit to total emissions since it rises with the number of firms.

Emissions Charges are a per unit fee that the government collects for pollution (Tietenberg and Lewis, 2018). As a firm will individually choose the level of pollution that maximizes its profits, the outcome will always be cost-efficient. Nevertheless, the taxation process is quite difficult, as the government may

[10] Contingent Valuation and Travel Cost Method are two examples for getting stated preferences. The Contingent Valuation Method tries in the first step to create a hypothetical market where those non-market goods are traded. The second step is to ask the population for their willingness-to-pay (WTP) for the goods or services in the hypothetical market. The Travel Cost Approach basically values the environmental good via people's WTP for a "visitor day", for example in the Grand Canyon (Tietenberg and Lewis, 2018).

not have full information to value the pollution. The problem here is the same one as with emissions charge as there is no limit to the cumulative amount of pollution.

A maximum can be set by Cap-and-Trade. The government sets the total emissions limit, but not that of an individual. The allowances can either be allocated or sold in an auction. The firms are then allowed to trade the allowances, which will lead to a cost-efficiency as the market creates the price and firms with lower costs to reduce emissions will cut them most. This method takes care of the problem of rising pollution, the price of pollution increases as the number firms or their production will rise, given that allowances will not change or even be decreased[11].

6. Matching instruments with sector needs

To illustrate the actual use of existing instruments, this section matches instruments with sectoral problems, showing which environmental problems dominate in a sector and which instruments are available. For traffic, energy, manufacturing, agriculture and recycling, we carve out market failures and possible remedies.

6.1 Traffic

This is the sector with high and still rising emissions, responsible for a quarter or more of total emissions. And even if in some countries total emissions are stalled or even slightly reduced, those of traffic are rising. "Avoid, shift, improve" are the recommendations for change.

Traffic arises through long distances between places where goods are produced or used, as well as distances between locations where people live, and jobs are available. Avoiding might mean reducing these distances, whether it be for work, shopping or leisure. Living outside the center where the activities are provided may be the consequence of higher costs of living in the metropolitan area or the result of congestion and smog. Firms, shops or cultural events cluster due to economies of scale or scope, and sometimes also due to the uneven distribution of public goods from logistics centers to universities and schools. To prevent clustering, governments could condition the subsidies for culture or the financing of organizations providing public goods on the de-centrality of their services, such as restricting large shopping malls or locating at junctures of railways and subways). This avoids the need for rising traffic. The same would be done if firms rethink their supply chains after transport are prices according to its true costs (reshoring). Avoiding flights using teleconferencing also reduces emissions.

Shifting would imply supporting the use of public traffic, subways, railways and electric buses or other means for the last mile. Innovations making life in cities cheaper and more attractive (urban greening) would reduce incentives to leave the city at the weekend, while improving urban quality may be comprehended as an innovative public good.

Today, relocating into rural areas is prevented by economies of scale. Economic instruments could be gasoline taxes, raising rents in the periphery, limiting new houses in rural areas if this leads to deforestation, or extensive agriculture or extensive land use (soil sealing).

Improving means using more efficient cars, buses, etc., in the sense of traveling a certain number of miles with fewer emissions. This could be achieved with smaller or more efficient cars, car sharing (priority lanes for cars with at least two passengers), electric cars as well as buses and trucks. CO2 and gasoline taxes have been mentioned, and specifically those rising progressively with emissions would

[11] Allowances are also sensitive to inflation. As the costs of control rise, allowance prices rise.

increase efficiency. Innovation plays a key role, with the government using its financial support to direct research und support the diffusion of knowledge and awareness into decarbonization. Taxing the emissions of ships, airplanes, or emissions per vehicle could reduce emissions, while progressive pricing would enhance the improvement of these low-taxed transport means. The role of the government is central, as public transport has the property of a public good.

Given the extent and dynamics of emissions and the demand for transport, all economic instruments must be used to fulfill the Paris goals. Pricing CO2, setting maximum standards for emissions, and incentives for innovation are necessary. Transport should be made more expensive, while the use of highways should be conditioned on road charges and investment in public infrastructure has to be increased. In this sector, the relation of environmental policy and social policy is evident, as well as the importance of regional policy. Deadlines are necessary as an incentive to limit wrong decisions. Maximum limits for the size and power of private cars as well as speed limits will curb emissions for those not reacting to price incentives.

6.2 Energy production and use

Energy production is an important source of emissions, and it is dominated by governments and public policy, with large parts of government income stemming from this sector Decarbonization and energy efficiency are the two pillars which reduce emissions.

Coal plant and burning is heavily subsidized. Limiting the use of coal is opposed by regions, trade unions, and local politicians. This holds, even when regions and dwellers near the coal plants are suffering from emissions, and coal mines had been a main source of workplace accidents. Oil was long thought to be cleaner; since its sources are distant from the locations where it is used, and leaks in pipeline and deep-sea platforms are invisible as long as no big accident happens. Some emissions like sulfate content have been reduced successfully or even eliminated. However, methane emissions from mines, pipelines, and distribution are increasing. Oil tanks and ships contribute to emissions such as heating in private houses. Emissions of gases and air pollution by traffic using combustion engines are decreasing relative to given car size and distances driven, but rebound effects tend to limit the long-run trends. Controls at all stages of consumption of oil or gas exist, standards should be upgraded, and heavier penalties for firms that cheat would be important.

Strategies to shift production from fossil energy to renewables are often proclaimed, but counterproductive subsidies are still large. International organization requires cutting them. Investment agreements and the WTO should forbid them.

The second strategy line is to boost energy efficiency. This can be done through research, given the large contributions of governments for universities and research labs. The goal of redirecting technical progress from labor saving to energy and resource saving has not yet found its place in innovation policy and economic policy in general. Firms and consumers would save energy if it were made more expensive. The contrary is done in most countries to boost industrialization or to prevent firms from changing locations. For private use, governments subsidize energy, for example, by lowering value added taxes to prevent energy poverty. While this is important, the main gain goes to heavily consuming, high-income households.

The energy sector is vital for a modern society, and therefore public interference from investment to transport (via pipelines, high-speed and power lines, safeguards against blackouts, hacking and embargos) is large, and public ownerships dominates in many countries. Large projects are closely observed (with admission procedures closely observed by neighbors), implying that public interests are

not easy to define. Given the degree of state interference in the production and use of energy, policy change should be easy.

6.3 Industry/manufacturing

The emissions of large industrial firms are closely controlled by law in most countries (Command-and Control), and actual emissions are reduced in absolute terms over time in contrast to traffic or agriculture. Emissions permits provided an economic incentive to choose projects with the largest economic cost saving. However, large firms got extra permits (grandfathering), with the rationale that they are stuck in old technologies and that change would be very expensive in the short run, even if necessary in the long run. Innovation policies should provide incentives to invest in small and even radical innovation, supporting the cooperation of firms, universities, and tech labs partly inside the big firms. Emissions are concentrated in some sectors (steel, cement, chemicals) and this requires different types of radical innovations. Completely underestimated and ignored by policy are crypto currencies and their waste of resources, not only when compared to their limited social value.

International cooperation exists, sometimes limited by the competition for a breakthrough patent. Technology is changing from brown technologies to green, as a change from burning coal to green hydroelectric technologies is possible and would provide competitive advantages as well as a game changer as far as emissions are concerned.

Thus, Command-and-Control play the largest role in manufacturing, with inroads of price elements and Emission Trading. Innovation policy is central for the long run, as is radical reduction in this sector. It is important that reducing emissions cuts costs, without reducing employment. On the contrary, the long-run competitiveness tends to be boosted by a first-mover advantage (Aiginger and Rodrik, 2020). Innovating, redirecting technical progress, breakthrough technologies are the pillar to reduce emissions in manufacturing.

6.4 Agriculture, food, reforestation

This sector has the reputation of being rather clean and nature-based (Pinchot, 1903). Problems come up due to the heavy use of chemicals (fertilizers and pesticides) and the increasing land use for European surplus production, which has to be exported into countries striving to build up a nature-based agricultural sector. The forest sector is a capture for CO2 emissions, but cannot increase in parallel to emissions. Deforestation dominates in some regions, partly due to neglect and partly through the attempt to increase incomes and profits. Europe contributed indirectly, as it imports soy from the Amazon, whose planting contributes to deforestation.

Methane contributes to greenhouse gas emission; its impact is much higher than that of CO2, at least in the short and medium run[12]. Shifting from flesh-based nourishment to vegetables has started in industrialized countries, but in low-income economies the share of meat consumed is increasing.

Agriculture is heavily subsidized in all countries. The goals are given by past political priorities, from reducing hunger or making food cheap to preventing farmers from leaving the region or taking jobs in manufacturing. The price subsidies still make up one third of the EU Budget (MFF), they are not based on emissions, but mainly on the size of the agricultural unit and sometimes on the importance of farming for mountainous area. Organic food adds to subsidies and is nevertheless more expensive than the mass production of imports from distant countries. The contribution to health and longevity is not so

[12] COP26 set the goal to reduce methane emissions.

evident, with governments or the EU daring to mandate price differences or import duties. Pricing transport according to its emissions would help to prioritize local and biological food, aside from curbing subsidies for traditional agriculture. Education and communication between firms, consumers and health experts would help. Obesity is one of the causes of the recent decline in the length of life in the US, and the share of endangered young people is also increasing in Europe, as the consumption of drinks with a high sugar content is one habit that could be limited by education, while enforcing the necessity to declare sugar in food in supermarkets and restaurant would be a second measure. Cutting subsidies for large firms, biological food and farming, reforestation are the pillars of reducing emissions.

6.5 Recycling

Here, all instruments must be used. Recycling depends on the design of the product, so that it is easy to get back as much material as possible, or it is possible to punish the intentional reduction of durability and to reduce parts. Recycling can be supported by collecting used bottles or reusing them. Pricing, Command-and-Control, media attention, education, and innovation can all reduce material consumption and increase recyclability.

7. Steps towards the mainstream in a nutshell

The problem that global warming is threatening to exceed two degrees Celsius, which would destroy the ability to live in many regions and towns, has finally arrived in the mainstream of economics. We see this in academic journals, quality media and publications of the OECD, IMF, UN, and World Bank, as well as the speeches of their representatives at the COP26 in Glasgow.

On the road towards mainstreaming, it is important that GDP growth no longer be the single most important measure of success. It is production-based rather than consumption or welfare oriented; GDP has consequently been substituted by Beyond GDP goals (of the OECD) and the Sustainable Development Indicators (SDGs) of the UN. Cost benefit analysis became a tool to assess economic policy.

The necessity to tax or price negative externalities and the request to reward firms and individuals for positive spillovers is now part of any economic textbook. Different pricing methods are available, focusing on single firms, markets, or emission caps. And public goods, defined by non-exclusivity or non-rivalry are standard arguments which also relate to ecological affairs. Regulation, often called Command-and-Control, has reduced pollution by forbidding dumping wastewater or requesting lower emissions. Sulphur emissions or FCKWs have been dramatically reduced, and many lakes and rivers are much cleaner today. National laws, innovations, and climate pacts (Kyoto etc.) have worked together to reduce these problems dramatically.

It is well understood today that common rules across countries and continents are needed to prevent "races to the bottom" or "beggar my neighbor policies", in the sense of producing goods at places with the lowest wages or standards. Globalization must be made responsible, increasing rather than limiting standards. Relocating production to low-cost countries can be prohibited through import or carbon tariffs (if these are compatible with WTO rules and do not reflect a clandestine protection of domestic firms). A minimum corporate tax rate for large firms has recently been agreed and will reduce incentives to shift headquarters into tax holes (tax shifting). It is positive if we make firms responsible for the intermediate products they use (chain responsibility) and if consumers value the services of firms when they publish a target of becoming climate neutral. At COP26 it was decided to support an agency to monitor the pledges of firms, to prevent greenwashing.

Green finance may provide the means for the large infrastructure investments required, and stocks can be assessed according to sustainability and good governance. It is possible to choose a pension fund investing in decarbonization, thus boosting the share prices and financial leverage of firms innovating in green technologies. An organization has to report whether promises of firms are followed by acting or have to be assessed as greenwashing.

International trade and investment compacts, along with the advice of international organizations to countries needing financial help, is now far from the criticized "Washington consensus", which demanded lower wages, deregulation, and the elimination of budget deficits as a condition of extending help and credits to countries in crisis.

All this does not imply that economic policy can guarantee welfare maximization or that emissions be dramatically reduced as needed. This is still the task of democratic processes that shape, reveal or support preferences. However, it is also evident that responsible rules and Sustainable Development goals do not stand in conflict with economic efficiency or competitiveness. A market economy striving for long-run sustainability should combat both market and public failures. It will support and redirect innovations and must provide public goods, including those providing ecological goals or merit goods. To do this to the extent outlined by the Paris Goals requires political will. This has to be mobilized through democratic processes and meetings like the COP26, as well as the further development and use of economic instruments. Rich countries must take the lead, the European Green Deal could indicate the willingness of Europe to do this.

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