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Polluter-Pays-Principle: The Cardinal Instrument for Addressing Climate Change

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Abstract: This article traces the evolution of polluter-pays-principle (PPP) as an economic, ethical and legal instrument and argues that it has the potential of effecting global responsibility for adaptation and mitigation and for generating reliable funding for the purpose. However, the contradiction is that while it rests on neoliberal market principles, the UN Framework Convention on Climate Change did not include the PPP as its provision though the principle of “common but differentiated responsibility based on respective capabilities” (Article 3.1) implicitly recognizes this. The article raises the basic question that under a free-market global system: why should the polluters not take responsibility of their actions so that the global society does not suffer? The Organization of Economic Cooperation and Development (OECD) countries apply this PPP in many of its forms. Some developing countries are also applying it albeit still more as a governmental rather than polluter responsibility. Currently there is an emerging consensus that a carbon tax should be applied globally to address the intractable problem of climate change. Since the problem relates to a global commons, the issue is how to apply the PPP globally yet equitably. This article brings in Caney’s proposal that as complementary to the PPP. The “ability to pay principle” (APP) can take care of emissions of the past agreed by the Parties and current and future legitimate emissions of the disadvantaged countries and groups of people. He calls the latter poverty-sensitive PPP. While PPP is primarily a market principle, APP is a principle of justice and equity. That polluters should pay the social and environmental costs of their pollution reflects the most fundamental principles of justice and responsibility.

Keywords: Article 3.1 of the UNFCCC; polluter-pays-principle; externality; global commons

1. Introduction

The fact that atmospheric pollution as a negative externality resulting from human activities into the global commons is accepted universally, without any contestation. Additionally, the fact that the sink capacity of the atmosphere is limited and that limited capacity tends to be overwhelmed is also accepted overwhelmingly by the global community of scientists and policy-makers [1–5]. However, there is no consensus about the cardinal principle for solving this intractable problem, *i.e.*, the polluter-pays-principle (PPP). The contradiction is that while it rests on the neoliberal market system for addressing the problem, the UNFCCC Article 3.1 did not directly include the PPP as its provision, though the fundamental principle of “equity and common but differentiated responsibility based on respective capabilities (CBDR + RC)” implicitly recognizes this.

The PPP makes perfectly rational economic and policy sense. The non-acceptance yet of the PPP is a testimony of material power in climate regime formation, where the industrial countries, historically as the main polluters, continue to dominate [6]. However, with the urgency of addressing the problem getting more and more intense, as we are already living in a climate changed world, the adoption of the PPP in many of its varied forms is very much on the agenda of many countries, including the major emitters. Since the problem relates to a global commons, the whole contestation is about how to apply it globally, from an equitable point of view. This article attempts to analyze the PPP as an economic, ethical, and legal principle, and show that application of PPP has the potential to take care of the climate change problem, including adaptation that will be needed for sometime to come, even with adequate mitigation from now on. However, achieving an adequate mitigation regime under the *Adhoc* Working Group on Durban Platform (ADP) is not likely to be very soon, at least not by the stipulated timeframe of 2015, though there is an emerging consensus on application of some forms of the PPP.

2. Origin, Nature and Rationale of the PPP

Historically, the idea of PPP for environmental harm is rooted in both Western and Eastern traditions. Luppi *et al.* [7] cite, as a footnote, in *The Dialogues of Plato: The Laws* [8] the celebrated passage by Plato: “If anyone intentionally spoils the water of another...let him not only pay for damages, but purify the stream or cistern which contains the water”. We can cite some passages from another celebrated Indian philosopher Kautiliya, who lived more or less at the same time of Plato. This dates back to 300 BC, when Kautiliya in his *Arthashastra* (Study of Economics) prescribed different levels of financial penalties for causing harm to the environment. The fines depended on the degree of harm caused. For example, he would prescribe “fines for voiding faeces in a holy place, in a place for water, in a temple and in royal property” [9]. Another example of property damage: “In case of damage to the ploughing or seeds in another’s field—channels or a field under water, they shall pay compensation in accordance with the damage” ([9], pp. III, 9, 27).

From the above passages of Western and Eastern sages, it was clear that they have conceived of the PPP for application to address problems of pollution in the local commons, as in those days there was no such private property culture, or global commons problems the way we have them today. Gradually, it was applied as an economic instrument in domestic policy making in order to allocate costs of pollution prevention and control [10,11].

Fast forward more than two millennia; in the 1980s, government regulations were deemed more desirable and efficient in environmental protection ([12], pp. 198–200, 319). Since then, some change has taken place. This is reflected in Agenda 21, adopted in 1992 at the Rio Earth Summit. The new call was for international cooperation in the use of economic instruments (Agenda 21, 252–54). The current focus in environmental policy-making is on prevention as more cost-effective, rather than cure, through incentives/disincentives to change individual behavior. However, this approach is not getting enough traction at the global level.

Thus, application of PPP was conceived as a check against socialization of environmental costs and privatization of benefits. Its proper application may require monetary valuation of environmental damages, and their estimation through expanded versions of cost benefit analysis that includes the currently non-marketed environmental goods and services [13]. Faure and Grimeaud ([14], p. 33) argue that “one can say that the polluter pays principle is probably the most ‘economic’ of all environmental principles”. This understanding of the PPP as a predominately “economic” principle is in line both with its modern origin [15] and with some of its most representative definitions that explicitly endorse the criterion of cost internalization, such as Principle 16 of the 1992 Rio Declaration and its inclusion in many international regimes. Thus, beginning with an economic principle, PPP has also become a normative doctrine of environmental law.

In response to the first UN Conference on Environment and Development in Stockholm in 1972, the PPP was first adopted by the Organization for Economic Cooperation and Development in 1972. The OECD document contained the following elaborate recommendation [16]:

The principle to be used for allocating costs of pollution prevention and control measures to encourage rational use of scarce environmental resources and to avoid distortions in international trade and investment is the so-called “Polluter-Pays-Principle”. This principle means that the polluter should bear the expenses of carrying out the above mentioned measures decided by the public authorities to ensure that the environment is in an acceptable state. In other words, the cost of these measures should be reflected in the cost of goods and services that cause pollution in production and/or consumption. Such measures should not be accompanied by subsidies that would create significant distortions in international trade and investment.

There are different rationales or interpretations of the PPP, of which the following four can be cited as the most common: an efficiency argument, an equity argument, a judicial/legal argument and a pedagogical argument [7,17–20]. Cost internationalization of negative externality as its core meaning is meant for efficient allocation of resources. This is also called the full cost pricing. The idea is that once the polluters are bound to internalize the costs, they will try to reduce the cost by reducing pollution, either through using better technology or through emissions trading. Thus, there is a built-in incentive for R&D for new technology. The judicial/legal interpretation of the PPP holds that states and local governments are jointly and severally liable for environmental damage caused by parties, either private or public, allowing the public regulatory agencies to act in “sub-rogation” against industrial polluters [7]. In addition to this, Nash [20] argues that there is a pedagogical argument for this principle, both for the producers and consumers: both these groups are instilled with a sense of responsibility about the pollution load that they generate either through production or consumption of the goods and services.

Nash further argues that politicians also are likely to like it, since supporting the PPP puts them on the side of the voters. Then, in its equity interpretation, it is understood in terms of fair distribution of costs. All these three meanings are extremely important for international climate policy formulation.

Again in efficiency interpretation, two versions can be distinguished, one of which is referred to by the OECD recommendation cited above: (a) a weak form (no subsidization) and (b) a strong form (cost internalization) of this doctrine. Weak form prohibits government subsidies for pollution abatement, to ensure that product prices reflect costs of pollution control. Strong form calls for governments to assure internalization of all environmental costs, including residual damage, in the form of liability and compensation. This means the strong form subsumes the weak form plus the principle of equity. Verbruggen [21] talks of the OECD light version and extended version of PPP, where the former requires polluters to pay only their own abatement expenses in meeting environmental policy obligations, and extended version adds commitment to compensate for damages inflicted occasioned to public good. Some scholars bring in the conceptions of negative and positive duties [22–24]. The negative duty must pay for damages and be stopped, while positive duty can be done out of beneficence. In this conception, PPP is a negative duty.

As a matter of fact, environmental pollution is a result of non-internalization of environmental costs by polluters, which then becomes a public concern. However, in the climate regime, the harm, the emissions have been commodified through emissions trading under the flexible mechanisms of the Kyoto Protocol.

In this process the concerns of public realm have been transformed into the judgement and decision process by the private authorities [25]. In fact, the climate regime reflects this philosophy. The cardinal principle laid out in the Article 3.1 of the UN Framework Convention on Climate Change (UNFCCC) is the basis for a regime formation to combat climate change: this is the principle of the CBDR + RC. This principle implicitly recognizes the PPP, and can only be operationalized through the global application of the PPP and directing the fund for introducing clean technology and adapting to the impacts of climate change. A version of compensatory PPP was considered during the Conference leading up to the Kyoto Protocol (KP) in 1997, but was rejected in favor of the CBDR + RC. The Brazilian proposal of a punitive and compensatory clean development fund (CDF) was replaced with the non-compensatory clean development mechanism (CDM) [26].

The application of PPP is currently done mainly within and across the OECD countries through many different versions of PPP, but not beyond. This “free-riding” by the major polluters is the crux of intractability of climate problem solution, which will be elaborated in the last section of this paper. Although the OECD Recommendation was not a binding document, PPP has increasingly been adopted in international treaties and laws, including codification in the European Union. Below is a list of few declarations and regimes that have internalized PPP in many different formulations:

- (a) The 1972 Stockholm Declaration Principle 21 says: “States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction”.

- (b) The 1990 International Convention on Oil Pollution Preparedness, Response and Cooperation declares PPP as a “general principle of international environmental law”. Under this Convention, the PPP applies along with existing civil liability and compensation schemes for damages inflicted.
- (c) The 1992 Rio Declaration Principle 16 urges national authorities “to promote internalization of environmental costs...taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment”.
- (d) The 1992 Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area mandates the application of the PPP: Article 3.4 makes the parties responsible for producing pollution responsible for paying for the damage done to the environment.
- (e) The 1992 Convention for Protection of the Marine Environment of the North-East Atlantic (Paris Convention, 1992). Article 2b says: “[t]he contracting parties shall apply...the polluter pays principle, by virtue of which the costs of pollution prevention, control and reduction measures are to be borne by the polluter”. Disincentives such as penalties and civil liability can also be seen as application of the PPP.
- (f) Madrid Protocol to the Barcelona Convention (Article 27).
- (g) Bamako Convention on the Ban of the Import into Africa and Control of Transboundary Movement and Management of Hazardous Waste Within Africa 1991 (Article 12).
- (h) Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region 1983 (Article 14).
- (i) The 1996 Protocol to the London Dumping Convention.
- (j) Third party liability under the Convention on Transboundary Movement of Hazardous Waste strengthened the PPP.

Other agreements, such as the North American Free Trade Association (NAFTA), Rio Agenda 21, the 2002 World Summit on Sustainable Development (WSSD) Implementation Plan, the Convention of the Protection of the Alps, and the Protocol on Water and Health also endorsed the PPP. This instrument can be applied more easily in a geographical region subject to uniform environmental laws. I will now discuss how countries in industrial and developing countries apply the PPP within their domestic contexts.

3. Application of the PPP in Industrial and Developing Countries

For the last two decades, PPP has been practiced in many different forms in different cultures and economic systems. It is applied through varied economic instruments, such as taxes and charges, emissions trading, as in cap and trade, deposit refund schemes, liability and insurance, *etc.* Conceptually, a carbon tax should be set at a level that internalizes the true costs of environmental damage, so that prices reflect the real environmental costs of pollution. This is known as Pigouvian tax. However, experience shows that Pigouvian tax has rarely been used because of difficulties in assessing the cost of damage associated with, in this case, GHG emissions. Thus, many countries have followed a more pragmatic “Baumol-Oates” approach, in which the tax is set at a rate that should influence taxpayers’ behavior ([27], p. xvii). The Nobel Prize economist Joseph Stiglitz has strongly argued for internalizing the true cost of natural resources in his latest book *The Price of Inequality* [28].

Thanks to extensive work of the OECD during the last two decades, the PPP has been transformed from an economic to a *legal* principle ([16], p. 9). PPP is well defined in the EU Law. After years of negotiations, environmental law regime in the EU in 1984 endorsed two very fundamental principles of environmental protection: the precautionary principle and the PPP. EC Directive 84/631 (6 December 1984) on control within the EC of transborder shipment of hazardous waste illustrates the application of PPP. It was formally adopted by the Europe Union in the Single European Act of 1987 (Single European Act, 17 February 1986, 1987 O. J. (L.169). Article 174 (2) of the consolidated versions of the Treaty on European Union and of the Treaty Establishing the European Union, 2002 O. J. (C325) 1 provides that:

Union policy on the environment shall aim at a high level of protection taking into account the diversity of situations in the various regions of the Union. It shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay (EC Treaty, Title XIX Environment, Article 174(2)).

However, implementation of the PPP by different states enjoyed different status in national legal systems [29]. Based on the array of application of several economic instruments, Sweden is regarded by some as having the most advanced application of the PPP in the world [30]. However, PPP continues to lack any generally accepted legal definition. Verhoef ([31], pp. 206–7) argues that “...the question of whether the polluter should pay...may often lead to different outcomes in terms of both allocative efficiency and equity...This ambiguity in the interpretation of the polluter pays principle is, unfortunately, often overlooked”.

The OECD also applies the extended producer responsibility in managing pollution (another interpretation of PPP), which was introduced first by Thomas Lindhqvist in his doctoral dissertation [32]. The OECD [33] defines it as:

a concept where manufacturers and importers of products should bear a significant degree of responsibility for the environmental impacts of their products throughout the product life-cycle, including upstream impacts inherent in the selection of materials for the products, impacts from manufacturers’ production process itself, and downstream impacts from the use and disposal of the products. Producers accept their responsibility when designing their products to minimize life-cycle environmental impacts, and when accepting legal, physical or socio-economic responsibility for environmental impacts that cannot be eliminated by design.

Now the PPP has been endorsed in many national legal systems. It is implemented in the form of payments for negative environmental impact as an instrument of environmental regulation in Russia and some other former Soviet countries, such as Ukraine and Belarus [34]. Russia has also imposed resource tax on natural resource extraction, as a form of user fee. The US domestic law did not codify PPP, but it did have an influence on the development of the US environmental law in the 1970s and 1980s. For example, certain provisions of the 1970 Clean Air Act (CAA) and the 1977 Clean Water Act (CWA) require polluters to meet certain standards at their own expense. The Comprehensive Environmental Response, Compensation and Liability Act 1980 (CERCLA) mandates fulfilling the

PPP by imposing liability for clean-up costs on the polluters. Under the 1990 amended CAA, the US introduced trading in sulphur dioxide, which is a variant of the PPP. The “Superfund” legislation in the US held that polluters are liable for clean-up costs of hazardous sites, even if dumped materials were not known at the time to be harmful [35]. This makes perfect sense since this strict liability inspires their clean-up [17].

There are other market-based solutions to other environmental pollution problems in the US. The California Public Utilities Commission authorized the San Diego Gas and Electric Company to collect \$1.73 billion for three years from an electricity rate hike about 12 percent. This will cost the average customer an additional amount of about \$10 a month. This money will be invested to underwrite the cost of attending climate policies in the state [36]. There are other market-based solutions to different environmental pollution problems in the US. For example, in a case, through a nutrient off-set bank, a large 50-acre for-profit project has been initiated, which aims at keeping excessive nitrogen and phosphorous out of the Chesapeake Bay, to maintain water quality across 64,000 sq km of the Bay [37].

It may be recalled that market-based ideas were put into the UNFCCC, negotiated under the administration of President Bush Sr., and the US delegation in 1997, led by the then Vice President Al Gore, played the key role in introducing market-based mechanisms in the Kyoto Protocol, as the USA by then had enough experience in emissions trading under their Clean Air Act of 1990. However, the US Senate refused to ratify. The Bush Jr. Administration took a vehement anti-Kyoto position, dubbing it as a “flawed treaty” on the grounds of non-participation in binding commitments by major emitters like China and India. Grubb argues that “the first paradox is that the United States was, in effect, rejecting its own treaty” [38]. M. Z. Cutajar, the former Executive Secretary of the UNFCCC, argues that:

the reluctance of the United States to be bound by multilateral disciplines, by laws other than its own, is a deep-rooted trait of their national character, which dates back to its pre-great power status. The current multilateral landscape is dotted with examples of treaties that the US either opposes, or accepts with reservations protecting its sovereignty, or supports without being formally bound (cited in [38]).

In actuality, the US perhaps lags the most when compared to other industrial countries in terms of imposing pollution/carbon tax, where most of the EU countries have imposed different forms of environmental taxes, including carbon tax. The EU’s attempt at regulating airline emissions is an example of application of PPP. Another instrument, a financial transaction tax is being considered for implementation from January 2016 by 11 countries within the Eurozone. President Hollande of France is leading this initiative.

In the US, some democrats in the Congress have been trying to initiate climate change legislation that includes a tax on carbon emissions. This is being initiated at a time when President Obama in his State of the Union Address (12 February 2013) has threatened to use regulations to stem GHGs if Congress fails to act. The new plan proposes three possible prices for a ton of carbon: \$15, \$25 and \$30 [39]. As *New York Times* columnist Thomas Friedman [40] put it, a carbon tax would be “win-win-win-win win” for the United States: by reducing emissions, generating funds for the deficit, “weaken petro dictators, strengthen the dollar, drive clean-tech innovation and still leave some money to lower corporate and income taxes”. However, there is a lot of skepticism among Congressmen about the

potential of the bill. The opponents of the tax proposal instead prefer addressing climate change through new technologies, like electricity storage, carbon capture and sequestration and biomass plants [40].

However, US citizens tend to support some versions of PPP, including a price on carbon. An online poll conducted by Yale and Mason Universities reveals that 61 percent agree that fossil fuel producers should pay the “hidden costs” of the industry; also, about the same percentage surveyed supported revenue-neutral tax on fossil fuels, with safeguards for the poor and the money to be invested for treatment of sickness from air pollution [41]. Another poll after the super storm Sandy in October 2012, the majority of coastal residents supported paying for the costs of coastal storms and the effects of sea level rise by the residents and businesses of the coastal towns, and not by the federal government. This was revealed in a recent poll taken by the Woods Institute and the Center for Ocean Solutions, both at Stanford University. The majority of those polled supported the fact that those who live and do business in harm’s way should pay for the costs involved [42].

On the other hand, OECD prescribes imposing a carbon tax and enhancing fuel and electricity prices to tackle air pollution in China. The Chinese Finance Minister stated in November 2012 that his country was looking into consumption taxes on resource-intensive and polluting goods, and would include water and coal in a new resource-tax system. However, the time frame was not clear [43].

The principle is also applied in many different forms and ways in the developing countries. Luppi *et al.* [7] argue that application of this principle in its judicial and legal interpretation hold states and local governments jointly-and-severally liable for environmental damage caused by private parties, allowing these public bodies to act “in subrogation” against individual polluters; they argue that the government’s goal is to provide prompt compensation to create incentives on local environmental agencies for proper monitoring. In this process, local governments may revoke license of private parties, fine, penalize, *etc.* India, as a major developing country, is very active, both at regulation and judicial level [44]. However, application of PPP in India is regarded somewhat different in the sense that the Government has assumed a system of direct liability, and pays compensation to victims, but later collects from polluters through an action of subrogation. Faure and Raja [45] discusses effectiveness of environmental regulation in India with reference to public interest environmental litigation (PIEL). It may be recalled that in Bhopal Gas Tragedy back in 1984, after five years of litigation, there was an out of court settlement between Union Carbide, and the Government of India. In other Countries, such as in Taiwan, Chile, South Africa, and Kenya, this PPP is also applied government liability. These countries adopted different variants of the PPP through judicial, legislative and constitutional reforms focused on mitigation of harms through government liability, to ensure victim’s compensation when polluters cannot be identified or are insolvent. Luppi *et al.* [7] argues that reframing the original rationale of the PPP, its application has been transformed into a Government-pays regime. This might be true in most of the developing countries where many different production activities by the private sector are subsidized by the government for maintaining growth and jobs in the economy. However, developed countries still lead in the subsidization process, particularly of fossil fuel extraction and agriculture products.

4. Global Application of the PPP—A Differential Approach between the North and South

The PPP can be applied internationally for addressing climate change, both in mitigation and adaptation. However, this warrants the fulfillment of a few conditions: (a) For developing countries to apply PPP, industrial countries are required to make transfer of resources, financial and technological, so that the former can improve environmental standards in production; (b) agreement on the specific year from which to assume historical responsibility by the industrial countries for past GHG emissions; and (c) a nation-state causing damage to another should bear the responsibility and pay compensation for it.

An International Monetary Fund (IMF) study that covered 176 countries finds that energy subsidy globally stands at a colossal \$1.9 trillion, of which industrial countries account for about 40% of the total including taxes foregone; the US subsidy alone amounts to \$502 billion; the study used a broader concept of subsidies to include failures to impose taxes on pollution externality and failures to impose taxes on energy that are comparable to taxes in other goods. In that exercise, the study assumed a price of \$25/ton of CO₂ [46]. The study argues that removal of subsidies can alone reduce 13% of global CO₂ emissions by 2050, and calls for imposing a carbon tax and putting a price on negative externalities of using fossil fuels. Together, the study prescribes offsetting the burdens on the poor by cash transfers and arranging access for them to alternative energy technologies. This huge amount of subsidy can be put against renewable energy worldwide which received six times less support than fossil fuels [47]. In addition, rich nations in 2011 gave more than \$58 billion in tax breaks and other production subsidies to fossil fuel industry. The US figure was \$13 billion. Steve Kretzmann of Oil Change International, an advocacy group for clean energy, argues that “we need to stop funding the problem, and start funding the solution” (cited in [47]). In this connection, it is worth mentioning another report by the UK-based Overseas Development Institute (ODI), which details out fossil fuel subsidies given to consumers in the major developing countries: it cites another study by the International Energy Agency that only eight percent of all consumption subsidies reached the bottom 20 percent of income groups; so the ODI prescribes elimination of all the inefficient and inequitable subsidies [48]. There is nothing wrong in such prescriptions by a very prominent developed country Think Tank, but they should hold validity only if the developed world stops their fossil fuel subsidy worth over half a trillion a year. The developed world has been promise-bound to eliminate such subsidies since October 2009.

Conca ([49], p. 484) uncovers the irony of neoliberalism and new constitutionalism while noting:

[Neoliberal market] advocates often portray aggressively liberalized trade as bringing welfare-enhancing gains rooted in the economic efficiency of comparative advantage. It is ironic that this rationale is so often repeated in a domain where so much of what is happening today is driven by cost externalization.

Former Executive Secretary of the UNFCCC, Yvo de Boer argues that “If companies had to pay for the full costs of their activities, they would have lost 41 cents out of every \$1 earned in 2010” [50]. Young [51] very cogently rationalizes the application of the PPP for a “progressive development” of the post-2012 climate regime: while industries pay for managing solid wastes, GHG emissions does not require full-cost accounting and this presents a serious anomaly. The earthly garbage dump is not free, but the atmospheric dump is treated free! This is because it’s a global commons. So, free-riding remains the norm because of the power of major emitters. While Posner and Sunstein [52] appreciates

the fact that either a worldwide carbon tax or some cap-and-trade scheme would be appropriate for addressing climate change, they argue that a climate agreement that is optimal for the world may not be optimal for the US. Perhaps this optimality consideration from national point of view externalizes emissions flying out of the US border. Again, while supporting for a global welfarist approach and rejecting the rationale for distributive justice and corrective justice in climate change, argues that the poor people and poor countries would be served better not by reduction of GHG emissions by the US, but through more effective forms of development aid, such as assistance to their housing. This kind of argument was pioneered, perhaps, by Tom Schelling back in the early-1990s [53], who later became a Nobel Laureate. In this argument, it appears implicit that climate change is not yet at a threshold demanding immediate attention.

However, the IPCC science including the latest AR5 (2014) being an agreed “minimum common denominator” and the latest assessments of normally staid bodies like the World Bank and the International Energy Agency do not allow us continuing that way anymore. Thus, having the PPP codified internationally would mean that polluters causing climate change will initiate reduction of GHGs, will have to pay those currently living who suffer the impacts, and who are forced to undertake expensive adaptation measures. The whole idea behind adaptation finance is that if the poor can adapt to already unfolding climate change, they would be better able to adapt in the decades ahead. Obviously, in negotiations some countries and groups like Alliance of Small Island States (AOSIS), LDCs, Bangladesh, Pakistan, Switzerland, and Ghana have argued for the application of the PPP in emission management and making it a guiding principle of the post-2012 climate regime ([54], pp. 17–23; [55]).

This is the reason now the instrument of border tax adjustment on imports between those imposing a price on pollution and externality non-internalizing regime is a hotly-debated topic among the World Trade Organization (WTO) Parties. Lord Stern argues:

Countries that are on track to price their industrial carbon emissions, like China and those in Europe, should make it clear that they will eventually slap a border tariff on imports from countries that lack such a price, like the United States...this is not just protectionism. It's an argument about proper pricing of inputs. And if countries subsidize their exports by not pricing carbon, that's perfectly logical and sound reason for making border adjustments [42].

Nobel-prize winning trade economist Krugman issued his own endorsement of the PPP, arguing that carbon taxes at the border are “a matter of levelling the playing field, not protectionism” ([56], p. 1). However, applying the PPP globally at this moment without any differentiation between the developed and developing countries would be problematic in terms of equity and justice, and hence universal acceptability. Principle 23 of the Stockholm Declaration is pertinent here. It reads:

Without prejudice to such criteria as may be agreed upon by the international community, or to standards which will have to be determined nationally, it will be essential in all cases to consider the systems of values prevailing in each country, and the extent of the applicability of standards which are valid for the most advanced countries but which may be inappropriate and of unwarranted social cost for the developing countries.

Thus this principle of considering a differential approach was kind of a precursor to the CBDR + RC, enshrined in the Rio Declaration, as well as in the UNFCCC. This was the reason perhaps why the

WTO adjudication over environmental cases has overwhelmingly given preference to economic rather than environmental considerations. However, in recent times the WTO is mulling over considering the border tax adjustments, as a form of global application of the PPP.

Rajamani ([57], p. 214) argues that climate change is the only environmental agreement with an operational provision of the CBDR principle, where Article 3.1 is juxtaposed with principle of leadership of industrial countries; the CBDR finds content in Principle 7 of Rio Declaration which clearly draws a link between industrial country culpability and enhanced responsibility. In fact, Brazil's proposal to apply PPP as compensation for historical emissions [26] was rejected then by the Annex I countries in Kyoto in 1997. There are several procedural problems in its application to account for historical emissions Posner and Weisbach [58] argue that the responsibility argument in PPP is backward looking, focusing on wrongful behavior of the past, when the wrongs were not known. And many of those who emitted GHGs are no longer alive. This is true, but the argument for avoidance should not stop here. Caney [59] and many others suggest that payment for emissions should be made at least since the time harm is known. This means the Annex I countries should pay at least since the 1980s or 1990 at the latest. Calculations by the MATCH research group [60] show that moving the baseline year by a few decades does not dramatically shift levels of historical responsibility. For example, shifting the first year of counting emissions all the way from 1890 to 1990 decreases the contribution of OECD Europe from 14 to 11 percent of the world total.

Finally, Caney proposes as complementary to the PPP the "ability to pay principle" (APP), which can take care of emissions of past generations and legitimate emissions of the disadvantaged countries and groups of people. He calls the latter poverty-sensitive PPP. A strict application of PPP also will affect major developing countries, such as China and India, since PPP is not based on capability, but payment for using the ecosystem services of the atmosphere. While PPP is primarily a market principle, APP is a principle of justice. The equity part of PPP relates to the equitable distribution of the cost of mitigation. The model of Greenhouse Development Rights [61] which links the problem of climate change to a responsibility and capacity index, with a universal development threshold, appears more appropriate, in terms of justice and fit with the Convention process. In another study, Muller and Mahadeva [62] propose a new framework (the Oxford Capability Measure, OCM) for measuring the national differentiated economic capabilities (ATP-ability to pay) as an integral part of operationalization of the CBDR + RC. In their calculations they use the analogous concepts of gross and net taxable income in a country; to illustrate the application of their methodology, they consider two examples: assessing the fairness of a given cost distribution and developing a (rule-based) "graduation scheme" regarding obligations to pay. They estimate that "while an OCM per capita scheme would be best, one should use 'poverty-intensity of GDP' as a second best surrogate" ([62], p. 2). Under this calculation, major emitters, such as India as a low-income country does not have any obligation in cost-sharing.

An estimate shows, assuming the costs of adaptation to be \$100 billion a year, that the total financial contribution by the industrial countries will amount to \$65–70 billion, which comes to a per capita basis of \$43–82 per year [63]. This is not a great amount, for people whose income amounts to over \$30,000 a year.

5. Conclusions

From the above discussion and arguments, it is clear that application of the PPP has several advantages in resource mobilization over domestic budgetary resources: public opposition is strong in allocating big chunk of aid from domestic resources, the fund transfer will not be based on charity, PPP will satisfy new and additional criteria of mitigation and adaptation finance, and there will be predictability, and, above all, prevention of harm through adequate mitigation which is lot cheaper than reactive or planned adaptation [64]. Some scholars find the potential in the PPP of ensuring sustainable development both in the North and South, if applied in appropriate ways [65]. That polluters should pay the costs of dealing with their pollution reflects the most fundamental principles of economics, justice and responsibility. Thus, the rich not making adaptation resources available to the poor avoid remedying a global public bad. It needs to be understood by the major polluters that for reaching a fair outcome in promised climate finance, the question of fair allocation of costs must be addressed. Simon Caney reflecting the sentiments of the particularly vulnerable country citizens argues that a situation in which there are such widespread and enormously harmful effects on the vulnerable of this world is not acceptable [23]. It is hoped that an efficient and equitable application of the PPP *ex ante* can redress the compounding situation. If not, the need for *ex-post* liability and compensation based on theno-harm principle and state responsibility will arise. This is already evident in the UNFCCC negotiations under the agenda item of Loss and Damage.

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