How Market Instruments and the Economy Can Contribute to the Protection of the Environment

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SUMÁRIO – *SUMMARY*

DIREITO DAS POLÍTICAS PÚBLICAS
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HOW MARKET INSTRUMENTS AND THE ECONOMY CAN CONTRIBUTE TO THE PROTECTION OF THE ENVIRONMENT

COMO OS INSTRUMENTOS DE MERCADO E A ECONOMIA PODEM CONTRIBUIR PARA A PROTEÇÃO AMIBENTAL

Michael Faure [I]

ABSTRACT

It is common to correlate development with environmental degradation, economic as a general cause and effect relationship, however the issue is a little more complex, this article intends to address more comprehensively a relationship between economic development and environmental protection, this will be the central object of the article. To deal with this intricate relationship, environmental policy should not be understood only as a restriction tool, the environmental regulatory function is not limited to the control/sanction binomial, in its implementation it must be included as determining factors for innovation and economic growth must be included as determining factors. Economics and, more particularly, the promotion of market-based instruments can therefore contribute to the construction of a more developed environmental law and policy. It is these market-based instruments that will be the central focus of this contribution, focusing on the interdependencies between

RESUMO

É comum correlacionar o desenvolvimento econômico com a degradação ambiental, costuma ser visto como uma relação de causa e efeito, contudo a questão é um pouco mais complexa, esse artigo pretende abordar de forma mais abrangente a relação entre o desenvolvimento econômico e a salvaguarda ambiental, esse será o objeto central do artigo. Para tratar dessa intrincada relação, não se deve entender a política ambiental somente como uma ferramenta de restrição, a função regulatória ambiental não se limita ao binômio controle/sanção, na sua efetivação deve ser incluído como fatores determinantes a inovação e o crescimento econômico. A economia e, mais particularmente, a promoção de instrumentos baseados no mercado podem, portanto, contribuir para a construção de uma lei e política ambiental mais desenvolvida. São esses instrumentos baseados no mercado que serão o foco central desta contribuição, centralizando-se nas interdependências

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economy and environmental quality, thus showing that the economy is not necessarily a threat to environmental protection, on the contrary, it could contribute to greater protection of the environment. Thus, the present work is presented in three parts. Initially, a literature review will be undertaken that empirically analyzed the relationship between economic growth and environmental quality, known as the Environmental Kuznets Curve. Subsequently, it seeks to demonstrate how some market instruments can play a central role in an efficient environmental policy. In the following topic, an approach will be made to these instruments and their applicability in different realities, such as developing countries, integrating their specificities and conditions. In the "Concluding remarks", a closing is carried out debating the main conclusions.

KEYWORDS

Environmental and Economic Development. Sustainability. Social and Environmental Regulation. Green Economy.

entre economia e qualidade ambiental, mostrando assim que a economia não é necessariamente uma ameaça à proteção ambiental, pelo contrário, poderia contribuir para a maior proteção do meio ambiente. Dessa forma, o presente trabalho é apresentado em três partes. Inicialmente, será empreendida uma revisão da literatura que analisou empiricamente a relação entre crescimento econômico e qualidade ambiental, conhecida como Environmental Kuznets Curve. Posteriormente, busca-se demonstrar como alguns instrumentos de mercado podem desempenhar um papel central em uma política ambiental eficiente. No tópico seguinte, será realizada uma abordagem desses instrumentos e sua aplicabilidade em realidades distintas, como os países em desenvolvimento, integralizando suas especificidades e condições. Nas "Observações finais", realiza-se um fechamento debatendo as principais conclusões.

PALAVRAS-CHAVE

Desenvolvimento Ambiental e Econômico. Sustentabilidade. Regulação Socioambiental. Economia Verde.

1 INTRODUCTION

A question that has always arisen in environmental policy is whether economic development and economic growth are necessarily incompatible with environmental protection. At first sight, this seems indeed to be the case. If there would be no industrial activity or other type of economic activity there would be no environmental pollution either. However, it would be too simple to assume that economic growth and economic welfare would necessarily lead to more environmental pollution. The relationship between economic growth and environmental quality is slightly more complicated as I plan to show in this contribution.

The starting point for an economic approach to environmental policy is that environmental pollution can be considered as an externality. Pollution is a consequence taking place outside of the decision-making as a result of which the market will not require the decision-maker to pay for those costs. These side effects are external to the industrial activity itself, since the company committing the pollution is in principle not affected by the negative side effects it causes by its actions. Pollution could be reduced to optimal levels by forcing the decision-makers to internalize those external costs, in other words by ensuring that they bear the costs of injuries and damages they impose on third parties. The goal of environmental law and policy is therefore to force the potential polluter to include in her decisions the damages caused by the pollution emitted by her activity choices. That would imply that the externalities are internalized into her decision-making process. From an economic perspective, the need for environmental law and policy is therefore clear. To the extent that law and policy are able to force polluters to this internalization of the externality, economic welfare and environmental quality can be reconciled. That is of course also expressed in the notion of sustainable development.

Environmental law and policy can, moreover, under particular conditions even stimulate economic growth or at least not endanger it. It has especially been Harvard professor Michael Porter who in many publications has pointed at the relationship between environmental regulation, innovation and economic growth.[1] He showed, both at the firm level as well as at the country level, that stringent environmental regulation

[1] Porter 1991 and Porter & Van der Linde 1995.

should not restrict companies' profits, but that the efforts to comply with environmental regulation will force firms towards innovation, which in turn will also lead to a generally higher profitability of those environmentally innovative firms. This has been known as the Porter hypothesis. Increasingly, the Porter hypothesis is also enjoying empirical support.[2]

The crucial question is, however, which instruments within environmental law and policy, are those that can promote sustainability in an optimal manner. Increasingly, the idea has been promoted that so-called incentive-based, "market-based" or "economic" instruments should be used. Economists have strongly argued that these incentive mechanisms can lead an operator to optimally internalize the externality at the lowest cost. It is based on the economic premise that a particular actor, more particularly the polluter, bases his decision on a cost-benefit analysis. Increased costs (resulting from for example the threat of having to pay a tax or to buy pollution rights) would lead to costs that would be higher than the benefits to the polluter and could therefore correct his behavior. The advantage of those market-based instruments is that the government would not mandatorily tell polluters how to internalize the externality, but would rather impose a price on pollution. Subsequently the market mechanism would drive polluters to invest in research and technology in order to develop smart, innovative technologies that could reduce environmental pollution at the lowest costs. Economics and more particularly the promotion of market-based instruments can therefore teach how a "smart" environmental law and policy can be developed. It is these market-based instruments that will be the core focus of this contribution. But in fact, more generally, I will investigate interdependencies between economics and environmental quality, thus showing that the economy is not necessarily a threat to environmental protection, but could rather contribute to the protection of the environment.

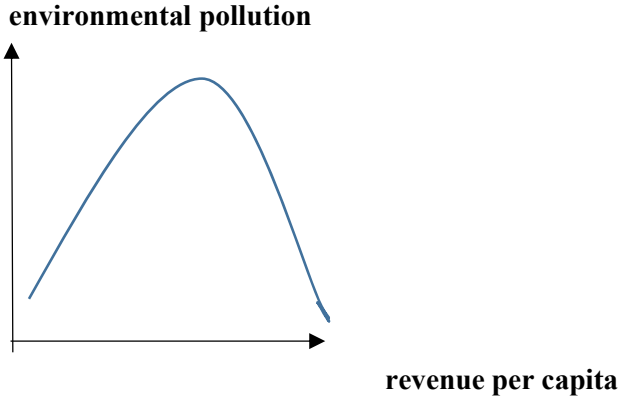
I will develop this argument along three different lines: after this introduction, I will first pay attention to an important literature that has empirically analyzed the relationship between economic growth and environmental quality, known as the Environmental Kuznets Curve (2). I will then turn to the efficiency of specific environmental policy instruments and show how more particularly market-based

[2] Ambec et al. 2013.

instruments could play a role in a smart environmental policy (3). However, the question arises whether the mix of instruments that might be optimal in theory would also be optimal in the context of developing countries, for example in Latin-America. After all, this instrument mix is often designed on the basis of assumptions about the availability of human capital in a bureaucracy and public servants working in the public interest. If, as is often the case in developing countries, those conditions would not be met, the question arises whether that leads to a different instrument mix for environmental policy (4). Section 5 concludes.

2 ENVIRONMENTAL KUZNETS CURVE

The idea of the Environmental Kuznets Curve (EKC) is named after the Nobel prize winner Simon Kuznets who wrote on the relationship between income inequality and income levels in a country.[3] Since the 1980s scholars have also applied this concept to environmental pollution, establishing an empirical relationship between measures of environmental quality and national income.[4] This literature showed an inverted u-shaped relationship, meaning that in a first phase of economic development (at low income levels) increasing economic development led to increasing environmental degradation. However, there is a certain turning point (the top of the inverted u-curve) where income levels have increased to such a point that a demand for higher environmental quality emerges and where hence increased economic welfare leads to increased environmental improvements:



[3] Kuznets 1955, 1-28.
[4] Grossman & Krueger 1993, 13-56; Grossman & Krueger 1995 353-377.

This work has especially become known through the World Bank which referred to it in its World Development Report 1992. The normative lesson that was drawn from this literature was that developing countries would have an interest in fighting poverty and increasing income levels, since this would also lead to higher levels of environmental quality. This vision has strongly been voiced by Beckerman, who was involved in drafting the 1992 World Development Report of the World Bank.[5] He for example holds 'it is fairly clear that the best way to improve the environment of the fast mass of the world's population is to enable them to maintain economic growth' and 'the strong correlation between incomes and the extent to which environmental protection measures are adopted demonstrates that, in the longer run, the surest way to improve your environment is to become rich'.[6]

There are different reasons why, theoretically, the EKC may work, in other words why higher income levels in a country could lead to lower pollution levels.[7] A first reason is that when income grows there may be a tendency for a larger share of total demand to consist of services, rather than of manufactured goods; second, general technological progress can lead to greater efficiency in the use of energy and materials. This is strongly related to the work of Michael Porter, already mentioned in the introduction, which holds that environmental improvement does not necessarily come at the expense of competitiveness. Porter showed that increased environmental performance can also lead to increased competitiveness.[8] This has been known as the "Porter hypothesis", showing that countries (and companies) may benefit from investments in environmental protection since this can increase competitiveness. There is also increasing empirical support for this Porter hypothesis.[9] The increase of income can also lead to changing preferences of the population: once the basic needs are satisfied, the population may value a clean environment, especially since it wants to enjoy free time and recreate in a clean environment. In the words of Arrow et al. "People spend proportionally more on

[5] Beckerman 1992, 481-496.
[6] Beckerman 1992, 491.
[7] Strand 2002, 6-8.
[8] Porter & Van der Linde 1995.
[9] There is also increasing empirical support for this Porter hypothesis, see Ambec et al. 2013, 2-22.

environmental quality as their income raises".[10] Another reason is that developed nations may dump emissions linked to their production in developing economies.[11]

There is empirical evidence to support the EKC, but the evidence does not provide an equivocal result.[12] The EKC has been studied inter alia for Latin-America by Cansino et al.[13] and Jimenez et al.,[14] but also for China[15] as the question obviously arises whether China has already reached the tipping point where higher income levels reduce pollution levels. There is some empirical evidence to support that hypothesis, but it strongly depends upon the type of pollutants involved.[16] According to Chen et al. the EKC pattern may not be valid for the situations of more wicked pollution.[17]

What are the lessons from the EKC literature at the policy level? A simplistic approach could be that the best way for a nation to promote environmental protection would be to promote economic growth. This has been qualified by Ayres as 'false and pernicious nonsense'.[18] That conclusion would be too unbalanced. Economic growth as such is not a panacea for environmental quality.[19]

The data used to develop the EKC also show that there are considerable differences in environmental performance between countries with a similar level of economic development – a pattern the curve fails to explain. The methodology and economic techniques of extant EKC research have been questioned due to controversial empirical research.[20] It has more particularly been the contribution of Dan Esty and Michael Porter who examined empirically to what extent not only income levels, as suggested by the Environmental Kuznets Curve literature, but also a nation's regulatory regime influence environmental quality. The result of this powerful research, based on an examination of regulatory intensity and environmental quality in a great number of developed and developing countries, is that economic development and environmental

[10] Arrow et al. 1995, 92.
[11] Sun et al. 2019.
[12] For a summary, see Faure 2011, 388-390.
[13] Cansino, Román-Collado & Molina 2019, 1-20.
[14] Jimenez et al. 2019, 1-11.
[15] Yang et al. 2018, 1-15.
[16] Gui, Faure & Xu 2017; Yang et al. 2018.
[17] Chen, Hu & Van Tulder 2019.
[18] Ayres 1995.
[19] Arrow et al. 1995, 93.
[20] Chen, Hu & Van Tulder 2019.

protection go hand in hand with the improvement of a country's institutions and more particularly the environmental regulatory regime.[21] They find that not only the rigour and structure of environmental regulations have a particular impact on environmental performance, but also the enforcement. The empirical evidence hence suggests that a country can benefit environmentally not only from economic growth, but equally from developing the rule of law and strengthening its governance structures.[22] Interestingly, they also found evidence that countries that adopted a stringent environmental regime relative to their income were able to speed up economic growth rather than retarding it.[23]

These data suggest that the quality of environmental regulation also plays an important role in determining the environmental performance of developing countries. An important policy conclusion from this empirical literature is that, even though the Environmental Kuznets Curve indicates a relationship between economic growth and higher environmental quality, the lesson is not that environmental law does not matter. To the contrary, Esty and Porter could show convincingly that strengthening the regulatory structure also encourages the promotion of environmental quality.[24] An important lesson from this literature is therefore that merely stimulating economic growth will not automatically lead to improved environmental quality. That strongly depends on the quality of environmental regulation. This therefore raises the question what specific instruments need to be employed in order to provide optimal incentives to operators for internalizing the externality caused by environmental pollution.

3 SPECIFIC INSTRUMENTS

Many instruments could in principle be employed to incentivize a polluter towards an internationalization of the externalities. Each of those have particular strengths and weaknesses which will be reviewed in turn.

[21] Esty & Porter 2000; Esty & Porter 2005.
[22] Esty & Porter 2005.
[23] Ibid.
[24] See further, more particularly on the role of environmental NGOs, Binder & Neymayer 2005.

3.1 Liability rules

Civil liability has been stressed as one of the more robust tools in correcting the problems of internalizing environmental externalities.[25] The essence of a rule of civil liability is that it forces, when particular conditions are met, polluters to compensate victims. By holding polluters liable, the liability rule also leads to deterrence. Under civil liability there is no prescription of a particular behavior like for example the use of a specific emission standard or technology. Under civil liability the polluter remains permitted to pollute, as long as he is able to pay the price, i.e. to pay the adjudicated damages to the victim. In that sense a liability rule can be considered as a price mechanism, just like taxes or subsidies.[26] There is substantial empirical research showing that environmental liability does indeed have the desired deterrent effect and indeed influences the behavior of potential polluters.[27]

Much research is also devoted to the question of whether environmental liability should be deterred through a negligence or a strict liability rule. Economic literature has often advanced strict liability for environmental pollution, since it provides the potential polluters optimal incentives for accident reduction.[28] Empirical research, for example, by Alberini and Austin, indeed confirmed that the imposition of strict liability in state environmental policies reduced unintended pollution releases.[29] Firms therefore show behavioral responses of avoiding liability "when they are strictly liable for releases of hazardous chemicals into the environment".[30]

However, the same authors also found the remarkable result that in states with strict liability, a greater spill severity and frequency could be found, which was associated with smaller production units and thus reduced assets, whereas this phenomenon was not found in states following negligence-based liability.[31] At first sight, this surprising result (more severe pollution cases under strict liability than under negligence) seems to deny the assumption of the literature that strict liability would provide better incentives for prevention. However, the same economic literature has equally indicated that strict

[25] Shavell 2011.
[26] Wiener 1999, 706-709.
[27] For an overview see Faure 2012, 301-303.
[28] See e.g. Shavell 1980, 2-3. But see e.g. Pozzo 1996, 111.
[29] See Alberini & Austin 2001, 112.
[30] Ibid.
[31] Ibid.

liability cold indeed lead to perverse results if polluters were potentially insolvent, meaning that the losses could be higher than their assets.[32] The fact that Alberini and Austin hence found that under strict liability firms organize themselves in smaller production units with reduced assets precisely confirms the assumption in the literature that strict liability is efficient only if a remedy for the insolvency problem can be found. The normative conclusion from this empirical research is hence not that the policy maker should not introduce strict liability for environmental pollution, but rather that if a serious insolvency risk exists, the introduction of strict liability should be accompanied with solvency guarantees, such as the introduction of compulsory insurance.[33] Otherwise, strict liability may exactly have the effect of driving polluters to reduce the assets that are exposed to liability.[34]

3.2 Regulation

The alternative, which is de facto most often used as environmental policy, is regulation by the government. Economists often qualify this as "command and control" rules. They consist of an administrative system based on licenses, permitting and standard-setting by administrative agencies. An impressive amount of literature is devoted to the effectiveness of environmental regulation. Thereby attention is paid to the question under what conditions the so-called command and control regulation may or may not be more effective than the so-called economic or market-based instruments.[35] The theoretical starting point for regulation is a classic paper by Shavell indicating that information on optimal abatement techniques may often be better with government and, since, as mentioned before, insolvency problems can arise and for a number of reasons, a liability suit for environmental damage can never be brought,[36] regulation may be more

[32] See Shavell 1986, 45. See generally Cooter 1984.
[33] See e.g. Jost 1996, 259-260; Polborn 1998, 141-143.
[34] For an overview of the literature concerning the incentive impacts of environmental liability, see also Earnhart 2004, 100-101.
[35] See generally Johnston 2007: Johnston 2002-2003.
[36] For example, because the damage can be widespread, victims can believe damage has natural causes, victims cannot be identified, long latency periods and problems of causation may exist. See Shavell 1984a, 363, 370.

effective to control environmental pollution than private law instruments like liability rules.[37]

There seems to be substantial empirical evidence of this relative effectiveness of safety regulation in controlling environmental harm. More particularly, Dewees demonstrated in various studies that in North America the quality of the environment has improved substantially as a result of regulatory efforts, and not so much in response to legal action in tort.[38] Dewees, Duff, and Trebilcock held that the large regulatory efforts to improve the environment have been met with considerable success when measured by the reduction of emissions.[39] However, they equally stressed that while environmental regulation is a determining factor in pollutant emissions and ambient concentrations, other non-regulatory factors, such as economic growth and even the weather, also influence environmental quality.[40] The fact that economic growth strongly correlates with environmental quality of course corresponds with the literature on the Environmental Kuznets Curve, discussed above.[41]

An impressive amount of research is also devoted to the fact that, notwithstanding the beneficial effects of regulation, regulation always entails the danger that it may not be welfare improving, but may rather serve the interests of particular groups in society. The application of this so-called interest group theory of regulation has been strongly advanced by the Public Choice school.[42] Maloney and McCormick were probably the first to show that with environmental regulation, industry will try to change the contents of the regulation to its advantage.[43] They argue that industry, realizing that environmental regulation is unavoidable, will cooperate with the development of the regulation and try to change the contents to its advantage.[44] A classic example is the introduction of so-

[37] Ibid., 368-371. See generally Wittman 1977 (analyzing the choice between using legal as opposed to market solutions to policy problems by reference to input and output monitoring procedure); Shavell 1984b, 271 (building further on Wittman's work and discussing the factors involved in determining which alternative should be preferred in a given situation).
[38] Dewees 1992a, 158-163; Dewees 1992b, 463-464.
[39] Dewees et al. 1996, 315.
[40] Ibid., 307.
[41] See supra 2.
[42] See generally Shaw 2002 (discussing Public Choice Theory, which models the way that interest groups affect collective decision-making, and noting that congressional representatives from northern industrial states used the 1977 Clean Air Act amendments to reduce competition).
[43] Maloney & McCormick 1982, 108.
[44] Ibid.

called "grandfather clauses," which stipulate that the regulation will not be applicable to firms or products, which are already active on the market.[45] Nash and Revesz showed that new regulations with grandfather clauses will retard the introduction of new, clean plants and will keep inefficient plants operating longer than they otherwise would.[46] There is, of course, also ample evidence that the grandfathering of emission rights under the European Emission Trading Scheme seriously reduced incentives of industry for pollution abatement.[47]

Public Choice Theory also predicts that if it were possible to organize a countervailing power against industry lobbying, a kind of competition between various pressure groups could emerge, the result of which may be closer to the optimum than when government is only lobbied by pressure groups representing industry interest.[48] Binder and Neymayer present some powerful empirical evidence of this for the environmental area.[49] They provide a systematic quantitative test of the relationship between the strength of environmental NGOs and air pollution levels.[50] They find that environmental NGOs exert a statistically significant impact on sulfur dioxide, smoke and heavy particulates concentration levels, based on a cross-country time series regression analysis.[51] This recent paper thus provides an important empirical backing for something environmental lawyers have long advocated: public participation and NGO influence will effectively help to achieve lower pollution levels.[52]

3.3 Command and control versus market-based instruments

An impressive amount of literature has dealt with the various aspects of comparing the traditional command and control approach via regulation with more incentive-based mechanisms, referred to as economic or market-based instruments.[53] One lesson from this literature is that it is impossible to compare general regulation with market-based

[45] Ibid., 101 (utilizing the Clean Air Act as an example of such "deferential pollution-control requirements").
[46] Nash & Revesz 2007.
[47] Endres & Ohl 2005; see also Olsen 2006; Woerdman et al. 2008, 128-129.
[48] See generally Becker, 386, 394-395 (asserting that non-cooperative competition between pressure groups for political influence favors efficiency).
[49] Binder & Neymayer 2005, 530-531.
[50] Ibid.
[51] Ibid., 531.
[52] Ibid., 537.
[53] For an excellent summary, see generally Revesz & Stavins 2007; Johnston 2007.

instruments, since the superiority of the one or the other is very much dependent upon the specific context, type of pollutant regulated, institutional design, etc. It is indeed not difficult to point to research showing that a regulatory approach can lead to significant reductions of, for example, waste water emissions, and encourage the implementation of less polluting production techniques in the long run.[54] As long as command and control approaches are designed with at least one eye on cost savings, incentive based systems are not necessarily superior to command and control.[55] Therefore one has to be careful with too sharply distinguishing the two. After all, command and control approaches also include a wide variety of measures, some of which are quite crude, but others which produce results as efficient as economic incentives.[56] One should keep in mind that one has to be very careful with those types of comparisons. Now a few examples of success stories of market-based instruments, at least as far as reducing emissions is concerned, will be provided based on empirical literature. That does not, however, necessarily imply that similar results could not have been reached with a regulatory approach.[57]

3.4 Taxation

An alternative to government regulation was already advocated as early as the 1920s by Pigou. The basic idea is to use financial instruments to correct the externality. The polluter could be taxed according to the amount of pollution emitted, giving the polluter better incentives. But a wide variety of tax-reducing incentives are possible to achieve pollution reduction and more particularly for innovative investments in pollution reduction tools. There is quite a bit of literature providing evidence of the successes obtained with environmental taxation. In the Netherlands, "water pollution by 14 industries responsible for 90% of total water pollution decreased by 50% between 1969 and 1975, and by another 20% by 1980."[58] Half of this reduction was, so the evidence shows, due to an effluent charge.[59] A similar success story comes from Germany where various scholars provided evidence that a system of charges on waste water led to a

[54] See Stephan 1988, 403.
[55] Oates et al. 1989, 1240.
[56] Oates 1990, 292-293; see generally Oates 1996.
[57] For an overview of the literature, see Stewart 2000, 203-218; Ackerman & Stewart 1988, 185-186; Stewart 1988, 159-161.
[58] Dewees et al. 1996, 326-327.
[59] Ibid.

considerable reduction of emissions.[60] Interestingly, most of these European legal systems had, and still have, a combination of effluent charges with emission standards.[61] Still the evidence shows that these significant investments in water treatment plants were not only due to the threat of sanctions in case of violation of emission standards, but also to taxation.[62] Comparative research by Bongaerts and Kraemer comparing the water pollution charges in France, the Netherlands, and Germany came to the same conclusion: that effluent charges provide a strong incentive to invest in water pollution abatement equipment.[63] The authors argue that the effect is especially strong in Germany where the charges are reduced by fifty percent for emitters who meet the emission standard.[64] Also, a study by Morley on environmental taxation in EU member states and Norway confirms a significant negative relationship between taxes and pollution.[65] That study hence confirms that the current use of environmental taxes to reduce the EU's levels of pollution appear to be having some effects.[66]

One should, however, not immediately become overly enthusiastic, since there is equal evidence that the special interest groups, of which we mentioned before, affect the quality of regulation and can also be active when it comes to designing a taxation system. It is, for example, remarkable that pollution permits are introduced on a large scale in the United States, but that taxation systems were traditionally more popular in Europe than in the United States.[67] Buchanan, together with Tullock, has argued that this should not come as a surprise, since firms will prefer emission standards or emission trading, especially when emission rights are grandfathered, to taxes.[68] Standards have the advantage that they can serve as a barrier to entry to new firms, thus raising the profits of existing firms.[69] Taxes on the other hand do not preclude entry by new firms and represent an additional cost to the existing firms on the market.[70] It should not come as a surprise

[60] Brown & Johnson 1984, 933-937, 943-945, 962-963; see also Frey 1972, 151.
[61] Laskowska & Scrimgeour 2002.
[62] Brown & Johnson 1984, 932-933, 962.
[63] Bongaerts & Kramer 1987, 15.
[64] Ibid. See also Laskowaska & Scrimgeour 2002, 14 (arguing also that it is difficult to disentangle the separate effects of charges and emission standards and listing various taxes).
[65] Morely 2010.
[66] Ibid., 15.
[67] Buchanan & Tullock 1975, 142.
[68] Ibid. 142-146.
[69] Hahn 2000, 107.
[70] Ibid.

that interest groups representing industry will oppose taxation, and that as a result, charges are rarely introduced "in their textbook form."[71] Moreover, governments often use fees as a revenue-generating device for public services rather than as an instrument of environmental policy, as predicted by economic theory.[72] As a result there is also a lot of evidence of inefficient environmental taxation, and not surprisingly the likelihood of these inefficiencies increases as the power of the interest group involved grows.[73]

3.5 Emissions trading

Whereas environmental taxes and charges on emissions were popular in Europe, emission trading started in the United States.[74] Hence already since the 1980s there has been overwhelming American research to show the effectiveness of trading in pollution rights. Making a random selection, one can for example, refer to research by Wallace Oates from 1986 concerning the well-known United States emission trading system for air pollutants.[75] He reports that this trading system has made real headway in certain regions and that the system has been successful.[76] Also, Hahn and Hester claim that the trading programs concerning the Clean Air Act have led to considerable cost savings, albeit that the cost savings may have been less than anticipated.[77] A problem is that trading may in some cases have increased emissions, more particularly where the pollution rights that were sold were previously not being fully utilized by the owner.[78] Nevertheless, the SO_2 cap and trade program has been qualified as a "living legend" of market effectiveness and "the total annual health benefits associated with the SO_2 emission reductions under the program" are estimated to be more than $50 million per year in 2010.[79] Keohane estimated the annual cost savings resulting from the trading program to be $150 million.[80] The enthusiasm concerning the trading system in the United States Clean Air Act not only comes from its environmental effectiveness, but also from

[71] Ibid., 107-108.
[72] Ibid., 107.
[73] Several examples illustrating the inefficiency of particular environmental taxes are discussed in Faure 2012, 312-315.
[74] Conniff 2009.
[75] Oates 1986, 252, 261-265.
[76] See Id. See Also Oates & McGartland 1985, 222.
[77] Hahn & Hester 1989, 151.
[78] Cf. Young 1998, 145.
[79] See Burtraw & Palmer 2004, 47. See also Ellerman 2007, 47, 50 (showing that the SO_2 emissions trading program caused significant reductions in emissions).
[80] Keohane 2007, 224.

the cost-savings, at least when referring to compliance costs for industry.[81] Moreover, Ellerman also showed that the administrative costs for running the emission trading system under the Clean Air Act are significantly less compared to a traditional regulatory system.[82] Other American studies examining the trading programs under the Clean Air Act provide a roughly similar picture.[83]

Recently, the attention has, for obvious reasons, shifted from the United States to Europe. The reason is of course that Europe chose emission trading as the instrument to implement the Kyoto Protocol and address the challenges posed by climate change.[84] Too many studies to be mentioned here have addressed the effectiveness of the EU emission trading scheme ("ETS").[85] The case of the European ETS is an interesting one, if simply to show the difficulties in interpreting the results of empirical research. Europe chose, with Directive 2003/87 of October 13, 2003, to give emissions rights, basically for free, to existing industry as a result of so-called grandfathering.[86] Again, the private interest theory of regulation, mentioned above,[87] can explain why emission trading with grandfathering was chosen instead of an environmental tax. This should not come as a surprise since grandfathering of course serves the interests of industry better[88] than costly taxation measures. Also not surprising, at least at first sight, is that grandfathering, in other words giving away allowances free of any charge, may lead to over allocation of emission rights.[89] As a result of this over allocation in early 2007, the price of allowances dramatically dropped below €1. This low price for allowances obviously provides evidence of over allocation by the European member states.[90] However, it is more difficult to answer the question whether this necessarily makes the whole EU ETS ineffective in

[81] See Burtraw & Palmer 2004, 59 (noting the "perceived success of the SO_2 program in reducing compliance costs" has boosted a number of similar legislative proposals).
[82] Ellerman 2004, 92; see also Ellerman et al. 2000, 250, 294-296.
[83] See Nash & Revesz 2002, 333, 335 (discussing the design of emissions trading programs more generally); Tietenberg & Johnston 2004, 29-30, 34.
[84] See Peeters 2006, 177.
[85] See generally Douma et al. 2007.
[86] Directive 2003/87, establishing a scheme for greenhouse gas emission allowance trading within the community and amending Council Directive 96/61/EC 2002 OJ L275, 32, 36 (EC); International Emissions Trading Association, high level group on the emissions trading scheme, 2006, http://ec/europa/eu/enterprise/policies/sustainable-businessfiles/environment/hlg/docs/contribution_ieta_en.pfd.
[87] See supra 3.2.
[88] Ellerman 2005, 90; Sterner & Hammar 2005, 31.
[89] Baldwin 2008, 9, 11, 13,15.
[90] See Woerdman et al. 2008, 143-144.

providing incentives for emissions reductions. At first sight one may be tempted to argue that this is the case: why would any company invest in emission abatement equipment if a ton of CO_2 emission rights could be purchased at a price below €1? Marginal costs of pollution abatement are undoubtedly higher. However, Kuik and Oosterhuis convincingly argue that the over allocation could be partly the result of investments in technological and other innovations, investments which precisely caused the emissions reductions.[91] They showed that the EU ETS led to an additional abatement of between 50 and 200 million tons, and equally showed that this emission trading scheme played a key role in the long-term decisions of companies to develop innovative technologies with, more particularly, a strong impact on the steel industry.[92] Hence, the mere fact that the price of a ton of CO_2 dropped below €1 (at the beginning of 2007) does not necessarily mean that the ETS had no incentive effect on innovation and is thus ineffective. Quite the reverse may be true as well; as the demand for emissions has dropped since the introduction of the EU ETS precisely because it had the desired effect of reducing those emissions.[93] These observations are of course not meant to argue that there is no room for improvement of the EU ETS; the institutional design could certainly be improved and that has to a large extent also occurred with the promulgation of the second ETS Directive.[94] However, one apparently has to be very careful in correctly interpreting results of empirical research: the price of one ton CO_2 falling below €1 does not necessarily mean that the EU ETS is ineffective. Instead, one has to interpret this in the correct context.

3.6 Optimal mixes

In addition to the instruments discussed so far, other incentive-based mechanisms are also employed to jumpstart the uptake of green technologies such as, for example, green public procurement (GPP). In that case the government uses it purchasing power to buy services or products with fewer environmental impacts. As a result, GPP can directly boost the quantity demanded in the short run and in the long run increase the demand for particular green technologies of private parties.[95] Although there is a large variety of

[91] Kuik & Oosterhuis, 212-214, 221.
[92] Id., at 212, 220.
[93] See id., at 217.
[94] See generally Directive 2009/29 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the community, 2009 OJ L140/63 (EC).
[95] See Faure & Shen 2020, 86-87.

instruments available, Gunningham and Grabosky made clear in their important book *Smart Regulation* that in fact all instruments have particular advantages, but also their specific weaknesses. They could, however, equally be used in combination.[96] In practice one can often notice a combination of various instruments and thus hybrid regulatory approaches.[97] This literature deals with the search for "optimal mixes of instruments" and tries to analyze which type of policy instrument is indicated under which particular circumstances. The insight that no instrument alone can lead to optimal results also indicates that in most cases a combination of different instruments is necessary to optimally internalize externalities. This leads to a growing literature on the search for smart mixes between a variety of different legal and policy instruments. A crucial question in that respect is how an optimal combination of a variety of legal and policy instruments can be designed to optimally internalize the externality caused by environmental pollution.[98] That will remain a topic that may feature high on the research agenda for the coming years.

4 EFFICIENT INSTRUMENTS FOR DEVELOPING COUNTRIES?

4.1 INEFFECTIVENESS

In the past efforts to assist developing countries in crafting environmental regulation have strongly relied upon the importation of legal schemes by colonial powers and the transplantations of regulatory models developed in the North.[99] This reliance on an imported model has often resulted in environmental regulations that were ill-suited for developing countries and therefor led to regulatory failure. In some developing countries the environmental law consists of a mere copying of foreign legislation. These legal transplants often led to a rejection, i.e. for a lack of enforcement of the imported law in the developing country. The reason was often that the imported laws were ill-suited to the political and economic environment in the developing country concerned.[100] There are

[96] Gunnngham & Grabosky 1998 and Wiener 1999.
[97] So also Stewart 2007, 154.
[98] See for such a search for smart mixes for transboundary environmental harm inter alia, Van Erp, Faure, Nollkaemper & Philipsen 2019.
[99] See Faure, Goodwin & Weber 2010, 100-108.
[100] Faure, Goodwin & Weber 2010, 105-108.

various types of literature that explain the ineffectiveness of the transplanted environmental laws in developing countries, but that equally suggest alternative approaches that may work better. Indications in that respect can be found both in the so-called law and development (4.2) literature as well as in law and economics (4.3).

4.2 LAW AND DEVELOPMENTS

The so-called law and development literature has fundamentally analyzed the relationship between law and the trajectory of development. This "law and development" literature is relatively critical concerning the opportunities for law to really affect and promote economic development.[101] Specific attention is paid in that literature to informal alternatives to law. For example, in place of the emphasis on the enforcement of private law, numerous studies on Chinese capitalism have made clear that securing property and contract rights was not the main purpose of law in traditional Asian societies.[102] Instead, law was an instrument of state interest and its unpredictable effects led merchants and traders to avoid formal encounters with the legal system. In its place, an informal legal order developed in parallel to state law. Since in the absence of formal enforcement this informal order relied upon trust as the guarantee of economic exchange, economic activity was embedded within social relations. This form of "relational capitalism" was remarkably successful, and remains so today for Chinese communities throughout Southeast Asia.[103] I do not intend to suggest that informal law is preferable to formal law. There are a number of notable disadvantages to a relational system of regulation. One is the limitation it places on economic transactions with people one knows, another is the difficulty of succession when concentrating assets in family firms. Informal systems may also lack the adaptability of formal law and, in the absence of formal enforcement of rights, may lead to a market in alternative enforcement, as in Russia.[104] Formal and informal law are also not mutually exclusive.[105] More recent research has suggested an interplay between informal and formal norms in creating institutional environments.[106] Rather, the existence of informal normative systems should be highlighted as they can be

[101] Faure, Goodwin & Weber 2010, 125-126.
[102] Ginsburg 2000; Pistor & Wellons 1999; Jayasuriya 1999.
[103] Ginsburg 2000.
[104] Ginsburg 2000; Cross 2002.
[105] North 1981.
[106] Posner 2000.

particularly important in developing countries with an historical absence of a strong formal legal system. Taking account of such legal pluralism is particularly important in considering legal reform in (developing) host countries.

One way of promoting legal change in developing countries is through so-called legal transplants, a technique whereby countries from the North (often old colonies) imposed their own norms on developing countries in the South.[107] Legal transplants can undoubtedly have advantages: developing countries might copy best practices and rely on experiences in the North concerning which legal instruments were effective and which were not. Thus, transplants could provide scope for mutual learning. However, a problem with legal transplants is that they are often based on a "theory of lack".[108] In this view developing countries lack the key characteristics and values of a civilized system. The classic example is the belief, historically prevalent in the field of comparative law, that the Chinese lack "real" law beyond an exclusively penal law system.[109] The problem with this approach is that it is offensive and humiliating to the people of developing countries and it is, moreover, based on a cultural superiority (often of former colonizers). That also explains why in developing countries there was often a resistance against the transplanted norms as a result of which many of the transplants failed. In the context of environmental regulation it is far more important to work with local communities in order to understand how they interact with their environment.[110] One important condition for a transplant to work is a familiarity with the receiving system, in other words whether the legal cultures of the donor and receiver share common core norms[111] and probably the most important guarantee of a successful transplant is that it should necessarily be user-driven, i.e. based on local demand and ownership and not imposed in a top-down manner.[112] Adapting the transplanted legal rule to the context-specific requirements and operation of the receiving system is thus necessary for the transplant to function well within its new surroundings.[113]

[107] Watson 1974.
[108] Nader 2007, 2.
[109] Ruskola 2002.
[110] Faure, Goodwin & Weber 2010, 134-136.
[111] Ibid.
[112] Berkowitz, Pistor & Richard 2003.
[113] Faure, Goodwin & Weber 2010, 140-143.

4.3 LAW AND ECONOMICS

The law and economics literature in this domain also starts from the finding that efforts to assist developing countries in drafting environmental regulation have often relied upon the importation of legal rules developed by former colonizers by developing countries. As a result, regulations were often imposed that were ill-suited for developing countries, leading to a poor quality environmental regulation in many countries.[114] In addition, the literature equally points at enforcement and implementation problems.[115] It is, however, argued that even though enforcement problems may be an important source of the ineffectiveness of environmental law in developing countries, the substantive content of environmental law is equally important.[116] In that respect recent law and economics literature has a few important consequences. One possibility is to take institutional weaknesses within developing countries into account in the design of law itself.[117] Within law and economics, there is a tradition of scholarship that focuses on the circumstances under which ex ante rules set by a legislative authority are preferable to ex post standards formulated by the judiciary or bureaucratic departments.[118] The principles developed within this field of study may be used to ascertain whether developing countries would be better advised to adopt a standard-based system of environmental regulation that relies heavily on the judiciary or lower levels of the executive for the specification of norms, or a rule-based system that concentrates more power in the legislature or at higher levels of the executive.

4.3.1 Lacking human capital

A number of scholars have suggested, on the basis of economic analysis, that in low-capacity administrative and legal systems, a rule-based system is easier to administer.[119] While standards are associated with low costs initially, they appear to have high enforcement and compliance costs later on. As a consequence, rule-based systems are likely to be preferable in developing countries because the concentration of decisions at the state level may provide an economic solution to the lack of human capital. The

[114] Faure, Goodwin & Weber 2017.
[115] O'Connor 1998.
[116] Faure, Goodwin & Weber 2017.
[117] Mitchell 1996.
[118] Diver 1983; Ehrlich & Posner 1974; Kaplow 1992; Posner 1998.
[119] Schäfer 2006; Posner 2000.

literature suggests that fewer and simpler rules should also form the main approach of legal and administrative systems with low enforcement capacities.[120] Moreover, scholars have argued persuasively that a rule-based system can create better outcomes in systems in which the judiciary may either not be fully functioning or be entirely independent because clear rules reduce the risk of bribery and of unwarranted influence in the application of the law.[121] Kenneth Dam has reached similar conclusions: namely, that the common law, by relying on indeterminate principles and a strong judiciary, is not superior to statutory law in achieving effective legal implementation in developing countries.[122]

In applying these insights to the design of environmental law in a country whose administrative structures suffer from limited governance capacities, it is misguided to develop an environmental legal system that depends to a large extent precisely upon the existence of a strong administrative legal system. In the case of Indonesian environmental regulation, the necessary executive orders were never promulgated, leaving two environmental management acts largely unimplemented.[123] Such a regulatory failure indicates that where it is possible to determine in advance that, for whatever reason, a developing country does not have the capacity or will to issue executive orders, it is necessary to structure environmental legislation in such a way that it becomes as independent as possible from such orders.

4.3.2 Corruption

Equally important are recent insights on corruption. In many developing countries, corruption presents another obstacle to establishing effective environmental regulation. As with the lack of administrative capacity, the preferred economic solution is to fight the corruption problem itself in order to increase the possibility of enforcing an environmental law based on Northern models.[124] However, a great deal of time and effort has been spent by numerous international organizations attempting to tackle corruption in the administrative structures of developing countries without any noticeable improvements.[125] This suggests that, as with capacity building within institutions, it could

[120] Ogus 2007.
[121] Posner 2000.
[122] Dam 2006.
[123] Faure & Niessen 2006, 2.
[124] Rose-Ackerman 1999; Worldbank 2003, 111; Van den Heuvel 1992.
[125] Huther & Anwar 2001, 7.

take a very long time before this ideal solution can improve environmental regulatory outcomes. The result is that in countries like Indonesia programs aiming at the redistribution of subsidized rice to poor households are likely to fail. Benjamin Olken has shown that, on average, 18% of rice intended for redistribution disappears. As a result, welfare losses from corruption are larger than potential welfare gains from the redistributive intent of the programs.[126]

An alternative and more pragmatic approach would be to accept the existence of corruption and attempt to create an environmental legal regime that is less corruptible. The work of Anthony Ogus dealing with the problems of corruption more generally is particularly relevant here.[127] Ogus begins from the position that corruption is difficult to remedy, and he recommends forms of regulation that are less susceptible to manipulation by corrupt officials. His approach builds upon the insights gained from the comparison of rule-based and standard-based systems, recognizing that the use of imprecise standards provides ample space for discretionary decisions and thus creates greater possibilities for opportunistic behavior. Precise rules can thus reduce the potential for corrupt behavior by bureaucrats.[128] Posner argues that rules allow for monitoring of judges and to reduce the occurrence of bribery and lobbying.[129] "General rules may indeed be suitable to overcome . . . the capture problems — that is, the susceptibility of government agencies to lobbying enterprises — that result from decentralized standard setting".[130]

4.3.3 Federalism

A third type of literature, equally relevant for the effectiveness of environmental law in developing countries deals with the question of central versus decentralized decision-making. A well-known problem with the decentralization of standard-setting power to local governments is that local authorities are often particularly vulnerable to lobbying by industrial interest groups as a consequence of the controlling role that such groups often play in the socioeconomic interests of local communities. In the specific area of environmental regulation, it is more likely that environmental standards will be created in the public interest after a reasonably transparent decision-making process at the central

[126] Olken 2006.
[127] Ogus 2004; Ogus 2007.
[128] Ogus 2007.
[129] Schäfer 2006; Posner 2000.
[130] Faure & Niessen 2006.

level, far away from efforts by local lobby groups to influence the process. Olson argues that large groups will face relatively high costs when attempting to organize for collective action while small groups will face relatively low costs. Furthermore, groups will have difficulties organizing themselves when there is only a small share of the benefits of the action for each group. Smaller groups, however, are better able to organize where there is a clearer gain for their members.[131] Studies on the efficacy of environmental regulation in developed countries suggest that even where local governments are not corrupt, it is difficult for local or state authorities to set stringent environmental standards in the public interest given the importance of a particular industry to the economic life of the locality. Esty has stressed the possibility of public choice distortions at the state level and argued in favor of standard setting at the centralized federal level.[132] Moreover, as more studies are done on the effects of decentralization in relation to environmental management in developing countries, the evidence almost overwhelmingly points to the capture of the decision-making process by local elites at the expense of end-users such as poor fishermen and small farmers. Such studies suggest that the poorest are better off where direct intervention by the central government is greater and the law is enforced against local elites. Béné et al. have been very critical of fishery decentralisation programmes in Sub-Saharan Africa, arguing that decentralization failed to improve governance and altered the distribution of power to the detriment of the fishermen.[133] Benjamin suggested that the shift to decentralized decision-making in the context of natural resource management in Mali has created a new local elite that undermines the functioning of customary institutions to the detriment of the poorest[134] and Sims pointed at structural problems of enforcement of environmental regulation in China following devolution of the administration of the rules to the provinces.[135] Sundar examined the success of "participatory committees" forest management in India, concluding that what matters in achieving success is not devolution but state accountability.[136] Moreover, given the likelihood of capture and exploitation by local elites, the environment is likely to suffer. Zbinden and Lee note for example, that while the Costa Rican scheme of payment for

[131] Olson 1965; Revesz 2000; Revesz 1997; Frederickson & Gaston 2000.
[132] Esty 1996; Esty & Geradin 1998.
[133] Béné et al. 2009.
[134] Benjamin 2008.
[135] Sims 1999.
[136] Sundar 2001.

environmental services has been very successful, participants and thus beneficiaries of the payments were considerably more likely to be relatively wealthy and well-educated farmers.[137]

These new insights concerning the effectiveness of environmental regulation in developing countries may have important policy consequences that will now be addressed.

4.4 POLICY CONSEQUENCES

4.4.1 Demand driven transplants

Both the law and development as well as the law and economics literature have important consequences for the design of an optimal environmental legal regime in developing countries. As was just mentioned, the most important lesson from the law and development literature is probably that environmental law and policy should be adapted to the specific needs of developing countries. In that respect attention was paid to the "legal transplants", i.e. transplantation of a legal rule from a donor to a host country. The lessons from the law and development literature in that respect are mixed: on the one hand it can be observed that many legal transplants to developing countries were not a major success and in fact often led to a rejection of the transplanted legal rule. It is for that reason that the law and development literature stressed that the process of adapting the rule is probably more important than a mere focus on the contents. On the other hand, legal transplants can have advantages as well. They can provide scope for mutual learning and best practices from other countries can constitute interesting examples for developing countries as well. In other words: legal transplants should certainly not generally be rejected since they can positively contribute to an effective environmental policy in developing countries, provided that particular conditions are met. A successful legal transplant should be user-driven and based on local demand and ownership. Crucial elements are the receptivity of the transplant within the existing legal culture in the host country as well as the familiarity of the host country with the transplanted rule. A related warning addresses the fact that in developing host countries, the institutional framework may often be different than in the donor country from which the transplanted rule

[137] Zbinden & Lee 2005.

originates. An issue of particular importance is the prevalence of informal law in developing countries and the resulting hybrid legal system whereby informal and formal laws are mixed. The literature therefore does not generally reject legal transplants, but simply sketches particular conditions that should be taken into account as determinants of successful legal transplants.

This literature is for example also of relevance for the increasing activities of China, also in Latin-America within the framework of the so-called Belt and Road Initiative (BRI). One of the goals of this project is also to bring Chinese law to the host countries.[138] An important lesson from this law and development literature is that transplanting legal rules from China to host countries in Latin-America may work, but the specific conditions (such as the need for a local demand, the transplant being user-driven and the fit in the legal culture of the host country) are important elements to be taken into account.

4.4.2 A different instrument mix

Also the law and economics scholarship has important consequences for the design of optimal environmental law and policy in developing countries. The most important conclusion is that the policy recommendations concerning optimal environmental law can be different for developing countries then what has been suggested based on a theoretical model for developed countries.

The literature has more particularly potentially important consequences for the optimal mix of instruments, discussed in the previous section. The lack of human capital (and capacity) in developing countries may necessitate minimal reliance upon highly refined and elaborate environmental legal rules, which depend to a large extent for their effectiveness upon implementation by administrative authorities. Where administrative authorities or the judiciary lack capacity to implement such rules, environmental law is likely to be ineffective. It may therefore be unwise to regulate by means of vague standards such as those set forth in permits by administrative authorities. Instead, the regulator should set out a limited number of environmental obligations in a very precise way, thus minimizing the need for further reliance upon administrative authorities for

[138] See in that respect Barresi 2017, 15.

their implementation or effectiveness. This also has the advantage that less discretion is left to the bureaucracy, given its high susceptibility to corruption.[139]

A second implication is that the advice from traditional environmental scholarship to use flexible, market-based (often referred to as economic) instruments, such as environmental taxes and emission trading, may be less fitted for developing countries where large corruption problems would exist. Economic instruments like taxation and emission trading not only require an elaborate system of implementation, but also an exchange of money between operators from industry and bureaucrats. In a corruption-tainted environment it may be wiser to rely on very specific and detailed rules in legislation which give less room for discretion to administrative authorities.[140]

A third policy conclusion relates to the level of governance. Traditional scholarship, based primarily upon regulatory experience in developed countries, holds that standard setting should take place at the local level. This allows local circumstances to be taken into account and arguably ensures that environmental standards correspond to location-specific circumstances in an optimal way. However, as may often be the case in developing countries, where local authorities and elites are particularly prone to corruption, the risk of corruption may outweigh the claims to democratic transparency and local efficiency. Thus, where it appears that the risk of collusion is greater at the local level, shifting decision making to the central level is more likely to ensure that standards are set in the public interest.

This law and economics literature therefore suggests that the optimal policy mix of instruments in developing countries may well be totally different from the optimal instrument mix as presented in the previous section. That can be an important consideration for policy-makers in developing countries, also in Latin-America.

5 CONCLUDING REMARKS

I started this contribution by stressing the fundamental relationship between economic development and environmental protection. It was stressed that as a starting point polluters need to internalize the negative externalities related to their activities. The

[139] Faure, Goodwin & Weber 2010, 123.
[140] Faure, Peeters & Wibisana 2006.

reason is simple: if there would not be such an internalization, the prices of products and services would not reflect the true social costs. As a result demand might be too high and a market failure would follow. That is why in fact since 100 years now (referring to the early work of Arthur Pigou) economists have looked for tools to price environmental pollution and to make polluters pay those costs. In fact there are many more instruments aiming at a pricing of pollution to internalize externalities which I could not discuss in this contribution. One can for example refer to carbon pricing, but also to payments for ecosystem services. All of those mechanisms have as important goal to expose polluters to the social costs of their activities in order to provide them incentives to reduce pollution to optimal levels based on a marginal costs/marginal benefit weighing.

Then I discussed the Environmental Kuznets Curve literature which has important consequences for policy-makers as it indicates that economic growth can go hand in hand with increased environmental quality. Yet, the literature equally made clear that this is in no way an automatic relationship. It is, in other words, not economic growth that causes increased environmental quality. The latter result will only follow because together with increased welfare societies will invest more in stringent environmental regulation, efficient instruments and institutions, providing incentives for technological innovation. The lesson is therefore that it is important to design effective institutions and instruments providing incentives to operators to invest in innovation aiming at a greening of the economy. I showed that whereas traditionally environmental law largely consisted of government regulation enforced with public sanctions (often referred to as command and control) there is now an increasing tendency to look for so-called smart instruments that would optimally incentivize polluters to reduce environmental pollution and to invest in innovative technologies to reach that goal in a dynamic manner. In that respect instruments like liability rules, taxes and emission trading only fix a particular price for pollution, but leave it up to the polluter to choose the technology to achieve optimal pollution levels. Those instruments are referred to as market-based or incentive-based as they will provide incentives to polluters to continuously improve their environmental performance and to dynamically innovate technology as it can simply be a means to reduce the price that has to be paid for pollution. However, it was equally shown that notwithstanding the advantages of market-based instruments, many instruments also have particular weaknesses as a result of which in reality one can often observe a combination

of different types of instruments. That makes it important to search for optimal mixes of different instruments that could effectively work together and reinforce each other.

However, in the last section I showed that a lot of the (theoretical) literature on (optimal mixes of) environmental policy instruments has been developed, based on particular assumptions. Those assumptions are inter alia that human capital is available within administrative agencies to efficiently fix pollution levels and determine optimal standards and that civil servants will work in the public interest in the design and enforcement of particular instruments. Reality in many developing countries can be totally different. The required capacity to implement environmental policy may often be lacking and poorly paid civil servants could be exposed to corruption. That may well explain why some of the legal institutions and instruments that were developed for the North and subsequently transplanted to developing countries did often not lead to a reduction of pollution levels. The law and development literature warns that one has to be cautious with legal transplants as they should be demand-driven and fit into the legal culture of the developing country. But the different features of the institutional environment in developing countries may also lead to a different advise concerning the optimal mix of instruments for developing countries. Whereas generally vague and flexible standards to be set by legislators were advised, largely relying on a specific implementation by administrative agencies, in a context of lacking human capital regulation should rather be rule-based, provide specific rules and not be dependent upon further implementation which might never take place. And in a context where civil servants are poorly paid and may be vulnerable to corruption, it may be dangerous to implement price instruments (like emission trading or taxes) if they suppose a transfer of money from operators to civil servants. The result is that the optimal policy mix of instruments may look different in the North than in the South, as the specific local conditions in developing countries have to be taken into account in the policy design.

When those conditions are met, there is reason for optimism. Notwithstanding the huge challenges concerning the environmental threats in developing countries, there are equally sufficient empirical studies which show that well-designed environmental policy instruments can provide incentives for pollution reduction and do indeed lead to improved environmental quality. It is therefore important to incorporate the economic insights in the design of an environmental policy mix for developing countries. If that is the case, a

smartly designed environmental law can contribute both to economic growth as well as to environmental protection.

6 REFERENCES

Ackerman, B.A. & Stewart, R.B., "Reforming Environmental Law: The Democratic Case for Market Incentives", *Columbia Journal of Environmental Law*, 1988, Vol. 13, 171-189.

Alberini, A. & Austin, D., "Liability Policy and Toxic Pollution Releases", in Heyes, A. (ed.), *The Law and Economics of the Environment*, Cheltenham, Edward Elgar, 2001, 92-115.

Ambec, S., Cohen, M., Elgie, S. & Lanoie, P., "The Porter Hypothesis at 20: Can Environmental Regulation Enhance Innovation and Competitiveness?", *Review of Environmental Economics and Policy*, 2013, Vol. 7(1), 2-22.

Arrow, K. et al., "Economic Growth, Carrying Capacity and the Environment", *Ecological Economics*, 1995, 91-95.

Ayres, R.U., "Economic Growth: Politically Necessary, but not Environmentally Friendly", *Ecological Economics*, 1995, Vol. 15(2), 97-99.

Baldwin, R., "Regulation Lite: The Rise of Emissions Trading", LSE Law, Society, and Economy Working Papers, No. 3, 2008.

Barresi, P.A., "The Role of Law and the Rule of Law in China's Quest to Build an Ecological Civilization", *Chinese Journal of Environmental Law*, 2017, Vol. 1, 9-36.

Becker, G.S., "A Theory of Competition among Pressure Groups for Political Influence", *Quarterly Journal of Economics*, 1983, Vol. 98(3), 371-400.

Beckerman, W., "Economic Growth and the Environment: Whose Growth? Whose Environment?", *World Development,* 1992, 481-496.

Béné, C. et al., "Power Struggle, Dispute and Alliance Over Local Resources: Analyzing 'Democratic' Decentralization of Natural Resources through the Lenses of Africa Inland Fisheries", *World Development,* 2009, Vol. 37(12), 1935-1950.

Benjamin, C.E., "Legal Pluralism and Decentralization: Natural Resource Management in Mali", *World Development,* 2008, Vol. 36(11), 2255-2276.

Berkowitz, D., Pistor, K. & Richard, J.-F., "Economic Development, Legality and the Transplant Effect", *European Economic Review,* 2003, Vol. 47(1), 165-195.

Binder, S. & Neymayer, E., "Environmental Pressure Groups, Strengths and Air Pollution: An Empirical Analysis", *Ecological Economics*, 2005, 527-538.

Bongaerts, J.C. & Kramer, R.A., "Water Pollution Charges in Three Countries: Control through Incentives", *European Environmental Review*, 1987, Vol. 1, 12-19.

Brown, G.M. Jr. & Johnson, R.W., "Pollution Control by Effluent Charges: It Works in the Federal Republic of Germany, Why not in the U.S.?", *Natural Resources Journal*, 1984, Vol. 24, 929-966.

Buchanan, J.M. & Tullock, G., "Polluters' Profits and Political Response: Direct Controls versus Taxes", *American Economic Review*, 1975, Vol. 65(1), 139-147.

Burtraw, D. & Palmer, K., "SO2 Cap-and-Trade Program in the United States: A 'Living Legend' of Market Effectiveness", in Harrington, W. et al. (eds.*), Choosing Environmental Policy: Comparing Instruments and Outcomes in the United States and Europe*, Washington, Resources for the Future, 2004, 41-66.

Cansino, J.M., Román-Collado, R. & Molina, J.C., "Quality of Institutions, Technological Progress, and Pollution Havens in Latin-America. An Analysis of the Environmental Kuznets Curve Hypothesis", *Sustainability*, 2019, Vol. 11(13), 3708, 1-20.

Chen, J., Hu, T.E. & Van Tulder, R., "Is the Environmental Kuznets Curve still Valid: A Perspective of Wicked Problems", *Sustainability*, 2019, Vol. 11(17), 4747, 1-17.

Conniff, R., "The Political History of Cap and Trade: How an Unlikely Mix of Environmentalists and Free-Market Conservatives Hammered Out the Strategy Known as Cap-and-Trade", Smithsonian, August 2009, http://www.smithsonianmag.com/science-nature/Presence-of-Mind-Blue-Sky-Thinking.html.

Cooter, R., "Prices and Sanctions", *Columbia Law Review*, 1984, Vol. 84, 1343-1523.

Cross, F.B., "Law and Economic Growth", *Texas Law Review,* 2002, Vol. 80, 1737, 1743-1753.

Dam, K.W., *The Law-Growth Nexus: The Rule of Law and Economic Development*, Washington DC, Brookings Institution Press, 2006.

Dewees, D., "Tort Law and the Deterrence of Environmental Pollution", in Tietenberg T.H. (ed.), *Innovation in Environmental Policy*, Aldershot, Edward Elgar, 1992a, 139-164.

Dewees, D.N., "The Comparative Efficacy of Tort Law and Regulation for Environmental Protection", *Geneva Papers on Risk and Insurance*, 1992b, Vol. 17, 446-467.

Dewees, D. et al., *Exploring the Domain of Accident Law: Taking the Facts Seriously*, Oxford, Oxford University Press, 1996.

Diver, C.S., "The Optimal Precision of Administrative Rules", *Yale Law Journal,* 1983, Vol. 93(1), 65-109.

Douma, W.T. et al. (eds.), *The Kyoto Protocol and Beyond : Legal and Policy Challengers of Climate Change*, The Hague, TMC Asser Press, 2007.

Earnhart, D., "Liability for Past Environmental Contamination and Privatization", *Environmental & Resource Economy*, 2004, Vol. 29, 97-122.

Ehrlich, I. & Posner, R.A., "An Economic Analysis of Legal Rulemaking", *Journal of Legal Studies,* 1974, Vol. 3(1), 257-286.

Ellerman, A.D., "The US SO_2 Cap-and-Trade Programme", in *Tradable Permits: Policy Evaluation, Design and Reform*, Paris, OECD, 2004, 71-97.

Ellerman, A.D., "US Experience with Emissions Trading: Lessons for CO2 Emissions Trading", in Hansjürgens, B. (ed.), *Emissions Trading for Climate Policy: US and European Perspectives,* Cambridge, Cambridge University Press, 2005, 78-95.

Ellerman, A.D., "Are Cap-and-Trade Programs More Environmentally Effective than Conventional Regulation?", in Freeman, J. & Kolstad, C.D. (eds.), *Moving to Markets in Environmental Regulation: Lessons from 20 Years of Experience*, Oxford, Oxford University Press, 2007, 48-62.

Ellerman, A.D. et al, *Markets for Clean Air: The US Acid Rain Program*, Cambridge, Cambridge University Press, 2000.

Endres, A. & Ohl, C., "Kyoto, Europe? – An Economic Evaluation of the European Emission Trading Directive", *Journal of Law & Economics*, 2005, Vol. 19, 17-39.

Esty, D.C., "Revitalizing Environmental Federalism", *Michigan Law Review,* 1996, Vol. 95(3), 570-653.

Esty, D.C. & Geradin, D., "Environmental Protection and International Competitiveness: A Conceptual Framework", *Journal of World Trade,* 1998, Vol. 32, 5-46.

Esty, D.C. & Porter, M.E., "Measuring National Environmental Performance and its Determinants", in Porter, M.E. & Sachs, J. (eds.), *The Global Competitiveness, Report 2000,* New York, Oxford University Press, 2000, 60-75.

Esty, D.C. & Porter, M.E., "National Environmental Performance: An Empirical Analysis of Policy Results and Determinants", *Environment and Development Economics*, 2005, 391-434.

Faure, M., "Does Environmental Law Matter?", in Faure, M.G. & Smits, J. (eds.), *Does Law Matter? On Law and Economic Growth*, Antwerp, Intersentia, 2011, 385-416.

Faure, M., "Effectiveness of Environmental Law: What Does the Evidence Tell Us?", *William & Mary Environmental Law and Policy Review,* 2012, Vol. 36(2), 293-336.

Faure, M. & Niessen, N., "Introduction", *i*n Faure, M. & Niessen, N. (eds.), *Environmental Law in Development: Lessons from the Indonesian Experience*, Cheltenham, Edward Elgar, 2006, 1-8..

Faure, M. & Shen, Y., "Environmental Liability as a Tool to Promote Sustainability", in Akkermans, B. & Van Dijck, G. (eds.), *Sustainability and Private Law*, The Hague, Eleven, 2020, 79-115.

Faure, M., Goodwin, M. & Weber, F., "Bucking the Kuznets Curve: Designing Effective Environmental Regulation in Developing Countries", *Virginia Journal of International Law*, 2010, Vol. 51, 95-157.

Faure, M., Peeters, M. & Wibisana, A., "Economic Instruments: Suited to Developing Countries?", in Faure, M. & Niessen, N. (eds.), *Environmental Law and Development. Lessons from the Indonesian Experience*, Cheltenham, Edward Elgar, 2006, 218-262.

Frederickson, P.G. & Gaston, N., "Environmental Governance in Federal Systems: The Effects of Capital Competition and Lobby Groups", *Economic Inquiry,* 2000, Vol. 38(3), 501-514.

Frey, B.S., *Umweltökonomie*, Göttingen, Vandenbroeck und Ruprecht, 1972.

Ginsburg, T., "Does Law Matter for Economic Development? Evidence for East Asia", *Law & Society Review,* 2000, Vol. 34(3), 829-856.

Grossman, G.M. & Krueger, A.B., "Environmental Impacts of a North-American Free Trade Agreement", in Garber, P.M. (ed.), *The US, Mexico Free Trade Agreement,* Cambridge, MIT Press, 1993, 13-56.

Grossman, G.M. & Krueger, A.B., "Economic Growth and the Environment", *Quarterly Journal of Economics,* 1995, 353-377.

Gui, B., Faure, M. & Xu, G., "Does the Environmental Kuznets-Curve Hold for China? An Empirical Examination", in Weishaar, S.E., Philipsen, N. & Xu, W. (eds.), *Regulatory Reform in China and the EU. A Law and Economics Perspective,* Cheltenham, Edward Elgar, 2017, 200-234.

Gunningham, N. & Grabosky, P., *Smart Regulation: Designing Environmental Policy*, Oxford, Clarendon Press, 1998.

Hahn, R.W., "Economic Prescriptions for Environmental Problems: How the Patient Followed the Doctor's Orders", *Journal of Economic Perspectives*, 1989, Vol. 3(2), 95-114.

Hahn, R.W. & Hester, G.L., "Where Did All in the Markets Go? An Analysis of EPA's Emissions Trading Program", *Yale Journal on Regulation*, 1989, Vol. 6, 109-153.

Huther, J. & Anwar, S., "Anti-Corruption Policies and Programs: A Framework for Evaluation", World Bank, Working Paper No. 2501, 2001.

Jayasuriya, K. (ed.), *Law, Capitalism, and Power in Asia: The Rule of Law and Legal Institutions*, London/New York, Routledge, 1999.

Jimenez, C., Moncada, L., Ochoa-Jimenez, D. & Ochoa-Moreno, W., "Kuznets Environmental Curve for Ecuador: An Analysis of the Impact of Economic Growth on the Environment", *Sustainability*, 2019, Vol. 11(21), 5896, 1-11.

Johnston, J.S., "On the Market for Ecosystem Control", *Virginia Environmental Law Journal*, 2002-2003, Vol. 21, 129-188.

Johnston, J.S., "Tradable Pollution Permits and the Regulatory Game", in Freeman, J. & Kolstad, C. (eds.), *Moving to Markets in Environmental Regulation: Lessons from 20 Years of Experience*, Oxford, Oxford University Press, 2007, 353-385.

Jost, P.J., "Limited Liability and the Requirement to Purchase Insurance", *International Review of Law & Economics*, 1996, Vol. 16(2), 259-276.

Kaplow, L., "Rules Versus Standards: An Economic Analysis", *Duke Law Journal,* 1992, Vol. 42, 557-629.

Keohane, N.O., "Cost Savings from Allowance Trading in the 1990 Clean Air Act: Estimates from a Choice-Based Model", Freeman, J. & Kolstad, C.D. (eds.), *Moving to Markets in Environmental Regulation: Lessons from 20 Years of Experience*, Oxford, Oxford University Press, 2007, 194-229.

Kuik, O. & Oosterhuis, F., "Economic Impacts of the EU ETS: Preliminary Evidence", in Faure, M. & Peeters, M. (eds.), *Climate Change and European Emissions Trading: Lessons for Theory and Practice*, Cheltenham, Edward Elgar, 2008, 208-222.

Kuznets, S., "Economic Growth and Income Inequality", *American Economic Review,* 1955, 1-28.

Laskowska, A. & Scrimgeour, F., "Environmental Taxation: The European Experience", University of Waikato, Working Paper, 2002, available at: http://wms-soros.mngt.waikato.ac.nz/NR/exeres/E33CCD10-4841AE-8A1A-C66E1B01E9FD.htm.

Maloney, M.T. & McCormick, R.E., "A Positive Theory of Environmental Quality Regulation", Journal of law and Economics, 1982, Vol. 25(1), 99-123.

Mitchell, R.B., "Compliance Theory: An Overview", in Cameron, J., Werksman, J. & Roderick, P. (eds.), *Improving Compliance with International Environmental Law*, London, Earthscan, 1996, 3-28.

Morely, B., "Empirical Evidence on the, Effectiveness of Environmental Taxes", University of Bath, Working Paper No. 02/10, 2010, available at: http://opus.bath.ac.uk/18105/1/0210.pdf.

Nader, L., "Promise or plunder? A past and future look at law and development", *Global Jurist Frontiers,* 2007, http://tinyurl.com/2aatxat.

Nash, J.R. & Revesz, R.L., "The Design of Marketable Permit Schemes to Control Local and Regional Pollutants", in Swanson, T. (ed.*), An Introduction to the Law and Economics of Environmental Policy: Issues in Institutional Design*, Amsterdam, JAI Press, 2002, 331-377.

Nash, J.R. & Revesz, R.L., "Grandfathering and Environmental Regulation: The Law and Economics of New Source Review", NYU School of Law, Pub. Law and Legal Theory Research Paper Series, Working Paper No. 07-03, 2007, available at: http://ssrn.com/abstract=965840.

North, D.C., *Structure and Change in Economic History*, New York, W.W. Norton & Co., 1981.

Oates, W.E., "Market Incentives for Environmental Protection: A Survey of Some Recent Developments", in Peston, M. & Quandt, R. (eds.), *Prices, Competition and Equilibrium*, Oxford, Philip Allan, 1986, 251-281.

Oates, W.E., "Economics, Economists and Environmental Policy", *Eastern Economic Journal*, 1990, Vol. 16(4), 289-296.

Oates, W.E., "The Environment and the Economy: Environmental Policy at the Crossroads", in Quigley, J. and Rubinfeld, D. (eds.), *American Domestic Priorities: An Economic Appraisal,* Berkeley, CA, University of California Press, 1985, 311-345.

Oates, W.E. & McGartland, A.M., "Marketable Permits for the Prevention of Environmental Deterioration", *Journal of Environmental Economics & Management*, 1985, Vol. 12(3), 207-228.

Oates, W.E. et al., "The Net Benefits of Incentive-Based Regulation: A Case Study of Environmental Standard Setting", *American Economic Review*, 1989, Vol. 79(5), 1233-1242.

O'Connor, D.S., "Applying Economic Instruments in Developing Countries: From Theory to Implementation", *Environment and Development Economics,* 1998, Vol. 4, 91-110.

Ogus, A.I., "Corruption and Regulatory Structures", *Law & Policy,* 2004, Vol. 26(3-4), 329-346.

Ogus, A.I., "Regulatory Arrangements and Incentives for Opportunistic Behaviour", in Eger, T. et al. (eds.), *Economic Analysis of Law in China;* Cheltenham, Edward Elgar, 2007, 151-163.

Olken, B.A., "Corruption and the Costs of Redistribution: Micro Evidence from Indonesia", *Journal of Public Economics,* 2006, Vol. 90(4-5), 853-870.

Olsen, B.E., "The IPPC Permit and the Greenhouse Gas Permit", in Peeters, M. & Deketelaere, K. (eds.), *EU Climate Change Policy: The Challenge of New Regulatory Initiatives*, Cheltenham, Edward Elgar, 2006, 153-168.

Olson, M., *The Logic of Collection Action: Public Goods and the Theory of Groups*, Cambridge, Harvard University Press, 1965.

Peeters, M., "Inspection and Market-Based Regulation Through Emissions Trading: The Striking Reliance on Self-Monitoring, Self-Reporting and Verification", *Utrecht Law Review*, 2006, Vol. 2(1), 177-195.

Pistor, K. & Wellons, P.A., *The Role of Law and Legal Institutions in Asian Economic Development, 1960-1995*, New York, Oxford University Press, 1999.

Polborn, M.K., "Mandatory Insurance and the Judgment Proof Problem", *International Review of Law & Economics*, 1998, Vol. 18(2), 141-146.

Porter, M.E., "America's Green Strategy", *Scientific American,* 1991, Vol. 264(4), 168-170.

Porter, M.E. & Van der Linde, C., "Towards a New Conception of the Environment-Competitiveness Relationship", *The Journal of Economic Perspectives*, 1995, Vol. 9(4), 97-118.

Posner, E.A. *Law and Social Norms*, Cambridge, Harvard University Press, 2000.

Posner, R.A., "Creating a Legal Framework for Economic Development", *The World Bank Res. Observer,* 1998, Vol. 13(1), 1-11.

Pozzo, B., "The Liability Problem in Modern Environmental Statutes", *European Review of Private Law*, 1996, Vol. 4(2), 111-144.

Revesz, R.L., "Federalism and Environmental Regulation: Lessons for the European Union and the International Community", *Virginia Law Review,* 1997, Vol. 83, 1331-1346.

Revesz, R.L., "Federalism and Environmental Regulation", in Revesz, R.L. et al. (eds.), *Environmental Law, the Economy, and Sustainable Development*, Cambridge, Cambridge University Press, 2000, 37-97.

Revesz, R.L. & Stavins, R.M., "Environmental Law", in Polinsky, A.M. & Shavell, S. (eds.), *Handbook of Law and Economics*, Amsterdam, Elsevier Science, 2007, 499-589.

Rose-Ackerman, S., *Corruption and Government: Causes, Consequences and Reform*, Cambridge, Cambridge University Press, 1999.

Ruskola, T., "Legal Orientalism", *Michigan Law Review,* 2002, Vol. 101(1), 179-234.

Schäfer, H.-B., "Rules versus Standards in Rich and Poor Countries: Precise Legal Norms as Substitutes for Human Capital in Low-income Countries", *University of Chicago Supreme Court Economic Review,* 2006, Vol. 14, 113-134.

Shavell, S., "Strict Liability versus Negligence", *Journal of Legal Studies*, 1980, Vol. 9(1), 1-25.

Shavell, S., "Liability for Harm versus Regulation of Safety", *Journal of Legal Studies*, 1984a, Vol. 13(2), 357-374.

Shavell S., "A Model of the Optimal Use of Liability and Safety Regulation", *Rand Journal of Economics*, 1984b, Vol. 15(2), 271-280.

Shavell, S., "The Judgment Proof Problem", *International Review of Law & Economics*, 1986, Vol. 6(1), 45-58.

Shavell, S., "The Corrective Tax versus Liability as Solutions to the Problem of Harmful Externalities", *The Journal of Law and Economics,* 2011, Vol. 54, 249-266.

Shaw, J.S., "Public Choice Theory", Library of Economics and Liberty: The Concise Encyclopedia of Economics, 2002, available at: http://www/econlib.org/library/Enc1/PublicChoiceTheory.html.

Sims, H., "One-Fifth of the Sky: China's Environmental Stewardship", *World Development,* 1999, Vol. 27(7), 1227-1245.

Stephan, G., "Economic Impact of Emission Standards: A Computational Approach to Waste Water Treatment in Western Europe", in Bös, D. et al. (eds.), *Welfare and Efficiency in Public Economics*, Berlin, Springer, 1988, 401-422.

Sterner, T. & Hammar, H., "Designing Instruments for Climate Policy", in Hansjürgens, B. (ed.), *Emissions Trading for Climate Policy: US and European Perspectives*, Cambridge, Cambridge University Press, 2005, 17-36.

Stewart, R.B., "Controlling Environmental Risks through Economic Incentives", *Columbia Journal of Environmental Law*, 1988, Vol. 13, 153-169.

Stewart, R.B., "Economic Incentives for Environmental Protection: Opportunities and Obstacles", in Revesz, R.L. et al. (eds.), *Environmental Law, The Economy and Sustainable Development*, Cambridge, Cambridge University Press, 2000, 171-244.

Stewart, R.B., "Instrument Choice", in Budansky, Y.D., Brunné, J. & Hey, E. (eds.), *The Oxford Handbook of International Environmental Law*, Oxford, Oxford University Press, 2007, 147-181.

Strand, J., "Environmental Kuznets Curve: Empirical Relationships between Environmental Quality and Economic Development", March 2002, Memorandum No. 04/2002, Department of Economics, University of Oslo (http://www.oekonomi.uio.no/memo, 6-8.

Sun, H., Clotty, S.A., Geng, Y., Fang, K & Amissah, J.C.K., "Trade Openness and Carbon Emissions: Evidence from Belt and Road Countries", *Sustainability*, 2019, Vol. 11(9), 2682, 1-20.

Sundar, N., "Is Devolution Democratization?", *World Development,* 2001, Vol. 29(2), 2007-2023.

Tietenberg, T. & Johnston, N., "Ex Post Evaluation of Tradeable Permits: Methodological Issues and Literature Review", in *Tradable Permits: Policy Evaluation, Design and Reform*, Paris, OECD, 2004, 9-44.

Van den Heuvel, G., "Corporate Crimes in East and West: In Search of 'Collusion'", in Strang, H. & Vernon, E. (eds.), *International Trends in Crime: East Meets West*, Canberra, Australian Institute of Criminology, 1992, 112-137.

Van Erp, J., Faure, M., Nollkaemper, A. & Philipsen, N. (eds.), *Smart Mixes for Transboundary Environmental Harm*, Cambridge, Cambridge University Press, 2019.

Watson, A. *Legal Transplants: An Approach to Comparative Law*, Edinburgh, University of Georgia Press, 1974.

Wiener, J., "Global Environmental Regulation: Instrument Choice in Legal Context", *The Yale Law Journal,* 1999, Vol. 108, 677-800.

Woerdman, E. et al., "European Emissions Trading and the Polluter-Pays-Principle: Assessing Grandfathering and Over-Allocation", in Faure, M. & Peeters, M. (eds.), *Climate Change and European Emissions Trading: Lessons for Theory and Practice*, Cheltenham, Edward Elgar, 2008, 128-150.

World Bank, *Combating Corruption in Indonesia: Enhancing Accountability for Development*, 2003, http://tinyurl.com/2d7ug4z, 9-12.

Yang, N., Zhang, Z., Xue, B., Ma, J., Chen, X. & Lu, C., "Economic Growth and Pollution Emission in China: Structural Path Analysis", *Sustainability*, 2018, Vol. 10(7), 2569, 1-15.

Young, H.N., "An Analysis of a Global CO_2 Emissions Trading Program", *Journal of Land Use & Environmental Law*, 1998, Vol. 14, 125-147.

Zbinden, S. & Lee, D.R., "Paying for Environmental Services: An Analysis Of Participation in Costa Rica's PSA Program", *World Development,* 2005, Vol. 33(2), 255-272.