

§ 2 Development of Pollution Reduction Instruments

This chapter comprises four parts. Part A examines the relevant conceptual foundations in the field of environmental economics. Following the market failure approach, this work describes, *inter alia*, the theories according to Pigou and Coase. Part B provides a brief introduction into EU and US ‘command and control’ measures. After defining the term ‘command and control’, this part goes on to describe performance standards and best available technique instruments under EU and US laws. Part C provides a brief introduction into EU and US market-based instruments. After defining market-based instruments, this part discusses selected environmental taxes, emissions trading and environmental liability under EU and US laws. Finally, Part D consists of a conclusion to the second chapter.

A. Point of Departure

1. Market Failure Due to Externality: The Problem

In a perfect market, the market participant covers all costs caused by him. Likewise, in a perfect market the market participant receives a consideration for all third-party advantages generated by him if he so wishes.⁵¹ Externalities exist if those two

Parts of this chapter have been published as an article in the Journal for European Environmental and Planning Law, Volume 7, Issue 2, September 2010, and are reproduced with permission of Koninklijke Brill N.

⁵¹ Cf M Fritsch *Marktversagen und Wirtschaftspolitik: Mikroökonomische Grundlagen staatlichen Handelns* (8th rev edn Vahlen, Munich 2011), 25–27. For a comprehensive outline of environmental economics containing extensive material and further references cf T Tietenberg and L Lewis *Environmental and Natural Resource Economics* (8th edn Pearson, Boston Mass 2009), 65–91, 356–389.

prerequisites of the theoretical model are not fulfilled.⁵² This is the fundamental theoretical argument for governmental activity in the environmental arena. Precisely, pollutant releases are seen as an externality. Therefore, pollutant releases can be seen as ‘an unintended consequence of market decisions which affect individuals other than the decision maker’.⁵³ This holds also true for the non-intentional influence on the environment.

1. Types of Externalities

Altogether, causes of market failure are externalities, indivisibility, information as well as adjustment deficits. This work follows merely those descriptions.⁵⁴ Market failure due to indivisibility and adjustment deficits are not discussed in this work. Market failure due to information deficits are discussed in Chapter 5. Not all types of externalities are connected to the curtailing of a proper functioning market. Consequently, to distinguish the relevant cases responsible for a market failure, altogether, three different types of externalities can be identified.⁵⁵ First, pecuniary externalities are of an indirect nature and represent a consequence of market relations. Due to the supply and demand behaviour of other market participants, prices of goods markets or factor markets vary; for example, the demand for electrical typewriters falls and forces suppliers to cut their prices due to an increased demand for personal computers. Pecuniary externalities merely indicate change in scarcity relations and thus control the allocation over the market. Hence,

⁵² M Fritsch (2011) (n 51), 80.

⁵³ R N Stavins ‘Environmental Economics’ (2007) National Bureau of Economic Research Working Paper No 13574 <<http://www.nber.org/papers/w13574.pdf>> accessed 30 June 2010, 1.

⁵⁴ For the term ‘public good externalities’ not applied here cf eg F M Bator ‘The Anatomy of Market Failure’ in T Cowen (ed), *The Theory of Market Failure: A Critical Examination* (George Mason University Press, Fairfax Virginia 1988), 55–57. ‘Public good’ is defined as goods ‘which all enjoy in common in the sense that each individual’s consumption of such a good leads to no subtraction from any other individual’s consumption of that good’, P A Samuelson ‘The Pure Theory of Public Expenditure’ (1954) 36 *Review of Economics and Statistics* 387, 387. For instance, air is regarded as a ‘public good’. However, it can be argued that over time the two requisites, non-excludability and non-rivalry, cannot be attached with the necessary certainty to it. Notably, it is perceived as a public good today. Notwithstanding, components of it, such as oxygen, are already marketable. Further, air as a public good does not refer to ‘used’ air which basically would be of no value to the human lung. Since breathable air is almost completely derived from or may be regarded as a sub-product which is created by the commons, particularly the forests, it must be preferred to consider all life sustaining resources, for instance air, water, land, fisheries or terrestrial animals, as ‘commons’. As the aforementioned causes for market failure (externalities, indivisibility, information as well as adjustment deficits) describe the problem more precise, the term ‘public good’ is abandoned in this work, also critically M Fritsch (2011) (n 51), 77–78.

⁵⁵ Ibid, 81.

they do not act as a cause of market failure. On those grounds no further examination is necessary.⁵⁶

Secondly, the utility level of an individual can be influenced by the consumption or utility level of third parties without the existence of a physical coherence or a market relation; for example, a neighbour's extravagance often arouses jealousy in an individual. This is an example of a psychological externality. In certain cases, such effects can cause a market failure that requires governmental-induced allocation measures.⁵⁷ This work, however, does not discuss psychological externalities in the context of pollutant releases.

Thirdly, as regards technological externalities, direct coherence between the utility function of multiple market participants exists, which is not captured by the market mechanism in the form of a consideration; for example, pollutant releases of motor vehicles lead to illnesses of residents living on a main road. This type of case is a cause of market failure.⁵⁸ Assuming a market failure, technological externalities have an impact on the allocation of resources. Consequently, they are examined in the following section, particularly focusing on external costs. It can be assumed that the presence of external utility (1) is less detrimental to the environment and (2) the producer of external utility has a higher motivation to reach an exclusion of or compensation from other users than the producer of external costs.

2. Technological Externalities and Allocation

The social costs consist of the private costs, which the market participant covers, and external costs, which describe the extent of the technological externality. The consequence is that the sum of the private costs differs from the sum of the social costs altogether. Where technological externalities are present, the market price reflects a biased scarcity relation on the grounds of the social costs which are partially not covered.⁵⁹ Assuming that technological externalities are present, the existing divergence between the private and the social costs causes the polluter to produce too much. His private costs are lower than the social costs caused. The production output of the injured party is, on the contrary, too low, because his private costs turn out to be higher due to the damage caused by the polluter. Additionally, with regard to price effects, the result has to be modified further. Assuming a normal and appropriate demand function, not only is the production

⁵⁶ Ibid.

⁵⁷ Cf *ibid.*, 81, 96–97.

⁵⁸ Ibid, 81.

⁵⁹ Cf *ibid.*, 82–83.

output of the polluter too high, but the price of the goods in question is also too low. Consequently, the price of the goods manufactured by the injured party is too high.⁶⁰

Although technological externalities lead to a misallocation of resources, from the standpoint of welfare economics it is not profitable to eliminate the damage entirely. An initial situation in which a pollutant has been released to a certain extent can be described. Because the polluter is not charged for the damage caused by him, a negative technological externality is present. It can further be assumed that the marginal cost for the reduction of one additionally emitted pollutant unit rises the more the damage has already been reduced. In this case, the costs for the prevention of the damage rise with increasing reduction of the social costs. The marginal damage function represents the utility loss of the injured party due to each additional emitted pollutant unit. The marginal damage likely has an inverse course as the marginal costs of the damage avoidance. Each additional emitted pollutant unit causes a utility loss. This utility loss normally rises the higher the emission level gets.⁶¹ This makes it comprehensible that from the standpoint of economical analysis, the reduction towards zero emission is not reasonable. There exists rather an optimal level of damage. This is the point where the marginal costs of the damage avoidance equal the additional utility generated by reducing the emission level or by preventing marginal damage respectively. All damage reductions beyond this point are, from an economic standpoint, objectionable. The prevention cost for an additional pollutant unit exceeds the generated utility in form of prevented damages.⁶²

3. Externalities, Excludability, and Property Rights

In the light of technological externalities it is apparent that the principle of excludability cannot be applied to all components of the cost or utility of a good. In the case of a positive externality, the non-application of the excludability-principle means that a third party cannot be excluded from receiving a utility without giving a consideration. In the case of a negative externality, the non-application of the excludability-principle means that third parties must accept costs without receiving a benefit.⁶³ The appearance of technological externalities is linked with the characteristic of applicable property rights. The reason for a positive externality is that no property rights exist (which are enforceable at a reasonable cost) which would enable the producer to inhibit the unpaid use of his goods by others. In the case of a negative externality, the polluter due to (limited)

⁶⁰ Cf *ibid*, 84–87.

⁶¹ Cf *ibid*, 87–88.

⁶² Cf *ibid*, 88–89.

⁶³ *Ibid*, 90.

existing property rights has no consequences of his actions to fear. The injured party is unable to defend itself against the damage caused by such a negative externality due to the absence of any enforceable property rights.⁶⁴

a) Free Rider Behaviour (Positive Externalities)

The deriving of a benefit by an individual from a positive externality at no cost to oneself is described as free rider behaviour. One gains a benefit from the actions of others without giving any consideration. As long as one party has the opportunity to engage in free rider behaviour and is not being excluded from the unpaid use of the goods in question, only a low incentive exists for this party to voluntarily contribute to the costs of said goods. The following example demonstrates the problematic decision pattern of individuals with regard to this type of behaviour. It can be assumed that a community plans to fight mosquitoes. The community has 1,000 members. The excludability principle is not applicable since mosquitoes are free to bite anyone and therefore it is not restricted to those who have not contributed. If the plan is executed the utility of each member of the community is 10 monetary units. The cost of executing the plan is 5,000 monetary units in total, or 5 monetary units for each individual member. If the contribution is voluntary, each community member is confronted with the following decision pattern. If all members pay 5 monetary units voluntarily, each individual has a net utility of 5 monetary units. Under the assumption that the quality of the plan will not be diminished if one community member does not contribute to the plan, this community member could gain a net utility of 10 monetary units. Not contributing, but profiting in this case constitutes the free rider behaviour. For the free rider, the utility one receives from the fight against mosquitoes is a positive externality. If each individual assumes that all other community members contribute 5 monetary units, the most advantageous decision pattern is not to contribute. If all 1,000 members follow this approach an allocation of this commodity falls through. As a result, the net utility in this case equals zero. If one member assumes that all others will not contribute voluntarily, and if it is accepted that in this case the fight against mosquitoes will be fully ineffective due to the marginal scale or the contribution needed to cover the administrative costs, the net utility of this one member is -5. However, completely independent from the contribution of other community members in any case, the free rider behaviour is the dominant strategy.⁶⁵ This dominant strategy holds true for all activities linked to pollution reduction.

⁶⁴ Ibid.

⁶⁵ Cf *ibid.*, 90–92.

b) Tragedy of the Commons (Negative Externalities)

The tragedy of the commons has two characteristics. First, such goods can be used without paying a consideration according to the actual scarcity relation which means an incomplete application of the excludability-principle. Second, reaching a certain degree of utilisation, rivalry in the use of the good exists. Rivalry means that the use of the good by one party limits the possibility for use by another party.⁶⁶ In economic affairs, however, another idea is widespread. An individual who intends only his own gain is led by an 'invisible hand'⁶⁷ to promote the public interest also. If this assumption is correct it justifies the continuance of laissez faire policy on the use of common goods. However, this work finds a different approach more convincing and gives an example according to Hardin. Imagine a pasture open to all. As a rational being, each herdsman seeks to maximise his own gain. Hence, what is the utility to each herdsman of adding one more animal to his herd? This utility has two components: (1) the positive component is the increased profit due to the additional animal and (2) the negative component is the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsmen, the negative utility for any particular decision-making herdsman is only a fraction of the positive utility. Adding together the partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to indefinitely increase the number of animals. 'Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.'⁶⁸ Likewise, this phenomenon reappears in problems of pollution. The rational man finds that his share of the cost of the pollution he discharges into the commons is less than the cost of purifying his wastes before releasing them. Since this is true for everyone, one is locked into a system of deteriorating the environment, so long as one behaves only as an independent, rational individual.⁶⁹

4. Summary

Externalities are present if the utility function of a market participant contains influences which the market participant did not intend. This analysis has centred on the technological externality. The technological externality can cause misallocation of resources. Accordingly, economic policy instruments are necessary in order to counteract such market deficiencies. The reason for the existence of technological externalities is that the principle of excludability cannot be applied to all costs and utilities, respectively, which are connected to a certain activity. Therefore, the

⁶⁶ Cf *ibid*, 92–94.

⁶⁷ A Smith *The Wealth of Nations* (Modern Library, New York 1937), 423.

⁶⁸ G Hardin 'The Tragedy of the Commons' (1968) 162 *Science* 1243, 1244.

⁶⁹ *Ibid*, 1245.

presence of technological externalities is closely linked to the incomprehensive existing property rights regimes.⁷⁰

The following dominant strategies are assumed here: As regards pollution reduction, the dominant strategy of each individual is not to contribute, as is demonstrated by the analysis of free rider behaviour. The latter largely prevents environmental information dissemination and utilisation. As regards pollution, the dominant strategy of each individual is to pollute as is demonstrated by the tragedy of the commons. The latter largely prevents environmental information collection and supports the secrecy rationale.

II. Selected Economic Approaches to Market Failure

Providing economic incentives for market participants to internalise the external costs of their actions was long thought to be the theoretical solution to the externality problem. In advance of the academic foundations attained from welfare economics, the idea that the reimbursements to individuals should be calculated according to some indicator of consumer's surplus was well instituted by nineteenth-century writers.⁷¹ Hick's work establishes the requirement for a method called cost-benefit analysis. Another advocate was Pigou, who suggested that the government should compel a charge on pollutant releases equal to the cost of the related damages. Coase wrote a response to Pigou's standpoint. Coase elegantly verified that in a mutual bargaining setting with transaction costs absent and other prerequisites, two negotiating parties will reach collectively preferable results. Moreover, the total quantity of pollution will be autonomous of the transfer of property rights. Only recently Driesen provided, in a broader context, a different perspective on the efficiency-based approach. He argues that economic incentives may facilitate better use of existing techniques rather than bring about fundamental changes in technology. He suggests ways in which the regulatory system could foster more environmentally beneficial technological innovations. The following Sects. 1–4 discuss all four approaches.

1. The Four Consumer's Surpluses (Hicks)

As generally formulated, cost-benefit analysis⁷² operates with the efficiency objectives of the *ex post* developed economic welfare. Given a set of alternative

⁷⁰ M Fritsch (2011) (n 51), 95.

⁷¹ Cf A Marshall *Principles of Economics* (8th edn published 1920 Macmillan, London 1890), book III, chapter VI; J Dupuit 'De la Mesure de l'Utilité des Travaux Publics' (1844) 8 *Annales des Ponts et Chaussées* 2nd Series.

⁷² For an overview of cost benefit analysis cf G M Guess and P G Farnham *Cases in Public Policy Analysis* (2nd edn Georgetown University Press, Washington DC 2000), 304–308. For a recent

allocations of goods or income for a group of individuals, a change from one allocation to another that can make at least one individual better off without making any other individual worse off is called a Pareto improvement. An allocation is defined as Pareto efficient when no further improvements can be made.⁷³ A common criticism of Pareto efficiency is that it does not necessarily result in a socially desirable distribution of resources, as it makes no statement about equality or the overall well-being of a society. In other words, Pareto assumes that all individual self-seeking actions simultaneously increase the social welfare of the entire society. This raises the question as to whether the actions of two market participants can very well be detrimental to a third party. Hence, according to the Kaldor–Hicks compensation principle, maximisation of the net social benefits is formally equivalent to the securing of the largest net welfare gain. Academic debate in this context has centred on the appropriate choice of determination of consumer's surpluses. The dominant view supports the use of the compensating variation measure promulgated by Hicks.⁷⁴ Compensating variation defines the amount of additional monetary units an individual would need to reach his initial utility level after a change in prices, or a change in product quality, or the introduction of new products. It is this reference to the social dimension which distinguishes the cost-benefit analysis from more conventional techniques such as calculating cash flows to a single enterprise.⁷⁵ Since costs and benefits accrue over time, cost-benefit analysis tends to adopt a discounting approach whereby future cash and non-cash flows are discounted back to their present value applying an appropriate discount rate.⁷⁶

2. The Economics of Welfare (Pigou)

Among other aims, Pigou determines that the general problem 'is to ascertain how far the free play of self-interest, acting under the existing legal system, tends to distribute the country's resources in the way most favourable to the production of a large national dividend, and how far it is feasible for State action to improve upon natural tendencies'.⁷⁷ It is further noted, that even in industrialised States there are failures and imperfections. Hence, Pigou's work is a study of obstacles preventing community resources from being distributed among different uses or occupations in the most effective way. The study seeks to high-light some of the ways in which it

defence of economic analysis of regulation cf R W Hahn *In Defense of the Economic Analysis of Regulation* (American Enterprise Institute Press, Washington DC 2005), 1 et seq.

⁷³ For analysis of the Pareto efficiency cf H Siebert *Economics of the Environment: Theory and Policy* (7th edn Springer, Berlin, Heidelberg 2008), 43–44.

⁷⁴ J R Hicks 'The Four Consumer's Surpluses' (1943) 11 *Review of Economic Studies* 31.

⁷⁵ A Kuper and J Kuper *The Social Science Encyclopedia* (2nd edn Routledge, London 2003), 165.

⁷⁶ *Ibid.*, 166.

⁷⁷ A C Pigou (1932) (n 40), xii.

may be feasible for governments 'to control the play of economic forces in such wise as to promote the economic welfare and through that, the total welfare, of their citizens as a whole'.⁷⁸ Pigous analysis directs itself to the conclusion that in the case of an externality, tax (or subsidy) programmes are generally those required for an optimal allocation of resources.⁷⁹

3. The Problem of Social Cost (Coase)

Coase points out that the traditional approach according to Pigou has tended to obscure the nature of the choice that had to be made. Basically, Coase turns the point from being a matter to be solved by governmental activity to a matter between two private individuals. The traditional question raised in this context is reflected as one in which A entails harm on B. The decision framework is: how should A be restrained. This framework is questioned by designing a predicament of a two-sided nature. Avoidance of harm to B imposes harm on A. The appropriate question in this regard is: should A be allowed to harm B or should B be allowed to harm A?⁸⁰ Coase advocates a change in approach explicitly mentioning three different features.

First, analysis in terms of private and social costs and the focus thereupon to remove those deficiencies withdraws concentration from pertinent other changes in the arrangement. The latter are inevitably connected to the remedial measure but may fabricate more impairment than the original insufficiency.⁸¹

Secondly, the investigation proceeds in terms of a contrast between a circumstance of laissez faire and an ideal world. A preferable advancement would be to start the analysis with a situation akin to one which exists in reality. Accordingly, examination of the effects of a suggested policy alteration and the try to come to a decision whether the new condition would be, in sum, better or worse than the previous one is the route one has to take. As a result, conclusions for guiding principles would have some significance to the real circumstances analysed.⁸²

Thirdly, Coase views the concept of a factor of production as being faulty. A production factor is usually described as a material thing, which the entrepreneur acquires and uses. It is not the individual possessing land and using it as a factor of production. The property-owner in fact enjoys the right to carry out a definite list of activities. If factors of production are thought of as rights, harmful effects such as pollutant releases can also be defined as a factor of production.⁸³

⁷⁸ Cf *ibid*, 129–130.

⁷⁹ W J Baumol 'On Taxation and the Control of Externalities' (1972) 62 *American Economic Review* 307, 307.

⁸⁰ R H Coase (1960) (n 41), 2.

⁸¹ Cf *ibid*, 42–43.

⁸² *Ibid*, 43.

⁸³ Cf *ibid*, 43–44.

An advancement of the Coase theorem was laid down in the work of Dales⁸⁴ in 1968. Dales pointed out that traditional economic and legal solutions to pollutant releases were never going to be satisfactory and that a market-based instrument was needed. Today, this work is seen as one of the intellectual foundations for emissions trading that began in California in the 1970s and now extends across the world.

4. The Economic Dynamics of Environmental Law (Driesen)

Driesen suggests that efficiency-based analysis may not provide a sufficient basis for either critiquing existing environmental protection or coming up with sensible reforms. Fundamentally, the normative value of efficiency is controversial even among scholars.⁸⁵ Since a free market provides economic incentives for material innovation, it provides little or no incentives for environmental innovation.⁸⁶ Core elements of the shape of environmental problems are decentralisation and change over time.⁸⁷ The problem of decentralised pollution poses an enormous challenge for relatively centralised regulatory systems.⁸⁸ Further, the importance of technological changes suggests that law and economics should pay serious attention to change over time. This introduces a temporal aspect to the study of legal policy and institutions. The direction of technological change over time becomes most important. Questions about cost must therefore include analysis on cost over a long period of time.

These cumulative problems lead to a concern about the change of environmental quality over time, which in the long run outweighs concerns about the efficiency of any single regulatory decision.⁸⁹ The free market, however, offers relatively rapid decentralised private decision-making. This is opposed by the loose pace of governmental decision-making. Driesen raises two questions: (1) how can the government make rapid decisions like market participants do as they attempt to improve material well-being, and (2) how can one improve the design of environmental legislation to encourage environmental innovation? In this context Driesen mentions, *inter alia*, the mandatory environmental information disclosure.⁹⁰ However, it is pointed out that informational strategies have limits.⁹¹ Driesen concludes that development of a regulatory framework, which fosters environmental

⁸⁴ Cf J H Dales *Pollution, Property and Prices: An Essay in Policy-Making and Economics* (University of Toronto Press, Toronto 1968).

⁸⁵ D M Driesen *The Economic Dynamics of Environmental Law* (Massachusetts Institute of Technology Press, Cambridge Mass 2003), 3.

⁸⁶ Cf *ibid*, 98–99.

⁸⁷ *Ibid*, 123.

⁸⁸ *Ibid*, 126.

⁸⁹ *Ibid*, 134.

⁹⁰ Cf *ibid*, 145–150.

⁹¹ *Ibid*, 148.

innovations, is necessary.⁹² Therefore, in the centre of his arguments he crafts an environmental competition statute. Basically, such a statute requires polluters to pay any costs that competitors incur in reducing pollution plus a substantial premium, thereby creating a significant incentive to be among the first to reduce pollution. From his point of view, this directly attacks a fundamental problem with existing free market incentives.⁹³

III. Environmental Innovation, Policy Mix and Capability Assessment

1. Characteristics of Environmental Innovations: Double Externality and Regulatory Push/Pull

From innovations it is expected that environmental policy induced costs are compensated. Extra utility from an innovation-friendly environmental policy is seen in context with cost reduction, higher competitiveness, and the creation of markets for environmental protection goods as well as new workplaces, all of which are commonly called ‘innovation offset’.⁹⁴ Environmental innovations are defined as ‘all measures of relevant actors (firms, politicians, unions, associations, churches, private households) which develop new ideas, behaviour, products and processes, apply or introduce them and contribute to a reduction of environmental burdens or to ecologically specified [...] targets’.⁹⁵ Porter found that stringent regulation⁹⁶ actually can produce greater innovations and innovation offsets than lax regulation and stated six reasons:

- Signals resource inefficiencies and potential technological improvements,
- Achieves – focused on information collection – benefits by raising awareness,
- Reduces investment uncertainty,

⁹² Cf *ibid*, 215–216.

⁹³ Cf D M Driesen ‘Does Emissions Trading Encourage Innovation?’ (2003) 33 *Environmental Law Reporter* 10094, 10107–10108.

⁹⁴ Cf M E Porter and C van der Linde ‘Towards a New Conception of the Environment-Competitiveness Relationship’ (1995) 9 *Journal of Economic Perspectives* 97. For a more sceptical view cf A B Jaffe and Others ‘Environmental Regulation and the Competitiveness of US Manufacturing: What Does the Evidence Tell Us?’ (1995) 33 *Journal of Economic Literature* 132, 157–159. For a recent overview on literature cf G Taistra ‘Die Porter-Hypothese zur Umweltpolitik’ (2001) 24 *Zeitschrift für Umweltpolitik und Umweltrecht* 241.

⁹⁵ K Rennings ‘Redefining Innovation: Eco-Innovation Research and the Contribution from Ecological Economics’ (2000) 32 *Ecological Economics* 319, 322.

⁹⁶ On the theory of regulation from an economic standpoint cf M Leschke ‘§ 6 Regulierungstheorie aus ökonomischer Sicht’ in M Fehling and M Ruffert (eds), *Regulierungsrecht* (Mohr, Tübingen 2010).

- Creates pressure that motivates innovation and progress,
- Levels the playing field, and
- Is needed in case of incomplete offsets where innovation cannot completely offset the cost of compliance.⁹⁷

However, it has also been noted that the double externality problem reduces the incentives for firms to invest in environmental innovations. While in environmental economics methods and strategies for the valuation and internalisation of negative external costs are developed, positive spillovers of basic research efforts in firms are investigated in innovation economics. An important peculiarity of eco-innovations is that they produce positive spillovers in both the innovation and diffusion phase. Positive spillovers in the innovation phase appear due to innovation knowledge also available to competitors which may be reduced by patent rights. Positive spillovers in the diffusion phase appear due to a smaller amount of external costs compared to competing goods and services on the market. The double externality phenomenon as regards environmental innovation results in a sub-optimal investment and imperatively induces a second peculiarity: the importance of the regulatory framework as a key determinant for environmentally innovative behaviour in firms, households and other institutions. The main discussion in innovation economics has been whether technological innovation has been driven by technological development, also considered as technology push, or by demand factors, also considered as market pull. Empirical evidence shows that the regulatory framework, and especially environmental policy, has a strong impact. Environmental innovations are, in contrast to such technologies as microelectronics and telecommunications, normally not self-enforcing. Rennings concluded that '[b]ecause factors of technology push and market pull alone do not seem to be strong enough, [...] [environmental] innovations need specific regulatory support'.⁹⁸

2. Intelligent Regulation by Use of a Policy Mix

In categorising pollution reduction instruments, this work generally follows the recent essay written by Lübbe-Wolff.⁹⁹ 'Command and control' as well as market-based instruments are outlined in parts B and C of this chapter and therefore not discussed here. Further, it must be dealt with reflexive and consensual instruments. A reflexive instrument is, for instance, voluntary participation in environmental auditing. This is not discussed in further detail or as a distinct class of instruments since such instruments cannot substitute other legal instruments as they derive their attractiveness from lowering the burden caused for instance by command and

⁹⁷ M E Porter and C van der Linde (1995) (n 94), 99–100.

⁹⁸ K Rennings (2000) (n 95), 325–326, and further references cited therein.

⁹⁹ G Lübbe-Wolff 'Instrumente des Umweltrechts: Leistungsfähigkeit und Leistungsgrenzen' (2001) 20 *Neue Zeitschrift für Verwaltungsrecht* 481.

control requirements.¹⁰⁰ Nevertheless, where they could serve to improve mandatory environmental information disclosure, the work refers to reflexive instruments. Additionally, environmental penalties and criminal laws are touched where this may be useful as an accompanying instrument for the functioning and improvement of the information collection process. Finally, a second order instrument is, for instance, the capacity building in environmental matters. Such instruments are not discussed here.¹⁰¹ This work acts on the assumption that incentive as well as 'command and control' resources are scarce and therefore limited. The gist of the discussion on the use of environmental protection instruments in general and pollution reduction instruments in particular, is the evaluation how and where incentive and 'command and control' resources are most efficiently inserted. It is essential to ascertain if and how the capability of environmental governance might be improved due to an intelligent policy mix, which maximises the advantages of environmental instruments and at the same time compensates the disadvantages.¹⁰²

3. Assessment of Instrument Capability

An evaluation of the E-PRTR and the TRI is carried out at the end of this work. As regards assessment of capability this work applies the criteria elaborated in the essay written by Roßnagel, Sanden and Benz.¹⁰³ This essay is primarily concerned with criteria for the application of instruments in order to improve the preservation of resources. Since the general considerations give guidance for the assessment of instrument capabilities beyond the preservation of resources they serve as an orientation guide.¹⁰⁴ They consider:

¹⁰⁰ Ibid, 491. For a similar conclusion *cf generally* D W Case 'Changing Corporate Behavior through Environmental Management Systems' (2006) 31 William and Mary Environmental Law and Policy Review 75, 110. On the concept of regulation *cf* M Ruffert '§ 7 Begriff' in M Fehling and M Ruffert (eds), *Regulierungsrecht* (Mohr, Tübingen 2010).

¹⁰¹ Thereto *cf* G Lübke-Wolff (2001) (n 99), 493.

¹⁰² Ibid, 481, and further references cited therein.

¹⁰³ A Roßnagel, J Sanden and S Benz 'Die Bewertung der Leistungsfähigkeit umweltrechtlicher Instrumente' (2007) 27 Umwelt- und Planungsrecht 361. With a focus on energy efficiency *cf* T Schomerus 'Pathways to Energy Sustainability: New Instruments for Promoting Energy Efficiency' in M Rodi (ed), *The Paradigm Shift towards Energy Sustainability: Climate Change, Innovation and the Optimal Instrument Mix* (Lexxion, Berlin 2010), 43–49; T Schomerus 'Rechtliche Instrumente zur Verbesserung der Energienutzung' (2009) 28 Neue Zeitschrift für Verwaltungsrecht 418, 419. Generally thereto G Hermes 'Instrumentenmix im Energieumweltrecht' in M Führ, R Wahl and P von Wilmowsky (eds), *Umweltrecht und Umweltwissenschaft: Festschrift für Eckard Rehlinger* (E Schmidt, Berlin 2007), 571. For an early essay *cf* S Röckseisen 'Kriterien zur Beurteilung der Leistungsfähigkeit umweltpolitischer Instrumente' in M Kotulla, H Ristau and U Smeddinck (eds), *Umweltrecht und Umweltpolitik* (Physica, Heidelberg 1998).

¹⁰⁴ A Roßnagel, J Sanden and S Benz (2007) (n 103), 361.

- The effectiveness (the degree of efficacy with which the objective is achieved),
- The legal conformity (compatibility to the existing legal framework),
- Enforcement feasibility for enforcer and addressee (enforcement cost and subjective motivation of enforcer and addressee),
- Efficiency (determination by a cost-benefit analysis),
- Political enforceability (consideration of the current social and economic state),
- Innovation potential (positive influence on environmental innovations), and
- Further environmental-specific strategic requirements (long-term duration of resource preservation and undertaking stability).

IV. Interim Result

It is commonly accepted that externalities exist due to market failure. The focus here is on external costs since pollutant releases are largely seen as negative externalities. The dominant strategy of individuals according to free rider behaviour and the tragedy of the commons is the underlying rationale for this work. Among economists, however, it is argued which theory and method bring the optimal level of abatement of such external costs. In the context of Hicks' approach, the use of social prices founded on consumer preferences impliedly supposes that the allocation of market power inside the pertinent economy is by now in itself most favourable. Because this is a value judgment, of course, it is open to anyone to surrogate it with other distributional judgments. It can be argued that this apparent unpredictability describes the insufficiencies of the cost-benefit analysis.

The shortcoming of Pigou's approach is the lack of explanation as to why the government should be involved as regards externalities. Before Pigou, others had argued that no governmental activity is needed. Pigou argued that the government is involved and has achieved certain results. On the grounds of ongoing imperfections and failures of the system, he concluded that additional governmental activity is required. Today, this argument obtained further clarification from the above mentioned dominant behaviour strategies of individuals as regards pollution. A deficiency of a tax (or subsidy), however, is that the environmental outcome, for instance a limit on the amount of emissions, is not guaranteed.¹⁰⁵

The bargaining scenario set forth by Coase is a theoretically appealing solution. In practice, however, serious problems arise. Since pollution has a global aspect, high transaction costs might bar most of the victims from bargaining with the polluter. If third parties cannot be excluded from the utility generated by the bargaining parties, free rider behaviour becomes more likely. There is a low incentive for such third parties to share the transaction costs. As regards emissions

¹⁰⁵ For the deficiency and a substitute approach cf eg W J Baumol and W E Oates 'The Use of Standards and Prices for Protection of the Environment' (1971) 73 *Swedish Journal of Economics* 42, 43–44, 51.

trading, the incentive for those facing high marginal costs of abatement to increase pollution cancels out the incentive on those with low marginal costs to go beyond compliance. Further, there is uncertainty about the cost of compliance as the price of a permit is not known in advance and will vary over time according to market conditions.

In principle, it must be agreed with Driesen's approach. It remains unclear, however, what is meant by the limits of mandatory environmental information disclosure. This work scrutinises whether mandatory information disclosure has limits in itself or whether it is the legal regime which sets the limits and if reshaping the legal framework would help to realign the boundaries. The approach of enacting an environmental competition statute might not appear fully convincing. On the one hand, defining the cost and the premium one has to pay to the competitor, and on the other hand, the contours of the role of the regulatory body seem to have no easy solution. The deficiencies of cartels also raise concerns. Mandatory information disclosure independently, as well as regenerated with classical pollution reduction instruments, appears to be a currently underutilised tool in the achievement of environmental innovation.

B. Command and Control Instruments

Problems which would today be categorised as environmental were for many centuries dealt with in the first instance by private law mechanisms: tort and property law. From the 19th century onwards, more and more of these approaches were deemed inadequate to prevent environmental degradation.¹⁰⁶ It was not until the late 1960s and early 1970s, that the governments in the EU and US systematically sought to control pollution.¹⁰⁷ 'Command and control' was the predominant form used to implement environmental protection.¹⁰⁸ This regulatory model is credited with significant successes in achieving environmental protection gains as well as major shortcomings since its implementation some 40 years ago. Here is not

¹⁰⁶ M Lee *EU Environmental Law: Challenges, Change and Decision-Making* (Hart, Oxford 2005), 183.

¹⁰⁷ For the EU *cf eg* D Robinson (1998) (n 10), 33. For the US *cf eg* E W Orts 'Reflexive Environmental Law' (1995) 89 *Northwestern University Law Review* 1227, 1235. Since there exists a very wide variety of literature, the precautionary principle is not discussed here. *Cf eg* on the subject of the precautionary principle: T O'Riordan (ed) *Reinterpreting the Precautionary Principle* (Cameron May, London 2001); C R Sunstein *Laws of Fear: Beyond the Precautionary Principle* (4th printing Cambridge University Press, Cambridge Mass 2008).

¹⁰⁸ For an overview of EU legislation *cf eg* L Krämer 'Thirty Years of EC Environmental Law: Perspectives and Prospectives' in L Krämer (ed), *European Environmental Law* (Ashgate, Aldershot 2003), 493–500. For an overview of US legislation *cf eg* E P Weber *Pluralism by the Rules: Conflict and Cooperation in Environmental Regulation* (Georgetown University Press, Washington DC 1998), 5–8.

the occasion for a review of the debate.¹⁰⁹ This part outlines a brief introduction into the term ‘command and control’ and discusses examples of the major command and control measures in the EU and the US.

I. Introduction

This ‘command and control’ type of legislation is a top-down, hierarchical form used to reduce pollution in two different ways.¹¹⁰ It can either control pollutant releases directly through performance standards, established for the polluter and enforced through a permit system. Alternatively, it can control pollutant releases indirectly through uniform best available techniques, which are established for certain types of polluting activity.¹¹¹ By contrast, it can also be argued that performance standards and best available techniques are distinct. Rather than specifying a level of performance, true command and control legislation is confined only to provisions specifying particular techniques and methods of compliance.¹¹² ‘Command and control’ has taken on a life of its own in environmental literature. Despite its widespread use in the EU and US, there is significant disagreement regarding the precise definition of the phrase. The term dates back to descriptions of the centrally planned economies of the Soviet Union and the Eastern European countries, which allowed proponents of alternative instruments to start a debate about the best choice of policy instruments ‘with the conclusion prefigured if not absolutely set in stone’.¹¹³ In many cases it is taken to include a residual variable that cannot be precisely categorised as a market-based instrument.¹¹⁴ It is also noted that the phrase ‘command and control’ has evolved over the last decades in academic literature into a depreciatory acronym for an extended criticism of this particular type of environmental legislation.¹¹⁵ Moreover, ‘command and control’

¹⁰⁹ There is a large literature on criticism and defences of the ‘command and control’ approach. For a mainly EU perspective, *cf eg* M Lee (2005) (n 106), 183 fn 1. For a mainly US perspective, *cf eg* R B Stewart ‘A New Generation of Environmental Regulation?’ (2001) 29 *Capital University Law Review* 21, 22 fn 1.

¹¹⁰ D W Case ‘Corporate Environmental Law Reporting as Informational Regulation: A Law and Economics Perspective’ (2005) 76 *University of Colorado Law Review* 379, 380.

¹¹¹ *Cf* R W Hahn and R N Stavins ‘Incentive-Based Environmental Regulation: A New Era from an Old Idea’ (1991) 18 *Ecology Law Quarterly* 1, 5–6.

¹¹² *Cf* D M Driesen ‘Is Emission Trading an Economic Incentive Program? Replacing the Command and Control/Economic Incentive Dichotomy’ (1998) 55 *Washington and Lee Law Review* 289, 297–298.

¹¹³ C S Russell *Applying Economics to the Environment* (Oxford University Press, New York 2001), 190.

¹¹⁴ *Cf* *ibid*, 190–191.

¹¹⁵ K Harrison ‘Talking with the Donkey: Cooperative Approaches to Environmental Protection’ (1998) 2 *Journal of Industrial Ecology* 51, 53.

is a misleading label. It fails to reflect the diversity of basic regulatory techniques and their potential flexibility.¹¹⁶ Much of the criticism originated in the US. It reflects a particular approach to implementation and enforcement of provisions in this jurisdiction, as well as an economic and political climate that was highly suspicious of the role of the State. The critique was not centred on flaws with the regulatory technique itself.¹¹⁷ Due to its virtue of familiarity, the term ‘command and control’ has been used in this work. Notwithstanding, it is frequently noted that the continued legitimacy of this class of regulations requires a revisiting and sharpening of the language,¹¹⁸ using the term ‘direct regulations’.¹¹⁹ Accordingly, in this work, this class of regulation is defined as direct regulations confined to limiting, directly or indirectly, the quantity of pollutant releases that each market participant may generate.¹²⁰

II. Direct Regulations for Production Processes and Products Under EU Laws

1. Performance Standards

To date, EU law contains no regulations which, by way of a universal principle, oblige ascertained installations to have a permit and to respect defined emission limits. In lieu thereof, regulations only apply to certain specific, as well as, large installations.¹²¹ For instance, Directive 76/464/EEC¹²² requires permits for installations which discharge certain dangerous substances into water. Further, Directive 84/360/EEC¹²³ similarly requires prior authorisation for industrial installations which discharge specified pollutants into the air. Apart from this, no standards, particularly for ground pollution, exist.¹²⁴ As regards certain products, the EU has its own set of emissions limits. New motor vehicles must meet standards

¹¹⁶ M Lee (2005) (n 106), 184.

¹¹⁷ Cf eg B A Ackerman and R B Stewart ‘Reforming Environmental Law’ (1985) 37 Stanford Law Review 1333.

¹¹⁸ Cf R Macrory ‘Regulating in a Risky Environment’ (2001) 54 Current Legal Problems 619.

¹¹⁹ For further references, cf M Lee (2005) (n 106), 184.

¹²⁰ R B Stewart ‘Economic Incentives for Environmental Protection: Opportunities and Obstacles’ in R L Revesz, P Sands and R B Stewart (eds), *Environmental Law, the Economy and Sustainable Development: The United States, the European Union, and the International Community* (Cambridge University Press, Cambridge Mass 2000), 174.

¹²¹ L Krämer (2003) (n 108), 494.

¹²² Council, Directive 76/464/EEC of 4 May 1976 on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment of the Community, [1976] OJ L 129/23.

¹²³ Council, Directive 84/360/EEC of 28 June 1984 on the Combating of Air Pollution from Industrial Plants, [1984] OJ L 188/20.

¹²⁴ For waste management legislation in the EU cf eg L Krämer (2003) (n 108), 500.

that are set for all road vehicles, trains, barges and non-road mobile machinery.¹²⁵ In late 2005, the EU started working on a proposal to limit CO₂ emissions from cars. In 2009, the regulations on CO₂ from passenger cars were set forth in the form of Regulation (EC) 443/2009.¹²⁶ Up to now, no standards apply to ships or aircrafts.

2. Best Available Techniques

Without any preparatory public debate, in the early 1990s it was decided to abandon the adoption of harmonised standards for production processes.¹²⁷ The standard approach of the EU is now contained in Directive 2008/1/EC.¹²⁸ It introduces some linguistic changes and adaptations. The substance of its predecessor, Directive 96/61/EC,¹²⁹ has not been changed and Directive 2008/1/EC is without prejudice to the proposal for a new directive on industrial emissions.¹³⁰ The elaboration of Directive 96/61/EC was highly influenced by previous experiences in the United Kingdom.¹³¹ The directive applies to certain types of installations listed in Annex I. Listed installations must obtain a permit laying down emission limits. Such limits must be based on the best available technique. This method includes economic considerations as well as specific local conditions of the installation. From the grassroots up it was anticipated that the scope of Directive 2008/1/EC would extend to smaller installations. This approach appears to have been subsequently set aside. In exceptional circumstances, the EU opts to adopt uniform emission limits at the Union level. These kinds of limits are, *inter alia*, fixed for large combustion installations¹³² and for waste incinerators.¹³³ This directive will progressively

¹²⁵ For the most recent example *cf* European Parliament and Council, Regulation (EC) 715/2007 of 20 June 2007 on Type Approval of Motor Vehicles with Respect to Emissions from Light Passenger and Commercial Vehicles (Euro 5 and Euro 6) and on Access to Vehicle Repair and Maintenance Information, [2007] OJ L 171/1.

¹²⁶ European Parliament and Council, Regulation (EC) 443/2009 of 23 April 2009 Setting Emission Performance Standards for New Passenger Cars as Part of the Community's Integrated Approach to Reduce CO₂ Emissions from Light-Duty Vehicles, [2009] OJ L 140/1.

¹²⁷ L Krämer (2003) (n 108), 495.

¹²⁸ European Parliament and Council, Directive 2008/1/EC of 15 January 2008 Concerning Integrated Pollution Prevention and Control, [2008] OJ L 24/8.

¹²⁹ Council, Directive 96/61/EC of 24 September 1996 Concerning Integrated Pollution Prevention and Control, [1996] OJ L 257/26.

¹³⁰ *Cf* Commission, Proposal for a Directive on Industrial Emissions, COM (2007) 844 final, 21 December 2007.

¹³¹ P Park *Energy Law and the Environment* (Taylor and Francis, London 2002), 82; L Krämer (2003) (n 108), 495.

¹³² European Parliament and Council, Directive 2001/80/EC of 23 October 2001 on the Limitation of Emissions of Certain Pollutants into the Air from Large Combustion Plants, [2001] OJ L 309/1.

¹³³ European Parliament and Council, Directive 2000/76/EC of 4 December 2000 on the Incineration of Waste, [2000] OJ L 332/91.

substitute earlier directives on the incineration of waste.¹³⁴ As regards certain products, the mandatory introduction of the catalytic converter for all new motor vehicles became mandatory as of 1 January 1993. However, no measures were introduced for motor vehicles already on the market. De facto, all motor vehicles in the EU had to be equipped with a catalytic converter as late as 2006.¹³⁵

III. Direct Regulations for Production Processes and Products Under US Laws

1. Performance Standards

US federal law contains regulations which, by way of a universal principle, oblige ascertained installations to have a permit and to respect defined end of pipe pollution reduction standards. The Water Pollution Control Act of 1972¹³⁶ contains the National Pollutant Discharge Elimination System, so called NPDES permit programme. For instance, pursuant to 40 Code of Federal Regulations § 129¹³⁷ effluent standards apply to owners or operators of specified facilities discharging into navigable waters. The standards or prohibitions for toxic pollutants established under 40 Code of Federal Regulations § 129 are applicable to specific sources and pollutants and may be incorporated in any permit, modification or renewal thereof. As a result, water quality in many areas has improved significantly.¹³⁸ Apart from this, no standards, particularly for ground pollution, exist.¹³⁹ Pursuant to the Clean Air Act of 1970,¹⁴⁰ commonly referred to as CAA, programmes to reduce pollution rely on performance standards such as the New Source Performance Standards, or

¹³⁴ Council, Directive 89/369/EEC of 8 June 1989 on the Prevention of Air Pollution from New Municipal Waste Incineration Plants, [1989] OJ L 163/32; Council, Directive 89/429/EEC of 21 June 1989 on the Reduction of Air Pollution from Existing Municipal Waste Incineration Plants, [1989] OJ L 203/50; Council, Directive 94/67/EC of 16 December 1994 on the Incineration of Hazardous Waste, [1994] OJ L 365/34.

¹³⁵ L Krämer (2003) (n 108), 493.

¹³⁶ Congress, Water Pollution Control Act of 1972, Public Law 92–500, 86 Stat 816. Cf 33 USC §§ 1251–1387 (2010). It is commonly referred to as the Clean Water Act (CWA).

¹³⁷ US Environmental Protection Agency, Toxic Pollutant Effluent Standards, 40 Code of Federal Regulations § 129 (2009).

¹³⁸ For further references, cf W L Andreen ‘Water Quality Today: Has the Clean Water Act Been a Success?’ (2004) 55 Alabama Law Review 537, 538.

¹³⁹ For waste management legislation in the US cf eg M S Dennison *RCRA Regulatory Compliance Guide* (Noyes, Park Ridge NJ 1993).

¹⁴⁰ Congress, Clean Air Act of 1970, Public Law 91-604, 84 Stat 1676. Cf 42 USC §§ 7401-7671q (2010).

so called NSPS, for immobile installations. 40 Code of Federal Regulations § 61¹⁴¹ requires prior authorisation for industrial installations which discharge specified pollutants into the air. It applies to the owner or operator of any stationary source for which a standard is prescribed. In addition to complying with the provisions, the owner or operator of a stationary source subject to a standard may be required to obtain an operating permit issued to stationary sources by an authorised pollution reduction agency.

As regards certain products, programmes to reduce pollution rely on performance standards such as the Corporate Average Fuel Economy, so called CAFE standards, for automobiles. New and partly in-use motor vehicles must meet standards that are set for all road vehicles,¹⁴² locomotives¹⁴³ and non-road mobile machinery.¹⁴⁴ Further, standards apply to ships¹⁴⁵ and aircrafts.¹⁴⁶ Federal emissions regulations, however, do not cover the primary component of vehicle exhaust, CO₂ emissions. In 2009, the federal government announced a new national fuel economy and emissions policy that incorporated California's contested plan to curb greenhouse gas emissions on its own, apart from federal government regulations.¹⁴⁷ On 2 April 2007, the Supreme Court found that greenhouse gases are air pollutants covered by the CAA.¹⁴⁸ In line with the Supreme Court judgment, the EPA took action to regulate greenhouse gases under the CAA. EPA found that

¹⁴¹ US Environmental Protection Agency, National Emission Standards For Hazardous Air Pollutants, 40 Code of Federal Regulations § 61 (2009).

¹⁴² US Environmental Protection Agency, Control of Air Pollution from Mobile Sources, 40 Code of Federal Regulations § 85 (2009); US Environmental Protection Agency, Control of Emissions from New and In-Use Highway Vehicles and Engines, 40 Code of Federal Regulations § 86 (2009); US Environmental Protection Agency, Clean-Fuel Vehicles, 40 Code of Federal Regulations § 88 (2009).

¹⁴³ US Environmental Protection Agency, Control of Emissions from Locomotives and Locomotive Engines, 40 Code of Federal Regulations § 92 (2009); M E Kraft, M Stephan and T D Abel *Coming Clean: Information Disclosure and Environmental Performance* (Massachusetts Institute of Technology Press, Cambridge Mass 2011), 4, critically note that 'remaining problems are attributable largely to nonpoint sources, such as urban runoff and agriculture, which cannot easily be regulated [by command and control instruments]. Much the same could be said about the millions of mobile sources of air pollution, such as passenger vehicles, trucks, and buses'.

¹⁴⁴ US Environmental Protection Agency, Control of Emissions from New and In-Use Nonroad Compression-Ignition Engines, 40 Code of Federal Regulations § 89 (2009); US Environmental Protection Agency, Control of Emissions from Nonroad Spark-Ignition Engines At or Below 19 Kilowatts, 40 Code of Federal Regulations § 90 (2009).

¹⁴⁵ US Environmental Protection Agency, Control of Emissions from Marine Spark-Ignition Engines, 40 Code of Federal Regulations § 91 (2009); US Environmental Protection Agency, Control of Air Pollution from Marine Compression-Ignition Engines, 40 Code of Federal Regulations § 94 (2009).

¹⁴⁶ US Environmental Protection Agency, Control of Air Pollution from Aircraft and Aircraft Engines, 40 Code of Federal Regulations § 87 (2009).

¹⁴⁷ The White House 'President Obama Announces National Fuel Efficiency Policy' (19 May 2009) Press Release.

¹⁴⁸ Supreme Court *Massachusetts v EPA* 549 US 497 (2007).

greenhouse gases threaten the public health and welfare of current and future generations and new motor vehicles and new motor vehicle engines contribute to the greenhouse gas pollution.¹⁴⁹ Consequently, EPA proposed greenhouse gas emission standards for light-duty vehicles covering model years 2012 through 2016.¹⁵⁰ The final rule was published in the Federal Register on 7 May 2010.¹⁵¹ Released on 21 May 2010, a presidential memorandum regarding fuel efficiency standards required the EPA and the DOT to start work on

- Medium-duty and heavy-duty trucks establishing fuel efficiency and greenhouse gas emissions standards for commercial medium-duty and heavy-duty vehicles beginning with model year 2014, with the aim of issuing a final rule by 30 July 2011; and
- Passenger cars and light-duty trucks improving fuel efficiency and to reduce greenhouse gas emissions of passenger cars and light-duty trucks of model years 2017 through 2025.¹⁵²

2. Best Available Techniques

The best available technique rationale has been known in the US since the 1970s. The standard approach of the US as regards water pollution is contained in CWA. According to § 1314 (b) clean water regulations

[...] identify, in terms of amounts of constituents and chemical, physical, and biological characteristics of pollutants, the degree of effluent reduction attainable through the application of the best practicable control technology currently available for classes and categories of point sources (other than publicly owned treatment works); and

[...] specify factors to be taken into account in determining the control measures and practices to be applicable to point sources (other than publicly owned treatment works) within such categories or classes. Factors relating to the assessment of best practicable control technology currently available [...] shall include consideration of the total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application, and shall also take into account the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques,

¹⁴⁹ US Environmental Protection Agency, Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act; Final Rule, 74 Federal Register 66496 (2009). These findings are effective since 14 January 2010.

¹⁵⁰ US Environmental Protection Agency, Proposed Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, 74 Federal Register 49454 (2009).

¹⁵¹ US Environmental Protection Agency and US Department of Transportation, National Highway Traffic Safety Administration; 40 CFR Parts 85, 86, and 600; 49 CFR Parts 531, 533, 536, et al; Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, 75 Federal Register 25323 (2010).

¹⁵² The White House 'Improving Energy Security, American Competitiveness and Job Creation, and Environmental Protection through a Transformation of our Nation's Fleet of Cars and Trucks' (21 May 2010) Presidential Memorandum Regarding Fuel Efficiency Standards.

process changes, non-water quality environmental impact (including energy requirements), and such other factors as the Administrator deems appropriate.

The standard approach of the US as regards air pollution is contained in the CAA. According to § 7479 (3) CAA

[t]he term ‘best available control technology’ means an emission limitation based on the maximum degree of reduction of each pollutant subject to regulation under this chapter emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each such pollutant. In no event shall application of ‘best available control technology’ result in emissions of any pollutants which will exceed the emissions allowed by any applicable standard established pursuant to

the CAA. As regards certain products, the phaseout of pollution in the US began in 1974, when the EPA, under the authority of the CAA, introduced rules requiring new cars to be equipped with catalytic converters. The mandatory use of catalytic converters in all cars started with the 1975 model year.¹⁵³

IV. Interim Result

As already stated in the beginning of this part, the regulatory model of direct regulations is well-founded and is credited with significant successes in achieving environmental protection gains since its implementation some 40 years ago. In principle, this class of regulations has a continued legitimacy being a measure which tackles the free rider and tragedy of the commons decision patterns of individuals. Moreover, direct regulations currently in place have shortcomings. Overall, it might appear that most of the performance standards are inflexible. Once achieved, those standards motivate no further environmental innovation in order to reduce pollutant releases.¹⁵⁴ The best available technique approach is softened by the consideration of several factors. In turn, this imposes a high burden on the permitting authority in determining the best available technique and the pollution levels respectively. Due to the account of factors, such as economic considerations, specific local conditions of the installation and age of equipment, it means in practice that for absolutely identical installations

¹⁵³ R G Newell and K Rogers ‘Leaded Gasoline in the United States: The Breakthrough of Permit Trading’ in W Harrington, R D Morgenstern and T Sterner (eds), *Choosing Environmental Policy: Comparing Instruments and Outcomes in the United States and Europe* (Resources for the Future, Washington DC 2004), 175.

¹⁵⁴ R B Stewart ‘Regulation, Innovation, and Administrative Law: A Conceptual Framework’ (1981) 69 California Law Review 1256, 1259.

- Different emission limits may apply,
- An impact on the competitiveness of the installation may arise, and
- An impact on the environmental performance of the products may be produced.¹⁵⁵

C. Market-Based Instruments

Over the last 30 years this topic has taken on great importance as the use of market-based instruments has spread worldwide. The development of market-based instruments has formed an important part of EU and US environmental policy.¹⁵⁶ First, market-based instruments have also proven advantageous to the Commission and governments in the EU, seeking an alternative to the welfare state and laissez-faire.¹⁵⁷ Second, governments sceptical of the efficacy of government intervention, such as several administrations in the US, have tended to embrace a deregulatory philosophy that relies on the free market to solve detrimental externalities. In theory, proper design and implementation assumed, market-based instruments allow any desired level of pollution reduction to be executed at the lowest overall costs to society. Those polluters that can achieve the greatest pollution reductions most cheaply are provided incentives in order to do so. Rather than equalising pollution levels among sources as with uniform performance standards, market-based instruments equalise their incremental amount that sources spend to reduce pollution – their marginal abatement costs.¹⁵⁸ However, the actual outcome in

¹⁵⁵ For the same findings *cf* L Krämer (2003) (n 108), 495.

¹⁵⁶ *Cf generally* B J Richardson *Environmental Regulation through Financial Organisations: Comparative Perspectives on the Industrialised Nations* (Kluwer Law International, The Hague 2002), 183 et seq. For the EU *cf eg* M Lee (2005) (n 106), 183–212; European Parliament and Council, Decision 1600/2002/EC of 22 July 2002 Laying Down the Sixth Community Environment Action Programme, [2002] OJ L 242/1, article 3. For the US *cf eg* D M Driesen ‘Economic Instruments for Sustainable Development’ in B J Richardson (ed), *Environmental Law for Sustainability* (Hart, Oxford 2006). Since there exists a very wide variety of literature, the ‘polluter pays’ principle is not discussed here. *Cf eg* on the subject of the ‘polluter pays’ principle: Organization for Economic Cooperation and Development *The Polluter Pays Principle: Definition, Analysis, Implementation* (Organization for Economic Cooperation and Development, Paris 1975).

¹⁵⁷ *Cf* D M Driesen (2006) (n 156), 277–278.

¹⁵⁸ R N Stavins ‘Market-Based Environmental Policies: What Can We Learn from US Experience (and Related Research)?’ in J Freeman and C D Kolstad (eds), *Moving to Markets in Environmental Regulation: Lessons from Twenty Years of Experience* (Oxford University Press, New York 2007), 20. For in-depth discussion *cf* W J Baumol and W E Oates *The Theory of Environmental Policy* (2nd edn Cambridge University Press, Cambridge Mass 1998); T Tietenberg *Emissions Trading: An Exercise in Reforming Pollution Policy* (Resources for the Future, Washington DC 1985).

practice is less clear. Here is not the occasion for a review of the debate.¹⁵⁹ This part outlines a brief introduction into the term ‘market-based instruments’ and discusses examples of the major market-based instruments in the EU and US such as environmental taxes, emissions trading and environmental liability.

I. Introduction

The term ‘market-based instrument’ seems to be too broad to define. Hence, as opposed to direct regulations, here the term ‘market regulations’ is used. Market regulations can be described as follows: Market regulations establish, directly or indirectly, a price that must be paid for each unit of residuals generated, but leave each market participant free to decide on the level of pollutant releases that she or he generates.¹⁶⁰ Scholars usually use the term ‘market-based instruments’ to refer to a wide variety of alternatives to traditional direct regulations.¹⁶¹ This usage reflects convention, rather than analysis of the differences between direct and market regulations.¹⁶² Even if the term has no rigorous definition, scholars generally agree about what instruments the term ‘market regulations’ refers to. Market regulations have in common that they, directly or indirectly, provide an economic incentive to clean up by way of forcing the market participant to pay for each unit of pollutant release generated. Direct regulations have in common that they, directly or indirectly, require the market participant to meet certain performance standards. It can be argued that direct regulations also provide an economic incentive to clean up by threatening polluters with fines for failing to comply with performance standards.¹⁶³ However, this work sets this argument aside, since this is a comparison of a state of compliance as regards market regulations and a state of noncompliance as regards direct regulations. Here, for both classes of regulations the state of compliance is compared. However, both, direct and market regulations create a

¹⁵⁹ There is a large literature on criticism and defences of the ‘market-based instruments’. For an EU and US perspective, cf eg R L Revesz, P Sands and R B Stewart (eds) *Environmental Law, the Economy and Sustainable Development: The United States, the European Union, and the International Community* (Cambridge University Press, Cambridge Mass 2000). For a mainly US perspective, cf eg J Freeman and C D Kolstad (eds) *Moving to Markets in Environmental Regulation: Lessons from Twenty Years of Experience* (Oxford University Press, New York 2007).

¹⁶⁰ R B Stewart (2000) (n 120), 174.

¹⁶¹ Cf J Rietbergen-McCracken ‘Introduction’ in J Rietbergen-McCracken and H Abaza (eds), *Economic Instruments for Environmental Management: A Worldwide Compendium of Case Studies* (Earthscan, London 2000); Organisation for Economic Cooperation and Development *Economic Instruments for Pollution Control and Natural Resources Management in OECD Countries: A Survey* (Organisation for Economic Cooperation and Development, Paris 1999), 11–13.

¹⁶² D M Driesen (2006) (n 156), 283.

¹⁶³ Ibid.

market for pollution reduction ideas and equipment, since they require market participants to reduce pollutant releases. Scholars have also employed varying typologies to classify the many economic instruments used around the world. As regards market regulations, it might prove useful to distinguish between price-based instruments, such as taxes, and quantity-based instruments, such as emissions trading.¹⁶⁴

II. Market Regulations Under EU Laws

1. Environmental Taxes

Environmental taxes are designed to put a price on either emissions from, or inputs to, a process or product with which the Member States of the EU have perhaps the most national experience.¹⁶⁵ At the EU level, there have been difficulties in trying to introduce environmental forms of taxation. Whereas environmental legislation in general is subject to qualified majority voting in the Council, all fiscal measures must meet the unanimity requirement.¹⁶⁶ Up to now, some Member States continue to resist majority voting in the tax area. Tax policy goes to the very heart of national sovereignty. Further, taxation and expenditure form central elements of national political debate. There is another reason which makes reaching a consensus on environmental taxation complex: for instance the most pertinent policy area is the long contested and controversial history of EU energy or carbon tax. In practice, it implicates major and influential sectors of industry. With the enlargements in 2004 and 2007 respectively, however, the adoption of measures on the basis of unanimity is presumed to become even more difficult.¹⁶⁷

A proposal for an EU carbon tax was first introduced in a 1992 Commission White Paper.¹⁶⁸ According to Article 1 (1) of the 1992 proposal, its purpose was to provide for the harmonised introduction in the Member States of a specific tax to be levied on carbon dioxide emissions and energy content.¹⁶⁹ The rate of the new tax

¹⁶⁴ Ibid.

¹⁶⁵ *Cf eg* T Sterner and G Köhlin 'Environmental Taxes in Europe' (2003) 3 Public Finance and Management 117; Commission, Communication of 26 March 1997 on Environmental Taxes and Charges in the Single Market, [1997] OJ C 224/6.

¹⁶⁶ Article 192 (2) (a) TFEU (ex article 175 (2) (a) TEC) and article 113 TFEU (ex article 93 TEC), *cf* European Union, Consolidated Versions of the Treaty on European Union (TEU) and the Treaty on the Functioning of the European Union (TFEU), [2008] OJ C 115/1.

¹⁶⁷ M Lee (2005) (n 106), 191.

¹⁶⁸ Commission, Proposal for a Directive Introducing a Tax on Carbon Dioxide Emissions and Energy, COM (1992) 226 final, 30 June 1992.

¹⁶⁹ For a recent assessment of the feasibility under the European legal framework *cf* T Schomerus 'Abgaben als Instrument des Klimaschutzes' (2010) 86 Zeitschrift für Zölle und Verbrauchsteuern 141, 145–146.

was suggested to be in addition to the rates applied by the Member States in relation to certain products. However, the most enduring reluctance came from Spain and the UK, above all for sovereignty reasons.¹⁷⁰ Hence the 1992 proposal was withdrawn. It was replaced by a far less ambitious proposal on energy products in 1997.¹⁷¹ According to Article 1 (1) of the 1997 proposal, Member States had to impose taxation on energy products in accordance with the directive. However, when implementing the directive, Member States had to avoid any increase in their overall tax burden, as set forth in Article 1 (2). The EU carbon tax was eventually agreed in 2003 under Directive 2003/96/EC.¹⁷² According to Article 1, Member States have to impose taxation on energy products and electricity in accordance with this directive. The levels of taxation which Member States have to apply to the energy products and electricity have to meet the minimum levels of taxation prescribed by the directive, as set forth under Article 4 (1). In lieu thereof, the Commission considers that it is for Member States to find the right balance between incentives and disincentives in their tax systems, while respecting overall fiscal constraints and fiscal neutrality.¹⁷³ Directive 2003/96/EC is currently subject to discussion. The Council is considering a review of the directive to bring it more closely in line with the EU's energy and climate change objectives.¹⁷⁴

2. The Greenhouse Gas Emissions Trading Scheme

One of the most prominent market regulations approaches for coping with the problem of limiting access to the common goods involves the use of emissions trading. Applications of this approach have by now spread out to many different types of natural recourses and different countries.¹⁷⁵ A recent survey found nine trading schemes in controlling air quality, seventy-five trading schemes in fisheries, three trading schemes in water resource management, five trading schemes in water quality control, and five applications in land use control.¹⁷⁶ And that survey does

¹⁷⁰ A Jordan and Others 'European Governance and the Transfer of New Environmental Policy Instruments (NEPIs) in the European Union' (2003) 81 Public Administration 555, 566.

¹⁷¹ Commission, Proposal for a Directive Restructuring the Community Framework for the Taxation of Energy Products, COM (1997) 30 final, 12 March 1997.

¹⁷² Council, Directive 2003/96/EC of 27 October 2003 Restructuring the Community Framework for Taxation of Energy Products and Electricity, [2003] OJ L 283/51.

¹⁷³ Commission, Green Paper on Market-Based Instruments for Environment and Related Policy Purposes, COM (2007) 140 final, 28 March 2007, 5.

¹⁷⁴ Council, Presidency Conclusions, 7652/1/08 REV 1, Brussels, 13 and 14 March 2008 <http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/99410.pdf> accessed 30 June 2010, 15.

¹⁷⁵ T Tietenberg 'Tradable Permits in Principle and Practice' in J Freeman and C D Kolstad (eds), *Moving to Markets in Environmental Regulation: Lessons from Twenty Years of Experience* (Oxford University Press, New York 2007), 63.

¹⁷⁶ Cf Organisation for Economic Cooperation and Development (1999) (n 161), 100–113.

not include many current applications, including those that have evolved in the aftermath of the Kyoto Protocol.¹⁷⁷ Emissions trading involves the creation of a market. Government determines the total quantity of emissions at local, regional and national level, by setting overall emission limits. Transferable 'property rights' are created in allowances. Individual allowances are allocated within the overall quantity. Each market participant can freely choose either to be in excess of compliance and purchase allowances on the market or to sell the difference. Decisions depend on the price of allowances as compared to the marginal costs of abatement. Since the state of technology differs from installation to installation, likewise the marginal costs of abatement differ. In theory, thereby the same overall level of pollution is achieved at lower total costs, because reductions are executed where marginal costs of abatement are lowest.¹⁷⁸

Overall, the EU had limited experience in emissions trading.¹⁷⁹ As the Kyoto Protocol entered into force, the Decision 2002/358/EC¹⁸⁰ commits the EU and the Member States to reduce their aggregate pollutant releases of greenhouse gases listed in Annex A to the Protocol by 8% in the period from 2008 to 2012 compared to a 1990 baseline. The decision includes a 'burden sharing' agreement between the Member States. At EU level this would result in a reduction of 7.2% leaving a gap of 0.8% from the Kyoto target. This was accompanied beforehand by extensive debate throughout the EU on the suitability and functioning of such a scheme.¹⁸¹ The scheme is based on Directive 2003/87/EC.¹⁸² According to Article 1, the scheme is set up in order to promote emission reduction in a cost-effective and economically efficient manner. In January 2005, the first EU-wide greenhouse gas emissions trading commenced operation. This trading period ended in December 2007. In total, 11,908 installations participated. However, the actual number of

¹⁷⁷ United Nations, Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1998 <<http://unfccc.int/resource/docs/convkp/kpeng.pdf>> accessed 30 June 2010.

¹⁷⁸ For the conceptual foundation cf T Tietenberg *Emissions Trading: Principles and Practice* (2nd edn Resources for the Future, Washington DC 2006), 25–47.

¹⁷⁹ One flagship example on Member States level which is not discussed in this work is the UK Greenhouse Gas Emissions Trading Scheme. Cf eg P Park 'The UK Greenhouse Gas Emissions Trading Scheme: A Brave New World or the Result of Hurried Thinking?' (2001) 13 *Environmental Law and Management* 292. However, as opposed by the RECLAIM programme it had major deficiencies in the initial design.

¹⁸⁰ Council, Decision 2002/358/EC of 25 April 2002 Concerning the Approval, on Behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the Joint Fulfilment of Commitments Thereunder, [2002] OJ L 130/1.

¹⁸¹ Cf P Park 'The EU Emissions Trading Directive' in M M Roggenkamp and U Hammer (eds), *European Energy Law Report II* (Intensia, Antwerp 2005), 32–35, 37.

¹⁸² European Parliament and Council, Directive 2003/87/EC of 13 October 2003 Establishing a Scheme for Greenhouse Gas Emission Allowance Trading Within the Community and Amending Council Directive 96/61/EC, [2003] OJ L 275/32. Amended by European Parliament and Council, Directive 2009/29/EC of 23 April 2009 Amending Directive 2003/87/EC so as to Improve and Extend the Greenhouse Gas Emission Allowance Trading Scheme of the Community, [2009] OJ L 140/63.

installations covered under the Directive 2003/87/EC changed over time due to new entrants, the closure of installations, and new Member States entering the scheme. The overall number of allowances allocated by competent authorities increased from 2,096 million allowances in 2005 to 2,153 million allowances in 2007. Compared to the actual verified CO₂ emissions for the same period for the 27 Member States, an over-allocation of allowances by 4% was observed for 2005, which decreased to 1% by 2007.¹⁸³ In average, 16% of the initial allowances remained in the new entrants reserves but individual shares among the Member States vary strongly. Most Member States cancelled allowances left over in the new entrants reserve at the end of the first trading period. Only Denmark, Hungary, Ireland and Lithuania have auctioned allowances as an allocation mechanism.¹⁸⁴ The legal nature of allowances is different across Member States, for both the purpose of financial regulation and accounting:

- Some Member States consider allowances to be financial instruments whose trading is supervised by the financial supervisory authority.
- Other Member States consider them to be normal commodities. In the latter case, only the derivatives of these normal commodities are viewed as financial instruments.
- For accounting purposes, allowances are regarded as intangible or financial assets in 12 Member States. In four countries allowances are treated as commodities or stock respectively. In Hungary, the treatment depends on the intended future use of the allowances.
- Only nine Member States reported having adopted specific accounting rules for allowances. In all Member States except Cyprus transactions of allowances are subject to value-added tax.¹⁸⁵

All covered installations are also regulated under the Directive 2008/1/EC. Although Directive 2003/87/EC restricts the regulation of emission limits of carbon dioxide under the integrated pollution prevention and control approach. According to Article 26 the permit does not include an emission limit value for direct emissions of that gas unless it is necessary to ensure that no significant local pollution is caused. This does not remove the obligation of Member States to ensure that the installation-specific best available technique is applied.¹⁸⁶ Regarding the permitting procedure required under both directives, nine Member States apply an integrated permit procedure. The other Member States established separate permit procedures for each of the directives. In Belgium, Germany, France and Lithuania, operators only need one permit for both directives. With the exception of the Czech

¹⁸³ European Environment Agency *Application of the Emissions Trading Directive by EU Member States: Technical Report No 13 (2008)* (Office for Official Publications of the European Communities, Luxembourg 2008), 14.

¹⁸⁴ *Ibid.*, 60–63.

¹⁸⁵ *Ibid.*, 10.

¹⁸⁶ P Park (2005) (n 181), 52–53.

Republic, Denmark, Estonia, Italy and Romania, all countries with separate permit procedures established other ways to coordinate the processes. In many countries a valid permit under Directive 2008/1/EC is a prerequisite for the granting of a permit under the emissions trading scheme. Finally, in 15 Member States, competent authorities will inform trading scheme regulators if an installation also needs a permit for the trading scheme.¹⁸⁷

Under Article 6 (2) (c) and (d) national competent authorities issue permits to market participants requiring monitoring and reporting conditions beforehand. Article 6 (1) sets forth that a permit is issued if the granting authority is satisfied that the market participant is capable of monitoring and reporting emissions. According to Article 6 (2) (e) of Directive 2003/87/EC the greenhouse gas emissions permits must contain ‘an obligation to surrender allowances equal to the total emissions of the installation in each calendar year, as verified in accordance with Article 15, within 4 months following the end of that year’. Article 9 (1) lays down that each Member State is required to set up a national allocation plan regarding the criteria listed in Annex III. It must contain the overall quantity of emissions and the initial allocation of allowances. The Member States then allocate emission allowances to individual market participants. Article 10 contains the method of allocation. For the period from 2005 until 2007, Member States were regulated to allocate at least 95% of the allowances free of charge. For the period from 2008 until 2012 Member States must allocate at least 90% of the allowances free of charge. In this context, arrangements for the allocation of allowances, new entrants and closures have been made. Several Member States mentioned the need for harmonisation of the allocation rules, such as the definition of a combustion installation and the treatment of new entrants and closures. The main lesson learned was identified as the need to simplify the allocation process in order to enhance clarity of the rules and reduce the workload of both authorities as well as companies.¹⁸⁸ However, no major changes as regards allocation method for the current trading period are likely. Notably, it was suggested that there are no free allowances at all in the next trading period commencing in 2012.¹⁸⁹ The Commission may accept or reject national allocation plans, as set forth in Article 9 (3).¹⁹⁰ Notwithstanding, in *United Kingdom of Great Britain and Northern Ireland v*

¹⁸⁷ European Environment Agency (2008) (n 183), 36–37.

¹⁸⁸ *Ibid.*, 60–63.

¹⁸⁹ J B Skjaerseth and J Wettestad *EU Emissions Trading: Initiation, Decision-Making and Implementation* (Ashgate, Hampshire 2008), 194.

¹⁹⁰ As of 17 May 2010 for the second period from 2008 until 2012 all national allocation plans are approved, cf <http://ec.europa.eu/environment/climat/emission/citl_en_phase_ii.htm>. For a comprehensive discussion on the complexity and the creation of unfairness or inefficiency of free allocation cf eg M Peeters ‘Emissions Trading as a New Dimension to European Environmental Law: The Political Agreement of the European Council on Greenhouse Gas Allowance Trading’ (2003) 12 *European Environmental Law Review* 82; A Johnston ‘Free Allocation of Allowances under the EU Emissions Trading Scheme: Legal Issues’ (2006) 6 *Climate Policy* 115.

*Commission*¹⁹¹ the CFI held that a Member State is entitled to propose amendments to its national allocation plan after it has been notified to the Commission, and until its adoption of its decision under Article 11 (1). The Commission is not entitled to constrain the Member State in the exercise of its right when adopting a rejection decision in accordance with Article 9 (3).¹⁹²

Additionally, an initial assessment of the national allocation plans for the trading period from 2008 to 2012 has been elaborated. Comparing proposed caps to the official Member State ‘business as usual’ projections provided in the national allocation plans suggest a shortage of 153 million tonnes CO₂ per year in the second phase. This corresponds to 7% of the total emissions within the scheme. But when proposed caps are compared to ECOFYS analyses there is a predicted surplus of allowances. Total proposed caps are 53 million tonnes CO₂ per year higher than the independent calculation of ‘business as usual’ emissions. The latter corresponds to 2.5% of the total emissions within the scheme. According to ECOFYS analyses there are huge differences between official national emission projections and the independent estimate of ‘business as usual’ emissions. For nine out of the 20 countries investigated the national emission projections are more than 10% higher than the independent projection. This leads to the conclusion that only a few Member States have proposed caps for the second phase that suggest substantial emissions abatement effort being required by participants. The level of a number of caps is not ambitious enough to put Member States on a path to reach their target under the Kyoto Protocol without purchase of joint implementation credits and/or clean development mechanism credits respectively.¹⁹³ Most of these countries have programmes in place for purchasing project-based emission credits. However, only in one out of nine the planned purchase would be sufficient to make up for the gap assuming that the credits are evenly spread over the different sectors in the economy.¹⁹⁴

Article 16 specifies a fixed penalty to be applied against any market participant that fails to surrender sufficient allowances without releasing the market participant from the obligation to surrender an amount of allowances equal to those excess

¹⁹¹ Court of First Instance, Case T-178/05 *United Kingdom of Great Britain and Northern Ireland v Commission* [2005] ECR II-4807. Cf also P Park ‘The Implementation of the Flexible Mechanisms of the Kyoto Protocol in the United Kingdom’ (2006) *International Energy Law and Taxation Review* 156, 158–159.

¹⁹² *United Kingdom of Great Britain and Northern Ireland v Commission* (n 191), paragraph 63.

¹⁹³ The linking directive allows operators covered by Directive 2003/87/EC to use emissions reduction credits from the Kyoto project mechanism for compliance with their obligation under this directive, European Parliament and Council, Directive 2004/101/EC of 27 October 2004 Amending Directive 2003/87/EC Establishing a Scheme for Greenhouse Gas Emission Allowance Trading Within the Community, in Respect of the Kyoto Protocol’s Project Mechanisms, [2004] OJ L 338/18.

¹⁹⁴ Cf ECOFYS ‘Initial Assessment of National Allocation Plans for Phase II of the EU Emission Trading Scheme’ (November 2006) <http://www.ecofys.de/de/veroeffentlichungen/documents/Ecofys_Summary_InitialNAP2_Assessment.pdf> accessed 30 June 2010, 9–10.

emissions when surrendering allowances in relation to the following calendar year; the name of the non-complying market participant must be published. If an operator does not hold sufficient allowances, harmonised non-compliance penalties apply. The excess emissions penalty is €100 for each tonne of carbon dioxide equivalent emitted for which the operator has not surrendered allowances. Member States provided detailed information on penalties which are to be imposed. In practice, the maximum fines differ significantly between Member States for similar infringements from €15 million to €400 million. Operators might also receive prison sentences in seven Member States. Five Member States imposed fines for infringements of national provisions in 2007.¹⁹⁵ The directive initially applies to carbon dioxide, but according to Article 30 (1) expansion to other greenhouse gases is possible. In the first instance it also applies to certain installations, again under Article 30 (1) provision for extension has already been made. The number of greenhouse gases listed in Annex II remained unchanged since 2003. In 2008, Directive 2003/87/EC was amended by Directive 2008/101/EC¹⁹⁶ to include aviation activities in the scheme for emissions trading within the EU.

Currently, a meaningful implication concerning the EU emissions trading scheme is not feasible. The consequences for actual reductions of CO₂ cannot be judged yet. The critical test will be the extent as to which the scheme, over time, leads to more reductions in greenhouse gases as compared to its absence or to a direct regulation measure.¹⁹⁷ In 2009, some relevant amendments for the third emissions trading phase commencing in 2013 have been made. Above all, Article 9 sets forth the EU-wide quantity of allowances. The latter issued each year starting in 2013 decrease in a linear manner beginning from the mid-point of the period from 2008 to 2012. The quantity decreases by a linear factor of 1,74% compared to the average annual total quantity of allowances issued by Member States in accordance with their national allocation plans for the period from 2008 to 2012.¹⁹⁸ Articles 10 to 10c regulate the allocation of allowances.¹⁹⁹ Allowances not allocated free of charge must be auctioned by the Member States from 2013 onwards. By 31 December 2010, the Commission determines and publishes the estimated amount of allowances to be auctioned. At the time of writing, the volume of 'early auctions' before 2013 remained to be decided. The consultation was open until 7 February 2011. It is unclear as to whether the new and rather complex rules

¹⁹⁵ European Environment Agency (2008) (n 183), 10.

¹⁹⁶ European Parliament and Council, Directive 2008/101/EC of 19 November 2008 Amending Directive 2003/87/EC so as to Include Aviation Activities in the Scheme for Greenhouse Gas Emission Allowance Trading Within the Community, [2009] OJ L 8/3.

¹⁹⁷ J B Skjaereth and J Wettstad (2008) (n 189), 193.

¹⁹⁸ European Parliament and Council, Directive 2009/29/EC of 23 April 2009 Amending Directive 2003/87/EC so as to Improve and Extend the Greenhouse Gas Emission Allowance Trading Scheme of the Community (n 182), article 1 (9).

¹⁹⁹ *Ibid.*, article 1 (11) and (12).

simplify the allocation process in order to enhance clarity among Member States.²⁰⁰ Finally, as regards international maritime shipping the Commission should make a proposal to include international maritime emissions according to harmonised modalities within the EU reduction commitment, with the aim of the proposed act entering into force by 2013.²⁰¹

3. Environmental Liability

Environmental liability, the non-contractual obligation to pay for environmental destruction done, has been on the EU policy agenda for many years. Finally, Directive 2004/35/EC came into force in 2004.²⁰² The environmental liability scheme provided by the directive is very modest in comparison with earlier drafts during the negotiation process. Above all, the final regime is confined to administrative law excluding the earlier proposed possibility to empower third parties to bring court actions.²⁰³ Article 2 (1) sets forth three different categories of environmental damage:

- Damage to protected species and natural habitats,
- Water damage and
- Land damage.

According to Article 2 (2), ‘damage’ is defined as ‘a measurable adverse change in a natural resource or measurable impairment of a natural resource service which may occur directly or indirectly’. Article 2 (1) (a) reads: ‘damage to protected species and natural habitats is any damage that has significant adverse effects on reaching or maintaining the favourable conservation status of such habitats or species’. Article 2 (1) (b) reads: ‘water damage is any damage that significantly adversely affects the ecological, chemical and/or quantitative status and/or

²⁰⁰ Notably, in this context Bogojević raised the questions ‘what legal consequences follow from any shifts in this power-relation between the [...] Commission and the Member States’, S Bogojević ‘Ending the Honeymoon: Deconstructing Emissions Trading Discourses’ (2009) 21 *Journal of Environmental Law* 443, 468.

²⁰¹ European Parliament and Council, Directive 2009/29/EC of 23 April 2009 Amending Directive 2003/87/EC so as to Improve and Extend the Greenhouse Gas Emission Allowance Trading Scheme of the Community (n 182), recital 3.

²⁰² European Parliament and Council, Directive 2004/35/EC of 21 April 2004 on Environmental Liability With Regard to the Prevention and Remedying of Environmental Damage, [2004] OJ L 143/56.

²⁰³ For a discussion *cf* M Lee ‘The Changing Aims of Environmental Liability’ (2002) 14 *Environmental Law and Management* 189.

ecological potential, as defined in Directive 2000/60/EC²⁰⁴]. Article 2 (1) (c) reads: ‘land damage is any land contamination that creates a significant risk of human health being adversely affected as a result of the direct or indirect introduction, in, on or under land, of substances, preparations, organisms or micro-organisms’.

Article 3 (1) (a) lays down a strict liability framework in respect of environmental damage incurred on the grounds of the activities listed in Annex III. Under Article 3 (1) (b) the polluter is also liable for damage to protected species and natural habitats caused by any occupational activities other than those listed in Annex III, whenever the market participant has been at fault or negligent. Having said this, strict liability is nevertheless subject to very significant limitation. According to Article 8 (4) (a) and (b) of Directive 2004/35/EC

(t)he Member States may allow the operator not to bear the cost of remedial actions taken pursuant to this Directive where he demonstrates that he was not at fault or negligent and that the environmental damage was caused by:

(a) an emission or event expressly authorised by, and fully in accordance with the conditions of, an authorisation conferred by or given under applicable national laws and regulations which implement those legislative measures adopted by the Community specified in Annex III, as applied at the date of the emission or event;

(b) an emission or activity or any manner of using a product in the course of an activity which the operator demonstrates was not considered likely to cause environmental damage according to the state of scientific and technical knowledge at the time when the emission was released or the activity took place.

This raises questions about the extent to which it is negligent to fail to move ahead of regulations. Further, the risk of particular types of scientific uncertainties remains with the society and not the market participant.²⁰⁵ The directive also describes the nature of the remediation required of the market participant. Annex II (1) lays down that ‘[r]emedying of environmental damage, in relation to water or protected species or natural habitats, is achieved through the restoration of the environment to its baseline condition by way of primary, complementary and compensatory remediation’. Under Annex II (2) ‘[t]he necessary measures shall be taken to ensure, as a minimum, that the relevant contaminants are removed, controlled, contained or diminished so that the contaminated land, taking account of its current use or approved future use at the time of the damage, no longer poses any significant risk of adversely affecting human health’. Therefore, the need for evaluation of environmental damage in monetary units, as merely listed in Annex II (1.2.2) and (1.2.3) is brought to a minimum by concentrating on physical remediation.

²⁰⁴ European Parliament and Council, Directive 2000/60/EC of 23 October 2000 Establishing a Framework for Community Action in the Field of Water Policy, [2000] OJ L 327/1.

²⁰⁵ M Lee (2005) (n 106), 206.

III. Market Regulations Under US Laws

1. Environmental Taxes

The US, at the federal level, imposes a very limited number of environmental taxes, albeit numerous taxes and user fees are imposed at the state and local level.²⁰⁶ As regards water pollution economists have long promoted pollution taxes as a policy to improve water quality. Above all, one of the reasons is that sources of water pollution are varied and difficult to assess individually in terms of control costs. As early as in the late 1960s and early 1970s, pieces of legislation calling for a national effluent charge were introduced in the House of Representatives and the Senate. It is noteworthy that, ultimately, these efforts went nowhere.²⁰⁷ As regards air pollution, among the few taxes imposed in the US at the federal level is the gas guzzler tax under the Energy Tax Act of 1978.²⁰⁸ The act created, among other things, a tax which applies to the sales of vehicles with official EPA-estimated gas mileage exceeding certain specified levels. In order to meet the requirements established under the Montreal Protocol²⁰⁹ to limit the release of ozone-depleting chemicals, the federal government levied a tax on specific substances in 1989. In this case the user had to pay a fee which was set proportional to a chemical-specific ozone-depleting factor.²¹⁰

²⁰⁶ Cf E S Goodstein *Economics and the Environment* (5th edn Wiley, Hoboken NJ 2008), 347–351; R N Stavins ‘Market-Based Environmental Policies’ in P R Portney and R N Stavins (eds), *Public Policies for Environmental Protection* (2nd edn Resources for the Future, Washington DC 2000), 41–50.

²⁰⁷ J Boyd ‘Water Pollution Taxes: A Good Idea Doomed to Failure?’ (May 2003) Resources for the Future Discussion Paper No 3–20 <<http://www.rff.org/rff/documents/RFF-DP-03-20.pdf>> accessed 30 June 2010, 1, 4.

²⁰⁸ Congress, Energy Tax Act of 1978, Public Law 95–618, 92 Stat 3174. Cf 26 USC § 4064 (2010).

²⁰⁹ United Nations Environment Programme, The Montreal Protocol on Substances that Deplete the Ozone Layer, 2000 <<http://www.unep.org/ozone/pdfs/montreal-protocol2000.pdf>> accessed 30 June 2010.

²¹⁰ R N Stavins (2000) (n 206), 48. Because the federal government has also set up an emissions trading scheme requiring producers to have adequate allowances, substantial debate centred on the question which mechanism should be credited with the success that has taken place, cf R W Hahn and A M McGartland ‘The Political Economy of Instrument Choice: An Examination of the US Role in Implementing the Montreal Protocol’ (1988) 83 *Northwestern University Law Review* 592; N O Keohane, R L Revesz and R N Stavins ‘The Choice of Regulatory Instruments in Environmental Policy’ (1998) 22 *Harvard Environmental Law Review* 313.

2. Emissions Trading

This section discusses two of the most prominent examples of emissions trading schemes established under US federal law.

a) The Acid Rain Programme

The US has had numerous experiences with emissions trading programmes on federal and state level.²¹¹ One flagship example is the SO₂ trading scheme. Acid deposition occurs when emissions of SO₂ and NO_x from fossil fuel combustion react with water, oxygen, and oxidants in the atmosphere to form various acidic compounds. The Acid Rain Programme is established under 42 USC §§ 7651-7651o of the CAA. It requires reductions of SO₂ and NO_x emissions from the electric power industry. Accounting for 69% of total SO₂ emissions nationwide, electric power generation is by far the largest single source of SO₂ emissions in the US. The trading scheme was implemented in two phases for SO₂ and NO_x. Phase I applied primarily to the largest coal-fired electric generation sources from 1995 until 1999 for SO₂ and from 1996 until 1999 for NO_x. Phase II for both pollutants began in 2000, expanding coverage of the programme, and tightening the SO₂ cap on affected sources.

The SO₂ programme sets a permanent cap on the total amount of SO₂ that may be emitted by electric generating units in the US. The programme is phased in, with the final 2010 SO₂ cap set at just under 9 million tonnes, a level of about one-half of the emissions from the power sector in 1980.²¹² Using a cap and trade mechanism to reduce SO₂ emissions allows flexibility for individual combustion units to select their own way of compliance. Currently, one allowance provides each electric generating unit limited authorisation to emit one tonne of SO₂. The scheme allocates allowances based on historic fuel consumption and specific emission rates prior to its start. According to 42 USC § 7651b (a) allowances are allocated by the EPA without cost to the recipient, except for allowances sold under 42 USC § 7651o. For example, a small proportion of allowances is available at auction. The total allowances allocated for each year equal the SO₂ emission cap. The programme encourages early reductions by allowing sources to bank unused allowances from 1 year and use them in later years. The Acid Rain Programme adopts a more traditional approach to achieve NO_x emission reductions. Rate-based limits apply to most of the coal-fired electric utility boilers subject to the Acid

²¹¹ Cf R N Stavins (2000) (n 206), 35–41. One flagship example on state level is the Regional Clean Air Incentives Market (RECLAIM) programme of California which is not discussed here. As to RECLAIM cf eg P Bader and F Rahmeier 'Das RECLAIM-Programm handelbarer Umweltlizenzen' (1996) 19 Zeitschrift für Umweltpolitik und Umweltrecht 43.

²¹² US Environmental Protection Agency *Acid Rain and Related Programs: 2007 Progress Report* (US Environmental Protection Agency, Washington DC 2009), 5.

Rain Programme. An owner can meet these NOX limits on an individual unit basis or through averaging plans involving groups of its units.

The point sources regulated under the Acid Rain Programme have decreased annual SO₂ emissions by 49% compared with 1980 levels and 43% compared with 1990 levels. Reductions in SO₂ emissions from other sources outside of the Acid Rain Programme scope, including industrial and commercial boilers and the metals and refining industries, and use of cleaner fuels in residential and commercial burners contributed to a 50% decline in annual SO₂ emissions from all sources since 1980. National SO₂ emissions from all sources have fallen from nearly 26 million tonnes in 1980 to less than 13 million tonnes in 2007. In the latter year, EPA allocated over 9.5 million SO₂ allowances under the Acid Rain Programme. Together with over 6.2 million unused allowances banked from prior years, there were 15.8 million allowances available for use in 2007. Sources emitted approximately 8.9 million tonnes of SO₂ in 2007, less than the allowances allocated for the year, and far less than the total allowances available.²¹³

b) Prospects for Federal Legislation on Greenhouse Gas Emissions Trading

During the 2007–2008 Congress, no fewer than 10 comprehensive climate-focused Bills were introduced, including the Lieberman–Warner Bill which proceeded further in the legislative process than any previous comprehensive climate change measure before being defeated in the Senate.²¹⁴ Likewise, the current Congress has seen significant legislative activity on global warming. Most notably was the discussion of such a scheme introduced under Waxman–Markey Bill, HR 2454.²¹⁵ On 26 June 2009, the House of Representatives passed the Bill by a vote of 219 Ayes, 212 Nays, and 3 Present/Not Voting, and it was subsequently placed on the Calendar in the Senate. The Bill applies to certain installations such as electric utilities, oil companies, large industrial sources, and other covered entities.²¹⁶ Bill 2454 provides that CO₂ and other greenhouse gases may not be regulated as criteria pollutants or hazardous air pollutants on the basis of their effect on global warming and therefore pre-empts the CAA. This bill never became law. This bill was proposed in a previous session of Congress. Sessions of Congress last 2 years, and at the end of each session all proposed bills and resolutions that have not passed are cleared from the books. The most recent initiative was started on 12

²¹³ Ibid, 6.

²¹⁴ K R LaMotte, D M Williamson and L A Hopkins ‘Emissions Trading in the US: Legal Issues’ in D A Freestone (ed), *Legal Aspects of Carbon Trading: Kyoto, Copenhagen and Beyond* (Oxford University Press, Oxford 2009), 413.

²¹⁵ House of Representatives, 2454, 111th Congress (2009).

²¹⁶ Committee on Energy and Commerce ‘The American Clean Energy and Security Act of 2009’ (31 May 2009) Discussion Draft Summary <http://energycommerce.house.gov/Press_111/20090331/acesa_summary.pdf> accessed 30 June 2010, 3.

May 2010 as Senators Kerry and Lieberman held a press conference to unveil the American Power Act, a Bill which is introduced to the Senate.²¹⁷ Most of the legislative proposals have adopted some sort of market trading approach, although there are substantive differences between the bills in terms of sectoral coverage, distribution of allowances, emission reduction targets and paths, governmental oversight, and use of emissions offsets from unregulated sectors and international linkages. There continues to be support from the Obama Administration and Congressional leaders in favour of action to tackle climate change. At this point, prospects for federal legislation on greenhouse gas emissions trading in the US look uncertain. First and foremost, the pace of the legislative activity is influenced by the lack of concrete agreements during the session of the parties to the UNFCCC which was held in Copenhagen in December 2009. As of June 2010, the negotiations held in Bonn appear to be intricate on the basis of the loose Copenhagen Accord. The outcome of the UNFCCC summit which took place in Cancun, Mexico, from 29 November to 10 December 2010 was an agreement, though not a binding treaty. Realities of the US political system and continuing resistance as well as scepticism from Sister States with particular interests stemming from heavy industry and coal mining make it highly unlikely that federal bills, first and foremost between Congress and Senate, will be negotiated and finalised before end of 2012.²¹⁸ However, whether draft legislation will enter into force depends on the overall political landscape and some unpredictable momentums, such as China's and India's position on the issue, catastrophic events such as the oil spill in the Gulf of Mexico or the floods in Bangladesh and Australia present at that time.

3. Environmental Liability

The Comprehensive Environmental Response, Compensation, and Liability Act,²¹⁹ commonly referred to as CERCLA or Superfund, was passed by Congress in 1980 and was subsequently signed into law. It changed the contours of US environmental law dramatically by equipping the EPA with a liability scheme of unprecedented scope. The courts found that market participants were jointly and severally liable for the entire costs of cleanup. The courts also found that the liability was retroactive in the sense that activities before the enactment of the law in 1980 were also subject to strict liability under CERCLA.²²⁰ According to § 9601 (6) damages are defined as injury or loss of natural resources. § 9601 (8) (A) and (B) read that the

²¹⁷ J Kerry and J Lieberman 'American Power Act Bill Will Secure America's Energy, Climate Future' (12 May 2010) Press Release.

²¹⁸ K R LaMotte, D M Williamson and L A Hopkins (2009) (n 214), 413–414.

²¹⁹ Congress, Comprehensive Environmental Response, Compensation, and Liability Act of 1980, Public Law 96–510, 94 Stat 2767. Cf 42 USC §§ 9601–9675 (2010)

²²⁰ For an extensive introduction and discussion cf A Topol and R Snow *Superfund Law and Procedure* (West, St Paul Minn 1992).

term ‘environment’ means the navigable waters, the waters of the contiguous zone, and the ocean waters as well as any other surface water, ground water, drinking water supply, land surface, or ambient air. § 9607 (a) lays down a strict liability framework for market participants, commonly called ‘potentially responsible parties’, in respect of environmental damage incurred. Initially, CERCLA laid down only a narrow set of available defences. When Congress amended CERCLA in 1986, through SARA,²²¹ it addressed a number of issues.²²² *Inter alia*, it created an exemption from liability for innocent landowners who purchase unaware of the contamination, as set forth in § 9601 (35). But for the most part, SARA strengthened the liability regime under CERCLA.²²³ Since SARA, three amendments to CERCLA have been made having one theme in common: all three narrowed the liability scheme. The 1996 amendment²²⁴ created safe havens for lenders who may have collected some level of ownership or control over the ground as part of managing a loan as well as for persons who were involved in activities in a solely fiduciary capacity. The 1999 amendment²²⁵ created a defence to liability for specified categories of persons who sent material to a site solely for the purpose of recycling and not for disposal. The 2002 amendment²²⁶ exempted small businesses from liability which had contributed to small amounts of waste on a site and where the waste was more in the nature of ordinary household waste than industrial waste. In order to encourage productive reuse of brownfields, understood as no longer used contaminated sites, it provides grants for redevelopment by, *inter alia*, creating a defence to liability for bona fide prospective purchasers. This is a class much broader than the innocent landowners under SARA.²²⁷ Under this liability regime the market participant is made liable for the government’s costs of site cleanup. Further, it authorises the EPA to require the market participant to execute the cleanup himself. Hence, the focus is on the physical remediation.

²²¹ Congress, The Superfund Amendments and Reauthorization Act of 1986 (n 17).

²²² For an extensive introduction and discussion *cf* S C Clarkson, S C Whitney and J W LaMoreaux (eds) *SARA, the Superfund Amendments and Reauthorization Act of 1986: The Legislative History* (Institute of Law and Public Health Protection, Environmental Institute for Waste Management Studies, Arlington Virginia 1987).

²²³ M Gerrard and J M Gross *Amending CERCLA: The Post-SARA Amendments to the Comprehensive Environmental Response, Compensation, And Liability Act* (American Bar Association, Chicago 2006), 2.

²²⁴ Congress, Asset Conservation, Lender Liability, and Deposit Insurance Protection Act of 1996, Public Law 104–208, 110 Stat 3009.

²²⁵ Congress, Superfund Recycling Equity Act of 1999, Public Law 106–113, 113 Stat 1536.

²²⁶ Congress, Small Business Liability Relief and Brownfields Revitalization Act of 2001, Public Law 107–118, 115 Stat 2356.

²²⁷ *Cf* M Gerrard and J M Gross (2006) (n 223), 2–3.

IV. Interim Result

Theoretically, market regulations are more appealing than direct regulations due to their enhanced flexibility and efficiency. However, there are real dilemmas attached to the practical use of market regulations. For example, if the market is inelastic, a market in which demand for the product remains relatively constant regardless of a price increase, increased costs are conveyed to the consumer and pollutant releases of the market participant remain at the same level. Under those circumstances, it is arguable whether market regulations are, in practice, a distinct regulatory class or should only be implemented alongside direct regulations.²²⁸ Quintessentially, ideological conflicts about the proper role of the government and its regulatory bodies can be seen in the area of market regulations.²²⁹

Overall, in the EU and US jurisdictions a very limited number of pollution taxes are in place, albeit the EU Member States and the US Sister States have extensive experience with a variety of environmental taxes which have not been discussed in this part. It appears that a predominant share of tax systems have not had the incentive effects expected from a Pigouvian tax. This has been due to the structure of the systems as well as the low levels at which taxes have been set.²³⁰ Since the States within the economic areas compete to settle market participants for job

²²⁸ At the risk of oversimplifying, economists generally tend to have a more favourable opinion on market regulations, although pointing out deficiencies in subareas, *cf eg* R N Stavins 'A Meaningful US Cap-And-Trade System to Address Climate Change' (2008) 32 *Harvard Environmental Law Review* 293; R N Stavins 'Addressing Climate Change With a Comprehensive US Cap-and-Trade System' (2008) 24 *Oxford Review of Economic Policy* 298; T Tietenberg (2006) (n 178), 188–206; R W Hahn (2005) (n 72), 39–40; R W Hahn and R N Stavins (1991) (n 111); R W Hahn 'Economic Prescriptions for Environmental Problems: How the Patient Followed the Doctor's Orders' (1989) 3 *Journal of Economic Perspectives* 95; R W Hahn and G L Hester 'Where Did All the Markets Go? An Analysis of EPA's Emissions Trading Program' (1989) 6 *Yale Journal on Regulation* 109; R W Hahn and G L Hester 'Marketable Permits: Lessons for Theory and Practice' (1989) 16 *Ecology Law Quarterly* 361; J H Dales (1968) (n 84); R H Coase (1960) (n 41). As opposed by legal scholars who tend to have a more careful and sceptical opinion on market regulations, although praising some achievements. *Cf eg* D M Driesen 'Design, Trading, and Innovation' in J Freeman and C D Kolstad (eds), *Moving to Markets in Environmental Regulation: Lessons from Twenty Years of Experience* (Oxford University Press, New York 2007); D M Driesen (2006) (n 156); M Lee (2005) (n 106), 183–212; P Park (2005) (n 181); P Park 'Implementation of the European Union Emissions-Trading Scheme in the United Kingdom: Some Lessons to be Learned' in O K Fauchald and J Werksman (eds), *Yearbook of International Environmental Law 2005* (Oxford University Press, Oxford 2007); D M Driesen (2003) (n 93); D M Driesen 'What's Property Got to Do With It?' (2003) 30 *Ecology Law Quarterly* 1003; E Rehbinder 'Market-Based Incentives for Environmental Protection' in R L Revesz, P Sands and R B Stewart (eds), *Environmental Law, the Economy and Sustainable Development: The United States, the European Union, and the International Community* (Cambridge University Press, Cambridge Mass 2000); D M Driesen (1998) (n 112); J Scott *EC Environmental Law* (Longman, London 1998), 44–63.

²²⁹ M Lee (2005) (n 106), 212.

²³⁰ R N Stavins (2000) (n 206), 41.

growth and other purposes, this fundamentally compromises the efficacy and efficiency of levied pollution taxes. First, it can be argued that, in theory, a level playing field can best be reached at the EU and US level of each of the jurisdictions. Secondly, it can be argued that, in theory, this level provides the best position to implement those measures effectively and efficiently.

The EU had very limited experience in emissions trading. The greenhouse gas emission scheme was the first of its kind. Out of many lessons learned,²³¹ three things are pointed out in this work. First, the emissions from market participants under the trading scheme are pre-empted from other regulatory issues, such as the Clean Air Act or the Directive 2008/1/EC. The integration approach is hardly advanced under these circumstances.²³² In fact, it might appear as a back draw concerning the fact that the environment is again considered in separate components.²³³ Secondly, it can create regional hot spots with unacceptable pollution levels.²³⁴ Thirdly, the artificial set up of a true market appears also to be more difficult in practice than in theory particularly with regards to the allocation of allowances. For instance, the free allocation of emission allowances raises concerns regarding competition. In fact, it creates a reproduction of the direct regulation problem: regulating old installations less stringently than new ones with the consequence that new installations can hardly compete with older, dirtier ones.²³⁵ In sum, it can be stated that the complexity of the system as a whole sets a daunting task to the regulator, out of which some areas may be resolved, others not.²³⁶ The overall EU cap amended in 2009 and decreasing from 2013 onwards can be describes as being a dynamic performance standard as set forth under a direct regulation. Noteworthy is the approach as regards enforcement in Romania. If the provisions of the permit under Directive 2003/87/EC are not met by an operator, the permit is suspended after 30 days advanced formal notice. This procedure allows the operator to fulfil his obligation. The suspension period is maintained until the causes are removed for a maximum period of 6 months. If the causes which lead to suspension of the permit are not removed, the competent authority may decide to cancel the permit and to order the activity of the installation to cease.²³⁷ The US has long-term experience in emissions trading on federal level, for instance, with the Acid Rain Programme. However, a scheme for greenhouse gases has not yet been established.

Environmental liability is able to respond to numerous different tasks. *Inter alia*, it provides funds for restoration or remedies wrongdoings and it can supplement

²³¹ Cf eg T Tietenberg (2006) (n 178), 188–205.

²³² A Farmer ‘Revising IPPC: Incremental Change Rather than a Radical Overhaul of EU Industrial Emissions Policy’ (2008) 10 *Environmental Law Review* 258, 266.

²³³ M Lee (2005) (n 106), 199 fn 88.

²³⁴ Cf E Rehbinder (2000) (n 228), 246–247.

²³⁵ M Lee (2005) (n 106), 202.

²³⁶ P Park (2005) (n 181), 51.

²³⁷ European Environment Agency (2008) (n 183), 73.

centralised enforcement of environmental laws.²³⁸ However, it applies only to certain kinds of pollutant releases which might explain the relative focus of the EU and US liability scheme on land and water pollution. Land and water pollution has, however, to a lesser extent been targeted under the categories of environmental taxes and emissions trading, which concentrate mainly on air pollution.

D. Conclusion of the Chapter

This is a selective and simplified picture of environmental and innovation economics, direct, as well as market regulations in the EU and US. This chapter neither attempts to assess single regulations nor to compare the first kind with the latter. Despite this incompleteness, this second chapter describes the actual state of affairs as regards environmental regulatory theory and major regulations. To make this clear, all efforts regarding the conservation of nature and the outcome respectively must be welcomed. The critique serves the quest for advancement of the current state of play. However, it appears that direct and market regulations in general are targeted at a very narrow range of pollutants, activities, and environmental media. Intentionally, direct and market regulations raise pressure on polluters to mandatorily change behaviour. The question arises as to whether the regulated pollutants are substituted by increasing releases of other existing pollutants into the environment or the introduction of totally new pollutants into the environment, creating future challenges ahead. Hence, it can be stated that the regulatory framework fails to establish a true and fair view on pollutant releases.

It can be argued that based on the insight into free rider behaviour and the tragedy of the commons, involvement of government is necessary in order to tackle externalities such as pollutant releases. Direct regulations contributed to reducing pollutant releases over the past 40 years and are today qualified as a distinct class of regulations. Criticism is also widespread. Heralded in theory, market regulations during the past 30 years contributed to conservation of nature to some extent. Deployment in practice appears to be challenging. Interestingly, it was observed that market regulations also depend on government. This type of regulation requires a sophisticated government apparatus set up and operated by well educated individuals acting in the public interest.²³⁹ For as long as the ‘ecological citizen’²⁴⁰ prevails prospectively, market legislation performs a useful role.²⁴¹ Adherent to the insight into free rider behaviour and the tragedy of the commons it might appear questionable as to whether market regulations qualify as a distinct class of

²³⁸ M Lee (2005) (n 106), 207.

²³⁹ Following the term ‘economic rationalist’ stamped by J S Dryzek *The Politics of the Earth: Environmental Discourses* (2nd edn Oxford University Press, Oxford 2005).

²⁴⁰ Cf A Dobson *Citizenship and the Environment* (Oxford University Press, Oxford 2003).

²⁴¹ M Lee (2005) (n 106), 212.

regulations.²⁴² Rather it has to be seen through the lens of what way actually achieves the reduction of pollutant release. In other words: which way fosters environmental innovations most. Only recently, three lessons with regards to direct and market regulations have been drawn:

- First, though it seems to be obvious, comparison between direct and market regulations must be fair. It would be incomprehensive to compare an idealised emissions trading scheme with a flawed existing performance standard. A fair comparison is challenging. The absence of rich *ex post* material particularly on the effects of direct regulations prevents such comparison, above all, due to methodological difficulties.
- Secondly, both direct and market regulations suffer in practice from many of the same weaknesses, including a substantial lack of monitoring and enforcement. Moreover, with both kinds of instruments, policy makers can sometimes find it difficult to pay attention to all relevant details of the context in which the tool will be deployed, resulting in significant design flaws.
- Thirdly, as regards evaluation of market regulations, it is important to ask not only whether they offer cost savings as compared to direct regulations, but also whether and to what extent they accomplish the regulatory purpose for which they are designed.²⁴³

The current state of play reached on the grounds of direct and market regulations can hardly – if at all – be described as being at a satisfactory level. The current regulatory regime set the stage where the much younger mandatory environmental information disclosure came into operation. Information is widely acknowledged as a prerequisite to local, national and international environmental management. The availability of and access to information ensures the participation of the public at large in all kinds of decision-making processes. It can further influence individual, consumer, corporate and government behaviour as well as capital and labour markets. Information also allows the regulatory authority to determine whether the regulated market participants are complying with their legal obligations.²⁴⁴ Therefore, the approach of mandatory environmental information disclosure must be advanced in Chaps. 3 and 4 of this work by outlining the current legal frameworks of E-PRTR and TRI.

²⁴² Notably in this context, however, the two notes on the Coase Theorem, cf G J Stigler ‘Two Notes on the Coase Theorem’ (1989) 99 Yale Law Journal 631. Stigler tests the Coase Theorem with the efficiency of smaller markets as well as transaction costs and points out the relevance of the domain in which a theory is applied. He argues that a property law would not affect the distribution of income but may successfully be compromised by the method of allocation which determines the windfall gains.

²⁴³ J Freeman and C D Kolstad ‘Prescriptive Environmental Regulation versus Market-Based Incentives’ in J Freeman and C D Kolstad (eds), *Moving to Markets in Environmental Regulation: Lessons from Twenty Years of Experience* (Oxford University Press, New York 2007), 7.

²⁴⁴ P Sands (2009) (n 9), 826.

Deficits in EU and US Mandatory Environmental
Information Disclosure
Legal, Comparative Legal and Economic Facets of
Pollutant Release Inventories
Bünger, D.
2012, XXX, 490 p., Hardcover
ISBN: 978-3-642-22756-1