Can and should patent law help cool the planet? An inquiry from the point of view of environmental law

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Introduction

It has now almost become trite to say that global warming is one of the most pressing problems we are facing. Very few would also now deny that the cause of this greenhouse effect and the correlated climate change is man.[1] What has not been much noted so far is that this extraordinary release of greenhouse gases (GHG) in the earth's atmosphere may be due in major part to our patent laws. Indeed, the main goal of patent laws is to incentivise industrial and technological development, which in turn creates pollution including the release of GHG. The question is therefore whether patent law should play a role in the protection of the environment and more specifically in cooling the planet. The first sub-question to ask is whether patent

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[1] "In November 2007, the United Nations Intergovernmental Panel on Climate Change (IPCC) finalised its Fourth Assessment Report (AR4), summarising six years of rigorous scientific research and analysis of the way the world's climate is changing. This landmark report will certainly not be the last word in the climate change debate, but it establishes *beyond all reasonable doubt* that greenhouse gas emissions from human activity are generating global warming which could have a devastating impact on people, our economies and our environment" (emphasis added). See http://ec.europa.eu/environment/climat/campaign/news/news08_en.htm The report is available at http://www.ipcc.ch/ipccreports/ar4-syr.htm (all web sites have been last accessed on 12 October 2008).

justifications accommodate this goal. This was the subject of a previous article.[2] It was there discovered that despite the outwardly neutrality of patent laws, the latter in fact already cater to some extent for the protection of the environment through article 53.a of the European Patent Convention (EPC)[3] and corresponding national provisions. The research also showed that current justifications do not prevent taking environmental concerns, and more particularly climate change, into account and some seem even amenable to it. In this light, it was submitted that patent justifications and laws should be rethought to include environmental goals.

The next question is, notwithstanding this conclusion, whether patent law should be fulfilling this role in addition to environmental law. And if so, what role - modest or more pronounced - it should play in the prevention of pollution and the reduction of greenhouse gases in particular and how it should be implemented in practice. This article seeks to provide an answer to these questions. It will show that whatever the position of positive patent law and its philosophical justifications are, in the European Union (EU), patent laws must take account of environmental laws, because the European Community Treaty (ECT[4]) forces them to. Section 1 examines the general environmental principles, as they apply to the issue of climate change, and the specific rules relating to global warming in order to discover what the impact of environmental laws on patent laws is. Section 2 envisages concretely how patent law can help further reduce GHG emissions in the atmosphere over and above the current environmental laws. It reviews the different possible systems that can be put in place (negative, positive or mixed), determines which one is best (sections 2.1-2.3), the way to ascertain the eco-friendliness of an invention and who bears this burden of proof (section 2.4). The article concludes that patent laws urgently need to address environmental concerns and more particularly the problem of climate change and advocates the adoption of a mixed system. The focus is on European and national patent and environmental laws. The specific problem addressed is global warming. Many of the conclusions could also apply to environmental protection in general although more research would need to be carried out to make such general extrapolation.

1. Environmental protection and reduction of greenhouse gases: the exclusive role of environmental law?

Should patent laws address the global warming issue or are environmental laws sufficient? In other words, are the latter already adequately addressing the problem? Doesn't the argument that patent law should be modified to grant specific treatment to eco-friendly inventions and mores specifically those emitting less GHG lose its teeth in view of the existing environmental law framework? In order to answer these questions, one has to examine what environmental laws actually provide (section 1.1.). In order to discover what role environmental laws play in the reduction of GHG emissions, an examination of the general principles of environmental law (sub-section

[2] E. Derclaye, "Patent law's role in the protection of the environment - Re-assessing patent law's functions and justifications in the 21st century", forthcoming [Note to the editor: submitted for publication, awaiting answer, which should come very soon].

[3] Article 53.a provides: "European patents should not be granted in respect of (a) inventions the publication or exploitation of which would be contrary to "ordre public" or morality, provided that the exploitation shall not be deemed to be so contrary merely because it is prohibited by law or regulation in some or all contracting states".

[4] Coordinated version, OJEC, 24.12.2002, C 325/33.

1.1.1) and the more specific rules relating to the reduction of GHG emissions is in order (sub-section 1.1.2). It will be seen that environmental law is a good starting point but that more needs to be done not only through environmental laws themselves but also through patent laws because of certain guiding principles of environmental law (section 1.2.). The analysis of environmental rules also shows that there is virtually no conflict between patent and environmental laws (section 1.3).

1.1. Environmental law in a nutshell

1.1.1. General principles

Before examining the general principles governing EU environmental law, it is necessary to clarify what legally speaking the notion of environment covers. The definition of environment varies, but it mainly includes everything apart from human beings, namely land, air, water, fauna, flora and natural eco-systems.[5] According to UNCTAD's interpretation of the TRIPs Agreement, the environment refers to "the surrounding objects, regions, or conditions especially circumstances of life of persons or society".[6] Whilst the EC treaty does not define the environment, one can derive a wide definition from article 174.1 and 175.2. Accordingly, in the EU, the environment includes human beings, natural resources, land use, town and country planning, archaeological and natural heritage, waste, water, air, fauna and flora.[7] Environmental law is perhaps best defined by the concept of sustainable development, which recognises that nature and human activities are fundamentally interconnected and interdependent.[8] The concept of sustainable development is itself part of the European legal order as will be examined below.

The European Community Treaty (ECT) requires protection of the environment. Environmental protection is dealt with at two different places in the treaty, namely in articles 2 and 6 (both within Part I "Principles") and in articles 174, 175 and 176 (in Part III, Title XIX "Environment"). The first four environmental principles (namely the prevention principle, the polluter-pays principle, the rectification at source principle and the integration principle) were introduced in the Treaty in 1987.[9] The first four of these are enshrined in article 174 ECT whilst the last one is laid down in article 6.[10] The precautionary principle was added later in the Treaty and entered into force on 1 November 1993.[11] The notion of sustainable development was added in 1997 in the Treaty of Amsterdam which entered into force in 1999 (article 2).[12]

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[5] J. Thornton & S. Beckwith, *Environmental Law*, Sweet & Maxwell, 2nd ed., 2004, p. 5; P. Stookes, *A Practical Approach to Environmental Law*, Oxford: Oxford University Press, 2005, p. 12.

[6] A. Plomer et al., *Stem cell patents: European patent law and ethics report*, p. 95 citing UNCTAD Resource Book on TRIPs and development: an authoritative and practical guide to the TRIPs agreement, http://www.iprsonline.org/unctadictsd/resourcebookindex.htm (2005-08-03), updated version as of 1 June 2005, p. 376 referring to Concise Oxford Dictionary p. 323.

[7] L. Krämer, *EC Environmental Law*, 6th ed., p. 1-2. The inclusion of town and country planning shows that the environment also includes the man-made environment. Ibid.

[8] Thornton & Beckwith, above fn. 5, p. 6, 12.

[9] Krämer, above fn. 7, p. 21, 8-9.

[10] The integration principle originated in 1987 in article 130R(2) ECT and was revised in 1992 and 1999. N. Dhondt, *Integration of Environmental Protection into other EC Policies*, Groningen, 2003, p. 16.

[11] W. Douma "The precautionary principle in the EU" [2000] 9(2) RECIEL 132-143, p. 132.

[12] An embryonic version of the notion of sustainable development already existed in the Maastricht Treaty in 1992. S. Bell & D. McGillivray, *Environmental Law*, 6th ed., Oxford: Oxford University Press, 2006, p. 197.

Articles 174-176 are defined so broadly that hardly any area of environmental policy is left outside the competence of the EU.[13] These principles and rules are then further elaborated in secondary legislation. They apply to environmental policies generally and therefore also to the reduction of GHG emissions. Most of these principles are also enshrined in international conventions[14] and in national laws.[15] The Treaty also sets out four objectives in articles 174-176 namely: preserving, protecting and improving the quality of the environment, protecting human health, using natural resources prudently and rationally and promoting measures at an international level to deal with regional and worldwide environmental problems. There is no hierarchy between them and they sometimes conflict.[16]

The most important provisions for our purposes are the six principles listed above. They will be examined in turn.

1.1.1.1. The principle of sustainable development

The concept of sustainable development is stated in both articles 2 and 6 ECT. Article 6 mentions that environmental protection must promote sustainable development. Article 2 provides that the EU must promote a "harmonious, balanced and sustainable development of economic activities" and also requires "a high level of protection and improvement of the quality of the environment". Article 2 applies across all areas. A high level of protection entails that measures which only provide for the lowest common denominator of environmental protection may no longer be adopted but it allows individual Member States to adopt more stringent measures if they wish.[17]

Sustainable development is therefore a stated objective of the European Union.[18] The concept is not further defined in the Treaty and has not yet been interpreted by the ECJ.[19] And after 20 years of discussion, there is still no international consensus on the precise meaning of sustainable development.[20] In fact, there arguably are more than 200 definitions for it, the most agreed with definition being that of the Brundtland Commission's 1987 Report, *Our Common Future*.[21] This is also the meaning the concept has in EU law.[22] It defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations

[13] Thornton & Beckwith, above fn. 5, p. 83.
[14] For international law on these principles, see Thornton & Beckwith, above fn. 5, p. 41 ff. The precautionary and polluter pays principles are enshrined in the Rio Declaration. The prevention principle is enshrined in article 2 of the UNFCCC (United Nations Framework Convention on Climate Change) 1992 which states that "the ultimate objective is to achieve the stabilisation of greenhouse gas emissions in the atmosphere to a level that would prevent dangerous anthropogenic interference with the climate system".
[15] N. de Sadeleer, *Environmental principles: from political slogans to legal rules*, Oxford: Oxford Univ. Press 2005, p. 330. This means that the principles are addressed to private and public users of the environment in contrast with international and EU laws which are only addressed to states.
[16] Thornton & Beckwith, above fn. 5, p. 83.
[17] Krämer, above fn. 7, p. 12; Thornton & Beckwith, above fn. 5, p. 82.
[18] P. Davies, *European Union Environmental Law, An Introduction to Key Selected Issues*, Ashgate: Aldershot, 2004, p. 28; Dhondt above fn. 10, p. 56.
[19] Bell & McGillivray, above fn. 12, p. 64-65. However, "it is possible to identify judgments which implicitly incorporate some of the more important aspects of sustainable development, including the balancing of environmental considerations as against other issues."
[20] Krämer, above fn. 7, p. 9; Dhondt above fn.10, p. 60 citing other authors.
[21] Thornton & Beckwith, above fn. 5, p. 12, 82.
[22] Dhondt above fn.10, p. 72.

to meet their own needs". Sustainable development is often regarded as pursuing the three goals of social development, economic development, and environmental protection and enhancement.[23] It has also been suggested that sustainable development consists of four elements:

- "the need to preserve natural resources for the benefit of future generations (the principle of "intergenerational equity")
- the aim of exploiting natural resources in a manner which is sustainable or prudent (the principle of "sustainable use")
- the equitable use of natural resources, implying that, in using resources, states must take account of the needs of other states ("the principle of equitable use" or "intragenerational equity")
- the need to ensure that environmental considerations are integrated into the economics of development plans and that development needs are taken into account in applying environmental objectives (the principle of "integration")".[24]

The requirement of meeting the needs of future generations can be interpreted in two different directions. One view is that the next generation must inherit a stock of environmental assets no less than the previous generation. The other view is that the principle can be satisfied by leaving a stock of environmental assets but also technological assets and know-how. Therefore, some environmental assets can be traded off against technology. For instance, if a type of landscape disappears, it is sufficient if technology can replace it (i.e. people can experience the landscape for instance by computer).[25]

However, the concept of sustainable development is an economic or political rather than legal one.[26] Therefore, according to some, the application of ECT's provisions on sustainable development are "more of a guideline to policy action that any meaningful legal concept."[27] Some have noted that if international law can influence the notion in the EU, it would seem to mean that "although environmental considerations should not be prioritised over the need for economic growth, resources should not be diminished to the extent that the needs of future generations cannot be sustained."[28]

1.1.1.2. The precautionary and prevention principles

The precautionary principle was introduced in article 174.2 of the Treaty only in 1993 but was not defined. It has been first implicitly and then explicitly defined by the Community courts, and it is also defined by the Commission in its Communication on the Precautionary Principle[29], which shall be examined below. What is clear in any case is that the EU institutions must base their environmental policy on the precautionary principle. Therefore, the principle must be reflected, explicitly or implicitly in the secondary legislation adopted as a consequence of this policy.[30]

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[23] Stookes, above fn. 5, p. 276. According to the International Court of Justice it is the need to balance economic development and environmental protection. See Bell & McGillivray, above fn. 12, p. 63-64.
[24] Thornton & Beckwith, above fn. 5, p. 46; Dhondt above fn. 10, p. 59 citing P. Sands, *Principles of International Environmental Law*, Cambridge: Cambridge University Press, 2nd ed., 2003.
[25] Thornton & Beckwith, above fn. 5, p. 47.
[26] Ibid., p. 13.
[27] Krämer, above fn. 7, p. 12.
[28] Davies, above fn. 18, p. 28.
[29] COM (2000) 1, 2 February 2000. Douma, above fn. 11, p. 132.
[30] Douma, above fn. 11, p. 133.

There is no single definition of the precautionary principle but it is accepted that it "means that lack of full scientific evidence should not be used as a reason for postponing measures to prevent environmental degradation."[31] The Community courts have interpreted the principle in a series of cases. The early cases which do so, do it implicitly as they do not cite the principle although it would have been appropriate to do so.[32] However, the cases shed some light on the meaning of the precautionary principle.[33] In summary, the cases show that the Community institutions can take protective measures without having to wait until the reality and seriousness of risks to human health or the environment is proved to exist.[34] In addition, they enjoy a broad discretion in doing so. Thus, the ECJ held that "it can only examine whether the Community legislator by adopting a precautionary measure, made a manifest error or misuse of powers, or manifestly exceeded the limits of its discretion."[35] Thus "the principles of article 174.2 can be used as a means of marginally testing the validity of EC measures."[36] Finally, in the 2002 *Pzifer Animal Health SA v Council of the European Union* case[37], the CFI explicitly interpreted the precautionary principle for the first time along the same lines.[38] It confirmed that the principle would apply when a risk to human health was not scientifically confirmed. "What was not made clear in the judgment was the point at which uncertainty would demand a precautionary response."[39]

In 2000, the Commission gave its definition of the principle in its Communication on the Precautionary Principle.[40] Along with the ECJ, the Commission's view is that even if the precautionary principle is only explicitly mentioned in the Treaty in the environmental field, "its scope is far wider and covers those specific circumstances where scientific evidence is sufficient, inconclusive or uncertain and there are indications through preliminary objective scientific evaluation that there are reasonable grounds for concern that the potentially dangerous effects [not only] on the environment, [but also] human, animal or plant health may be inconsistent with the chosen level of protection."[41] The Communication also gives guidelines on how to apply the precautionary principle and in this light, encourages the reversal of the burden of proof.[42] It has been argued that in its Communication, the Commission took

[31] Thornton & Beckwith, above fn. 5, p. 13. See also Davies, above fn. 18, p. 45.
[32] Douma, above fn. 11, p. 135.
[33] For a detailed explanation of the cases, see Douma, above fn. 11, p. 135.
[34] Case C-157/96, para. 63 (case concerning British beef possibly infected by the mad cow disease).
[35] See case C-341/95, *Bettati v. Safety Hi-Tech*, para. 34 (involving measures to protect the ozone layer) and also the driftnets ban case, cited by Douma, above fn. 11, p. 135.
[36] Douma, above fn. 11, p. 138.
[37] T 13/99 [2002] ECR II-3305.
[38] Bell & McGillivray, above fn. 12, p. 74; Stookes, above fn. 5, p. 31-32; Douma, above fn. 11, p. 138; M. Lee, *EU Environmental Law, Challenges, change and decision-making*, Oxford: Hart Publishing, 2005, p. 105.
[39] Dhondt above fn. 10, p. 156 reviewing the case law says that "it seems no longer necessary for the Member States to always give clear and indisputable evidence that a product or substance forms a threat to health or life. A strong suspicion will do in some cases".
[40] COM (2000) 1.
[41] Ibid, p. 10 [of the Communication]. Davies, above fn. 18, p. 46 citing cases C-157/96 *R v MAFF, Commission of Customs and Excise ex parte national Farmer's Union et al* [1998] ECR I-2211 and C-180/96 *UK v. Commission* [1998] ECR I-2265, para. 99 (banning exports of British beef due to probable link between BSE in cows and Creutzfeldt-Jacob disease in humans).
[42] European Commission, Communication on the precautionary principle, COM (2000) 1, p. 21; Douma, above fn. 11, p. 143.

a minimalist view.[43] The protection of the environment is not mentioned when it discusses the reversal of the burden of proof.[44] The Communication also does not mention the integration principle.[45] In addition, the environment Commissioner herself played down the importance of the Communication.[46]

The European approach of the precautionary principle is strong rather than weak. A weak approach is that of the Rio Declaration which relies on "sound science" and cost-benefit analysis (CBA). This approach requires serious or irreversible damage. These two words do not appear in the EU discussion of the precautionary principle, although CBA is often referred to in EU risk regulation[47] and also in the EU policy on the precautionary principle.[48] A strong approach to the precautionary principle "would provide that where there are threats to the environment or health, the proponent of an activity must prove its safety, without reference to costs and benefits."[49] But of course this raises difficulties; it is almost impossible to prove there is no risk and this can in the end completely stall the further development of technology.[50] Therefore, the strong approach is not often supported officially.[51] Some have however interpreted the principle "as far as to support a reversal of the burden of proof in the sense that responsibility is placed on those who wish to use a method or substance to prove that it is safe."[52] In other words, it is the producers' responsibility to prove that "drugs, pesticides or food additives are safe where risk to human health cannot be determined with sufficient certainty."[53] The Commission's Communication on the precautionary principle also encourages shifting the burden of proof and refers to the easily fulfilled condition of the need to identify "potentially negative effects".[54] Nevertheless, the Commission and CFI reject the zero risk approach.[55] The bottom line is that whilst a measure cannot be based on a "mere conjecture which has not been scientifically verified", it can however, be based on a risk which "although the reality and extent thereof have not been "fully" demonstrated by conclusive scientific evidence, appears nevertheless to be adequately backed up by the scientific data available at the time".[56] All this has led some to conclude that "the potential of the precautionary principle has not yet been fully explored by the EC institutions."[57]

Related to the precautionary principle is the prevention principle. The treaty does not define it either[58] but it has been in place in the EU for a long time[59] and there are

[43] Douma, above fn. 11, p. 141.
[44] Ibid., p. 143.
[45] On the relevance of this principle to other EU policies than environmental policy, see below section 1.1.1.5.
[46] Douma, above fn. 11, p. 143.
[47] Lee, above fn. 38, p. 98.
[48] Ibid., p. 98, 103. Bell & McGillivray, above fn. 12, p. 77 say that the weak version is the current version in the EU and UK though.
[49] Lee, above fn. 38, p. 100.
[50] Ibid.; Bell & McGillivray, above fn. 12, p. 77.
[51] Lee, above fn. 38, p. 100.
[52] Davies, above fn. 18, p. 47.
[53] Ibid., p. 47-48.
[54] COM (2000) 1, p. 13; Lee, above fn. 38, p. 98.
[55] Lee, above fn. 38, p. 100-101. (see also Alexander on this in last section)
[56] Ibid., p. 102, citing case T-70/99 *Alpharma Inc v Council* [2002] ECR II-3495, para. 157; case T-13/99, *Pfizer Animal Health SA v Council* [2002] ECR II-3305, para. 144.
[57] Lee, above fn. 38, p. 105.
[58] Thornton & Beckwith, above fn. 5, p. 83.

many legislative instruments which apply it (for instance the End-of-Life Vehicles Directive, the IPPC Directive[60] and the regulations on eco-labels).[61] Also in his Opinion on the *APAS* case, Advocate General Van Gerven mentions the principle of prevention.[62] The literature is divided on whether there is a difference between the prevention and precautionary principles. Some think there is no difference so that the principles can be used interchangeably[63] while some think there is.[64] It seems though that there is a difference between the two principles.[65] According to some commentators, the fact that the precautionary principle was added to the prevention principle, rather than replaced it, shows that the two principles are not the same.[66] Accordingly, the prevention principle applies when it is more or less certain that damage to the environment will occur and the precautionary principle applies when it is unclear it will.[67] The distinction between the two is therefore "the degree of uncertainty surrounding the degree of risk".[68] In other words, whether the measure is preventive or precautionary depends on the question whether the risk is certain or uncertain. A concrete example of the application of the precautionary principle can be seen in the field of climate change as the EU committed to reduce GHG emissions even if the latest scientific evidence still lacks.[69] It could now even be argued that it is the prevention principle that applies to global warming if one agrees that there is a difference between the two principles.[70]

1.1.1.3. The polluter must pay principle

The third principle states that the polluter must pay the cost of environmental clean up. It was included in the Treaty (article 174.2) in 1987 but existed in Community legislation since 1973. Although there is no agreed definition of the principle[71], it means that the price of environmental damage should not be borne via taxes on society but by the polluter. The problem however is the identification of the polluter: in the case of a car, is it the producer of the fuel, the manufacturer of the car or the driver?[72] It is also difficult to assess the cost of degradation[73] and first of all, what is pollution.[74] The problem is that in reality most pollution sources are difficult to find (e.g. water, forest decline, soil erosion, climate change) and therefore public authorities are the only ones that can ensure cleaning.[75] So far the principle is only

[59] See e.g. the Community's first programme of action on the environment, Title II, para. 1, OJEC 1973 C112/1 cited by Davies, above fn. 18, p. 49.
[60] Directive 96/61, see below section 1.1.2.2. Article 1 of the Directive states that regulations may prevent polluting emissions. Stookes, above fn. 5, p. 31.
[61] Davies, above fn. 18, p. 49-50.
[62] Case C-435/92 [1994] ECR I-67, cited by Dhondt above fn. 10, p. 150.
[63] Krämer, above fn. 7, p. 25; Thornton & Beckwith, above fn. 5, p. 83 (the precautionary principle "tends to be referred synonymously with the prevention principle").
[64] De Sadeleer, above fn. 15, p. 74-75; Stookes, above fn. 5, p. 30-31; Lee, above fn. 38, p. 100 (the preventive principle is less radical than the precautionary principle). These authors distinguish the two principles but do not say in what they differ.
[65] Douma, above fn. 11, p. 132. See also De Sadeleer, above fn. 15, p. 74-75.
[66] Ibid., p. 133.
[67] Ibid., p. 132.
[68] De Sadeleer, above fn. 15, p. 75.
[69] Krämer, above fn. 7, p. 24.
[70] As global warming has become a certainty. See above fn. 1.
[71] Bell & McGillivray, above fn. 12, p. 266.
[72] Thornton & Beckwith, above fn. 5, p. 84.
[73] Ibid., p. 14.
[74] Davies, above fn. 18, p. 52.
[75] Krämer, above fn. 7, p. 28.

found in EU Directives regulating waste.[76] However, some Member States have adopted taxes on energy products and fuel, thereby indirectly promoting the development of environmentally friendly technologies.[77] An EU tax has never seen the light of day because it requires unanimity in the Council (art. 175.2 ECT). The principle is still insufficiently implemented by the EU and the Member States.[78] But the EU is committed to apply it more broadly; certain Directives already implement the principle and other measures have been recently adopted such as the Directive on environmental liability which also incorporates the principle.[79] In relation to global warming, one could say that the emission trading scheme[80] is a way of making producers of GHG pay.

1.1.1.4. The principle of the rectification of environmental damage at source

The principle of the rectification of environmental damage at source as a priority seems to favour the control of pollution at the point of emission rather than further down the chain.[81] But it has not prevented the EU from adopting measures that control pollution later in the chain anyway.[82] "The principle allows Community emissions limit values to be preferred over quality standards but it does not require that such an approach be taken."[83] Some argue that it is more "wishful thinking than reality".[84] The term "rectified" is not defined and therefore the EU institutions have a broad discretion in deciding how to apply the principle.

1.1.1.5. The integration principle

The integration principle is a general principle of EU law in comparison with the four above principles which are specific principles. This means that the integration principle "guides the Community's policy objectives and activities and the implementation of those policies."[85] It is stated in article 6 ECT which provides that "environmental protection requirements must be integrated into the definition and implementation of the Community policies and activities referred to in article 3, in particular with a view to promoting sustainable development". As some have rightly put it, "the issue of tackling climate change (…) provides a classic example of the need to integrate environmental protection requirements into other policies."[86]

The fact that the integration principle is placed at the beginning of the Treaty is very important and symbolic. Since the Amsterdam Treaty, environmental protection is a

[76] Davies, above fn. 18, p. 52.
[77] Ibid., p. 53.
[78] Bell & McGillivray, above fn. 12, p. 266.
[79] Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage (2004), OJ L 143, p. 56. See also the Sixth Environmental Action Programme, cited and explained by Davies, above fn. 18, p. 53 ff.
[80] Directive 2003/87/EC of the European Parliament and of the Council (2003) OJ L 275, p. 32 (ETS) amended by Directive 2004/101 amending Directive 2003/87 establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of Kyoto Protocol's project mechanisms (2004) OJ L 338, p. 1. See below section 1.1.2.2.
[81] Davies, above fn. 18, p. 51.
[82] Ibid.
[83] Krämer, above fn. 7, p. 27.
[84] Thornton & Beckwith, above fn. 5, p. 84, citing Krämer, above fn. 9.
[85] Davies, above fn. 18, p. 33.
[86] Ibid., p. 35 referring to European Commission, "Partnership for integration – a strategy for integrating environment into European Union policies", COM (98) 333, p. 9-10.

fundamental purpose of the Community. Economic objectives are no longer prioritized.[87] Environmental protection is now considered as forming part of the common market and must be taken into consideration even if it interferes with the achievement of economic objectives. Article 6 is the most significant environmental principle as it is the bridge between environmental policies and other EU policies.[88] It is applicable to all Community policies[89] and invites[90] or imposes[91] the continuous "greening" of all these policies. Therefore, article 6 has an impact not only on secondary legislation but also on primary legislation.[92] The "Community policies and activities" affected by article 6 are those listed in article 3 ECT, i.e. all activities of the Community under the Treaty.[93] Article 3 lists among others: (h) the approximation of the laws of Member States to the extent required for the functioning of the internal market[94], (m) the strengthening of the competitiveness of Community industry and (n) promotion of research and technological development. These three policies are the most relevant in respect of intellectual property. "Environmental protection requirements" mentioned in article 6 include the different objectives and principles laid down in articles 2 and 174.1 and 174.2, therefore sustainable development and the precautionary, polluter pays and rectification at source principles.[95] "Indeed it does not make sense to apply the precautionary principle under the environmental policy and take action without the last scientific evidence of a substance's harmfulness and then take the opposite approach in the context of the internal market policy."[96]

Whilst according to article 6 ECT, the EU institutions must take the environmental impact of Community activities into account[97], they also have a wide discretion on how to implement the integration principle at the level of specific legislative measures.[98] However, it is clear that article 6 does not have priority over other interests or requirements.[99] This is because the different objectives of the EC Treaty

[87] M. Wasmeier "The integration of environmental protection as a general rule for interpreting community law" [2001] 38 CMLR 159.
[88] Krämer, above fn. 7, p. 390.
[89] Davies, above fn. 18, p. 65.
[90] Krämer, above fn. 7, p. 21.
[91] Davies, above fn. 18, p. 32-33; Lee, p. 44, citing AG Jacobs's opinion in case C-379/98 *PreussenElektra AG v. Schleswag AG* [2001] ECR I-2099, para. 231 "article 6 is not merely programmatic; it imposes legal obligations".
[92] Wasmeier, above fn. 87, p. 175.
[93] Krämer, above fn. 7, p. 21.
[94] "Because it is now included in the general part entitled "principles", it is clear that the principle of integration must be applied to the more specific rules of the Treaty", for instance when interpreting rules on free movement of goods. Wasmeier, above fn. 87, p. 175.
[95] Krämer, above fn. 7, p. 21-22.
[96] Ibid., p. 21-22 also noting that "The whole debate on how to classify a specific Community measure is rather futile. (…) It seems rather old-fashioned to classify a specific measure as belonging to a specific policy: article 6 contributes to progressively overcoming this artificiality."
[97] Davies, above fn. 18, p. 33. For Wasmeier, above fn. 87, p. 164, all EU legislation must be compatible with article 6. The Maastricht Treaty made the principle justiciable (by using the term "must"). Ibid, p. 160.
[98] Davies, above fn. 18, p. 33; De Sadeleer, above fn. 15, p. 322; Krämer, above fn. 7, p. 22-23 (doubting that every individual measure in the field of agriculture, transport, etc. must respect article 6. Article 6's interpretation is wide thus "whenever a measure is taken under the EC treaty, full consideration must be given to protecting the environment." But he notes again that this is to be done at the level of the formulation and implementation of policy not individual measures).
[99] Krämer, above fn. 7, p. 21; Wasmeier, above fn. 87, p. 163.

have equal rank. Thus the Community must endeavour to achieve them all.[100] The integration principle implies that when Community legislation must be interpreted, its interpretation must favour a meaning which renders the provision consistent with the integration principle or at least be consistent with it, especially when there is a gap in the law or more than one interpretation.[101] When a conflict between economic and environmental objectives arises, the two must be reconciled insofar as possible.[102] If this is not possible, then one of the conflicting objectives may be given priority temporarily.[103] "It is doubtful whether, in case of such a conflict, an interpretation of Community law that would cause, increase or intensify pollution could be at all in line with the integration principle."[104] The ECJ has so far not discussed the issue whether an EU act had to be voided because it did not take environmental requirements into consideration but some commentators think such acts should.[105] For instance, the Fifth Environmental Action programme advocated the integration of the environment into key economic sectors (particularly tourism, transport, energy, industry and agriculture) and the Sixth Environmental Action Programme intends to reduce "pressures in the environment from various sources".[106] So for instance, "the Community's transport policy must take due account of potential environmental impacts, but the fact that a particular proposal in that field might have negative environmental effects could be outweighed by economic and social considerations. If this proved to be the case, negative environmental impact should be assessed and kept to a minimum but environmental harm may well still be inflicted even if due account is taken of the integration principle."[107]

Whilst this is how the integration principle should be applied in theory, the chequered history of the principle's application shows that in reality, environmental protection is, still now, far from being well integrated in other EU policies. It is not the place to retrace the history of the principle but suffice it to say that the first EU Environmental Action Programme, which dates from 1973, already mentioned that environmental protection should be integrated in other EU policies but the Commission did nothing to that effect and this remained so even after introduction of the principle in the treaty in 1987 and with the actions the Commission envisaged in 1993 (i.e. mark all proposals with significant environmental impacts, and set up an environmental network between the Directorates-General) but never actually executed.[108] In the end, if progress has been made, it has been slow and uneven, mainly due to lack of (political) commitment.[109] This leads some to conclude that such integration will start to become a reality when the Community courts annul a Regulation or Directive because it did not respect article 6.[110] Until then, article 6 will remain a nice principle

[100] Ibid., p. 21. See also Wasmeier, above fn. 87, p. 160.
[101] Wasmeier, above fn. 87, p. 160-162.
[102] Ibid., p. 160.
[103] Ibid., p. 163.
[104] Ibid., p. 163.
[105] Krämer, above fn. 7, p. 23 citing Dhondt above fn.10. Krämer himself (ibid.) thinks that a complete lack of considering the environmental impact of Regulation 1954/2003 (fishing access to the Azores) would breach article 6 and therefore could be voided.
[106] Davies, above fn. 18, p. 33.
[107] Ibid., p. 34.
[108] L. Krämer, "Thirty Years of Environmental Governance in the European Union", in R. Macrory, *Reflections on 30 Years of EU Environmental Law, A high level of protection?*, European Law Publishing, The Avosetta Series 7, Groningen, 2006, p.560; Davies, above fn. 18, p. 34.
[109] Davies, above fn. 18, book, p. 34, 36; Krämer, above fn. 7, p. 392-393.
[110] Krämer, above fn. 7, p. 396.

not taken seriously by the institutions.[111] In sum, more remains to be done to give full effect to the integration principle.

1.1.1.6. Legal character of the environmental principles

All this is well and good but do the environmental principles described above have any legal effect? The literature is divided on this crucial question.[112] Some deny the principles any binding character[113], whilst some argue that they are binding.[114] However, when analysed more closely their positions are not so far apart, as those who deny binding character to the principles still concede that they are a leitmotiv and rule of interpretation, which imply a certain legal effect.[115] Those who argue they have binding character still insist that as the principles are vague, the institutions have a broad margin of discretion. The majority's view seems to be that the principles are legally binding for three main reasons. First, they are included in the Treaty; second, their vagueness does not mean they have no legal effect and third, the ECJ has recognised that some principles have legal force.[116]

However, the way principles are drafted differs so their legal force does too.[117] Accordingly, three different types of principles can be distinguished as proposed by Espiney: (1) global objectives, (2) obligations to take account and (3) obligations referring to result.[118] In which category do the several environmental principles fall into?

Global objectives are formulated so vaguely that the institutions' discretion is very wide. Therefore, it is almost impossible that the ECJ could hold that these obligations have been breached[119] and therefore, that the non-respect of the concept of sustainable development can be used to nullify a measure taken by the EU.[120] These global objectives are therefore non-binding guidelines. Espiney categorises sustainable development and "a high level of protection" (both provided for in art. 2 ECT) as global objectives. However, in case C-284/95, "the Court seems to admit that every

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[111] Ibid.

[112] A. Espiney, "Environmental principles", in R. Macrory, *Reflections on 30 years of EU Environmental Law, A high level of protection?*, European Law Publishing, The Avosetta Series 7, Groningen, 2006, p. 20-21; Douma, above fn. 11, p. 135; Dhondt above fn. 10, p. 181.

[113] E.g. Krämer, above fn. 7, p. 15 (for this author, article 174 only means that the Community *must* base its *policy* on it); J. Jans & A.-K. Von Der Heide, *Europaesiches Umweltrecht*, Groningen, Europa Law Publishing, 2003, p. 18 ff.

[114] E.g. C. Callies "Article 174" in C. Callies & M. Ruffert (eds.), *Kommentar zu EU-Vertrag und E.G.-Vertrag*, 2nd ed., 2002 Neuwied, Luchterhand, para. 43, 44; W. Kahl, "Article 174", in R. Streinz (ed.), *EUV/EGV Vertrag ueber die europaesiche Union and Vertrag zur Gruendung der europaeischen Gemeinschaft*, 2003, Muenchen, Beck, para. 64 ff.; Espiney, above fn. 112; De Sadeleer, above fn. 15, p. 321. The way the Treaty framers drafted the principles (use of present tense rather than conditional) means that the Community institutions must apply them when implementing their environmental policy. Douma, above fn. 11, p. 134-135 citing L. Hancher, "EC environmental policy – a precautionary tale?" in D. Freestone and E. Hey, *The Precautionary Principle and International Law, The Challenge of Implementation*, The Hague, Kluwer, 1996, 187, at 202, only referring to the precautionary principle. Dhondt above fn. 10, p. 182-183 (in the light of her findings (see below), the literature which thinks that the principles have no legal relevance should be disregarded).

[115] Espiney, above fn. 112, p. 19-39, p. 21.

[116] Ibid., p. 21, citing case C-284/95, *Safety hitech* [1998] ECR I-4301.

[117] Ibid., p. 22.

[118] Ibid., p. 23.

[119] Ibid.

[120] Davies, above fn. 18, p. 31.

measure should contain such a high level".[121] The phrase "aiming at" is arguably an obligation for the institutions to take measures "in a way that the high level may be attained or approached".[122]

Obligations referring to result are precise and refer to the content of Community measures.[123] Arguably articles 174.2 and 6 are such obligations. The principles in this category are still too imprecise to deduce enforceable obligations to act.[124] When legislating however the institutions must respect the principles; therefore they are binding. But since they have a wide margin of discretion (albeit less wide than under the general objectives), the principles would be breached only if the measures manifestly disrespected the principles[125], i.e. when the institutions made a manifest error, misused their powers or manifestly exceeded the limits of their discretion.[126] So an act could be annulled only exceptionally.[127] Indeed, the Community courts have agreed to review the validity of secondary legislation according to article 174.2 principles, clearly showing that the principles are binding.[128] The fact that Community legislation can only be annulled when it is blatantly disregarded does not change this fact.[129] The decisions show that for instance, the precautionary principle is enforceable "in the sense that it can influence the outcome of legal disputes before the ECJ".[130] But "in practice, it will be hard to prove that this obligation was not met due to the wide margin of discretion."[131] Furthermore, "even if the number of court decisions invoking the polluter-pays, prevention and precautionary principles has been small to date, evolution has led some of those principles being given an autonomous normative value that makes them directly applicable in German, French Belgian and Dutch law."[132] It is unlikely however that the principles will ever have direct effect i.e. that an individual can argue that a national measure can be voided because it does not respect one of the principles.[133] Indeed, the Treaty principles are addressed only to the Community institutions.[134] Nonetheless, even if secondary legislation does not explicitly refer to but nevertheless enshrines the principles, article 10 ECT obliges Member States to give them effect because it states that Member

[121] Espiney, above fn. 112, p. 28.
[122] Ibid., p. 28-29.
[123] Ibid., p. 30. In the same vein, see De Sadeleer, above fn. 15, p. 339, 368 who argues that for a principle to be binding it must be taken up in a legal text and be phrased in sufficiently prescriptive terms.
[124] Espiney, above fn. 112, p. 33. De Sadeleer, above fn. 15, p. 340, also opines that their level of abstraction means that they are less binding than other more prescriptive rules.
[125] Espiney, above fn. 112, p. 34. Krämer above fn. 9, p. 15, does not diverge so much from this view even if he considers the principles as mere guidelines ("they are not binding rules of law which apply to each individual community measure; nor do they contain an obligation to take specific measures in favour of the environment"). He then says that "they could only be enforced by the European Court in very extreme cases where a systematic disregard of the principles in the policy is demonstrated".
[126] Douma, above fn. 11, p. 140; Lee, above fn. 38, p. 105.
[127] Dhondt above fn. 10, p. 183.
[128] De Sadeleer, above fn. 15, p. 322-323; Dhondt above fn. 10, p. 183. See also above section 1.1.1.2.
[129] Douma, above fn. 11, p. 141.
[130] Ibid. p. 140.
[131] Ibid., p. 143.
[132] De Sadeleer, above fn. 15, p. 332, giving Belgian decisions as examples.
[133] Ibid., p. 328. See also Douma, above fn. 11, p. 134-135 citing L. Hancher, "EC Environmental Policy – A Precautionary Tale?" in D. Freestone and E. Hey, *The Precautionary Principle and International Law, The Challenge of Implementation*, The Hague, Kluwer, 1996, 187, p. 202 (only discussing the legal character of the precautionary principle).
[134] Douma, above fn. 11, p. 135.

States must take measures to fulfil their obligations arising out of the Treaty or at least to refrain from taking any measure which could jeopardise the attainment of the objectives of this Treaty.[135] Thus, according to some, once the precautionary principle (and in our view by extrapolation the other principles as well) is included in secondary legislation, individuals can argue that national actions or legislation that fall within the scope of EU legislation violating the precautionary principle are void.[136]

The Community institutions' - and if the above argument is followed, the Member States' - breach could be an action or arguably also an omission.[137] For instance, Espiney wonders whether the precautionary principle is (sufficiently) taken into account in the IPPC Directive.[138] Also in the area of road traffic, the integration principle is most likely not sufficiently taken into account.[139] Even if there is discretion, she thinks that they establish some sort of minimum standard and "this must be taken into account on the level of the obligation to a positive action as well as on the level of the manner of shaping secondary legislation."[140] She also thinks that the ECJ tends to be too generous in the margin of discretion it leaves to the institutions.[141] In the same vein, Dhondt believes that the integration principle must be interpreted as an "obligation to take account of the requirements in such a way that it *must* have real consequences for (existing and proposed) action."[142] In this interpretation the margin of discretion is more limited. This may mean that there is an obligation to apply the environmental principles "in the same way as they are applied in the context of environmental policy."[143] Some commentators are more categorical and believe that "*any* Community legislation that does not integrate environmental protection requirements properly, in particular, if a resulting harmful effect on the environment cannot be justified by clear and overriding reasons, is therefore subject to annulment by the court in accordance with article 230 et seq EC" (emphasis added).[144] What seems clear under this view is that economic and other interests when conflicting with environmental concerns will have to be conciliated and balanced.[145] Some even argue that the balance should tilt in favour of environmental concerns when the three principles of prevention, precaution and polluter-pays clash with other

[135] De Sadeleer, above fn. 15, p. 328. See also Dhondt above fn. 10 p. 108 (article 6 is also relevant for the policies of the Member States and the integration principle, outside the harmonised areas and in conjunction with article 10 ECT, carries a passive obligation for Member States to refrain from adopting policies which would hinder the achievement of environmental objectives and principles).
[136] Douma, above fn. 11, p. 135.
[137] Espiney, above fn. 112, p. 37. *Contra*: De Sadeleer, above fn. 15, p. 323 (because article 174.2 does "not require the EC to legislate on a particular subject in a specific and detailed manner, therefore it would not be possible to annul an EC measure for omission to act").
[138] Espiney, above fn. 112, p. 37.
[139] Ibid. Dhondt above fn. 10, p.472, shares this opinion. For instance, "the fact that fiscal instruments have been insufficiently used resulting in a systematic failure to guarantee the internalisation of environmental costs may be regarded as a breach of the integration principle in that it constitutes a failure to systematically apply the polluter pays principle". Ibid, p. 173.
[140] Espiney, above fn. 112, p. 38. See also in the same vein Dhondt above fn. 10, p. 109-110.
[141] Ibid., p. 38.
[142] Dhondt above fn. 10, p. 109.
[143] Ibid.
[144] Wasmeier, above fn. 87, p. 164.
[145] De Sadeleer, above fn. 15, p. 371. Krämer, above fn. 7, p. 16 notes that if all the principles of article 174 had to be taken into account in every individual measure, they would contradict other measures. This may true but it does not prevent a conciliation or balance of interests.

norms.[146] In conclusion, commentators diverge as to the exact legal force of the principles but there is consensus that they must have some legal effect.

1.1.2. Specific regulation of greenhouse gases emissions

1.1.2.1. International framework

Before analysing EU law, a brief overview of the international legal framework set up to combat climate change and therefore reduce GHG emissions will help put EU law into the broader context. There are two major international legal instruments addressing climate change, namely the United Nations Framework Convention on Climate Change (UNFCCC) and its subsequent Kyoto Protocol.[147] A revision of the Kyoto Protocol should take place in Copenhagen in 2009.

The UNFCC, signed in Rio, dates from 1992 and came into force on 21 March 1994.[148] 186 governments were parties to it in 2004. Both the Community and the Member States are bound by it.[149] The convention's objective is to stabilise rather than reduce the release of GHG.[150] More precisely, it is to "stabilise gas emissions at a level which would not interfere with the climate system or food protection but would still allow sustainable economic development (art. 2)."[151] In the convention, parties commit *inter alia* to "develop and transfer technologies, practices and process to control greenhouse gases in all relevant industrial sectors (including energy, transport, agriculture, forestry and waste management) and promote research (…)".[152]

The Kyoto Protocol dates from 1997 and entered into force in 2005.[153] It goes further than the Convention as it aims to reduce emission of the 6 main GHG i.e. carbon dioxide, methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6). The aim is to arrive at a reduction of 5.2 per cent of 1990 GHG levels by 2012. Reduction can be done in three ways: joint implementation (countries teaming together to reduce GHG levels so that one country can reduce GHG less than the other), clean development mechanisms (emissions reduction projects in developing countries financed by the industrialised countries) and emissions trading.[154] According to the Treaty, emissions trading could start only as of 2008[155], but that did not prevent countries to start trading emissions earlier. The EU initiated emissions trading on 1 January 2005.

1.1.2.2. Community framework

[146] De Sadeleer, above fn. 15, p. 369; Dhondt above fn. 10, p. 109-110 ("In practice, this means that the policy maker will have to choose the most environmentally-friendly (no conflict situation) or least environmentally-damaging (conflict situation) ways available to achieve the specific objectives of other policy areas").
[147] Thornton & Beckwith, above fn. 5, P. 55.
[148] 9 May 1992, New York, 31 I.L.M. 849 (1992).
[149] Davies, above fn. 18, p. 272.
[150] Thornton & Beckwith, above fn. 5, P. 56.
[151] Bell & McGillivray, above fn. 12, p. 639.
[152] Thornton & Beckwith, above fn. 5, P. 57.
[153] Bell & McGillivray, above fn. 12, p. 640. For an account, see e.g. P. Davies "Global Warming and the Kyoto Protocol" [1998] 47 International and Comparative Law Quarterly, 446-461.
[154] Thornton & Beckwith, above fn. 5, p. 61; Bell & McGillivray, above fn. 12, p. 640.
[155] Davies, above fn. 18, p. 287.

How is the EU tackling climate change? What do EU environmental laws provide in relation to GHG emissions?

The EU took the initiative to tackle GHG emissions early, in the 1970s, and still strongly believes that developed countries "must show the lead in reducing emissions."[156] Many measures so far taken by the EU directly or indirectly reduce GHG in the atmosphere, and will be examined below. Environmental instruments are mostly Directives rather than Regulations. The most prominent recent measure is the EU's ratification of the Kyoto Protocol on 31 May 2002 in which it agreed to reduce its levels of emissions by 8 per cent in comparison to the levels in 1990.[157] Prior to ratification, in 2000, the EU had already started implementing the Kyoto Protocol in the European Climate Change Programme (ECCP).[158] The approach taken by the ECCP is "a good example of external integration of environmental considerations into other policy areas as it involves initiatives across the energy, transport and industrial sectors."[159] In 2002, the Decision on the Sixth Environment Action Programme mentioned that its aim was to limit the global temperature rise at 2 degrees Celsius and acknowledged that in order to achieve this goal, a global reduction in emissions of GHG by 70 per cent compared to levels in 1990 was necessary, as identified by the Intergovernmental Panel on Climate Change (IPCC).[160]

Here follows a list of the most relevant environmental measures adopted by the EU in relation to the reduction of GHG emissions. They are classified by type of measure (whether directly and indirectly reducing GHG emissions[161]) and chronologically, to highlight whether they were adopted before or after the Kyoto Protocol (i.e. 1997). The measures most relevant in the context of this article include the EU emissions trading scheme (as set out in the ETS Directive), effective implementation of the energy efficiency requirements of the IPPC Directive, the promotion of renewable energy and biofuels[162] and other measures which improve the thermal insulation of buildings, and the efficiency of certain equipments, such as electrical ones. What these instruments do will therefore be briefly described below.

Direct measures:

- Directive 93/76 to limit carbon dioxide emissions by improving energy efficiency (SAVE) (1993) OJ L 237, p. 28.
- Directive 95/12 implementing Directive 92/75 with regard to energy labelling of household washing machines (1995) OJ L 136, p. 1.

[156] Ibid., p. 304 citing Commission documents. This was repeated by G. Verheugen, Vice-President of the European Commission at the European Patent Forum 2008, http://www.epo.org/about-us/events/archive/2008/epf2008/forum-1.html, adding also that being cleaner will give a competitive advantage to the EU. Krämer, above fn. 7, p. 348 however is much more pessimistic, stating that "the European Union is not a political global player and does not have the weight to lead the world into a successful policy on climate change".

[157] C. Streck & D. Freestone, "The EU and climate change", in R. Macrory, *Reflections on 30 Years of EU Environmental Law, A High Level of Protection?*, European Law Publishing, The Avosetta Series 7, Groningen, 2006, p. 95.

[158] COM (2000) 88.

[159] Bell & McGillivray, above fn. 12, p. 642.

[160] See Dec. 1600/2002 laying down the 6th Community Environment Action Programme [2002] OJ L 242/1, art. 2.2 cited by Krämer, above fn. 7, p. 337.

[161] "Implementation of other Directives will also contribute to emission reduction". Davies, above fn. 18, p. 303.

[162] These are fuels derived from biomass i.e. plant or animal matter.

- Directive 96/57 on energy efficiency requirements for household electric refrigerators, freezers and combinations thereof (1996) OJ L 236, p. 36.
- Directive 96/60 implementing Directive 92/75 with regard to energy labelling of household combined washer-driers (1996) OJ L 266, p. 1.
- Directive 96/61 concerning integrated pollution prevention and control (IPPC Directive) (1996) OJ L 257, p. 26, as amended by Directive 2003/87 below
- Directive 2001/77 on promotion of electricity produced from renewable energy sources in the internal electricity market (2001), OJ L 283, p. 33.
- Directive 2002/91 on the energy performance of buildings (2003) OJ L 1, p. 65.
- Directive 2003/30 on promotion of the use of biofuels or other renewable fuels for transport (2003) OJ L 123, p. 42.
- Directive 2003/87/EC of the European Parliament and of the Council (2003) OJ L 275, p. 32 and Directive 2004/101 amending Directive 2003/87 establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of Kyoto Protocol's project mechanisms (2004) OJ L 338, p. 1 (ETS Directive).
- Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity (2003) OJ L 283/51.
- Decision 2004/280 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementation of the Kyoto Protocol (2004) OJ L49/1. Under this decision, the Commission drafts regular reports and evaluates the national programmes to limit GHG emissions.[163]
- Directive 2006/40 relating to emissions from air-conditioning systems in motor vehicles (2006) OJ L161/12.
- Regulation 2006/842 on certain fluorinated greenhouse gases (2006) OJ L 161/1.
- There are also several Directives setting emissions standards for emissions in the atmosphere.[164]

Indirect measures:

- Directive 94/62 of 20 December 1994 on packaging and packaging waste (1994) OJ L 365, p. 10.
- Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles (2000) OJ L 269, p. 34. As the Directive obliges Member States to encourage the reduction of the amount of materials to manufacture cars, it indirectly reduces the consumption of materials which can produce GHG when cars are made in the first place. The Directive "will for example lead to increased recycling and recovery rates for used cars, and the improved treatment of fluids containing greenhouse gases."[165]
- Directive 2002/96/EC of 27 January 2003 on waste electrical and electronic equipment (WEEE), (2003) OJ L 37/24, amended by Directive 2003/108/EC of 8 December 2003 (2003) OJ L 345, p. 106.

1 - Directive 96/57 on energy efficiency requirements for household electric refrigerators, freezers and combinations thereof requires that "Member States shall take all necessary measures to ensure that refrigeration appliances covered by this Directive can be placed on the Community market only if the electricity consumption of the appliance in question is less than or equal to the maximum allowable electricity

[163] Krämer, above fn. 7, p. 345.
[164] For a list, see Bell & McGillivray, above fn. 12, p. 205.
[165] Davies, above fn. 18, p. 303.

consumption value for its category as calculated according to the procedures defined in Annex I." The Directive is a first step only as it does not set specific targets to reduce the general consumption of such appliances.

2 - Directive 96/61, also called the IPPC (Integrated Pollution Prevention and Control) Directive can be said to be the ancestor of the ETS Directive. The aim of the IPCC Directive is to reduce emissions in the air, water and land caused by certain activities mainly those of heavy industries such as coke, timber and chemical industries[166] (art. 1). The Directive defines "substance" as "any chemical element and its compounds, with the exception of radioactive substances within the meaning of Directive 80/836/Euratom and genetically modified organisms within the meaning of Directive 90/219/EEC and Directive 90/220/EEC" (art. 2.1.). "Pollution" is defined as "the direct or indirect introduction as a result of human activity, of substances, vibrations, heat or noise into the air, water or land which may be harmful to human health or the quality of the environment, result in damage to material property, or impair or interfere with amenities and other legitimate uses of the environment" (art 2.2). Article 2.5 defines "emission" as the release of substances, heat, noise or vibrations in the air, water or land. This language is very broad. The substances listed in Annex III of the IPPC Directive include GHG and therefore their release constitutes pollution.[167] According to the Directive, the listed industries ("installations") have to have a permit to emit substances. The Commission sets emission limit values whilst Member States set up the relevant authorities which grant permits. Therefore, the emissions of the listed substances are reduced.

3 - Directive 2001/77 on the promotion of electricity produced from renewable energy sources in the internal electricity market "lays down non-binding "indicative" targets for the proportion of electricity generated from renewables, and requires Member States to publish reports on their performance".[168] The overall EU target is 22 per cent. Article 3 of the Directive provides that Member States must take "appropriate steps to encourage greater consumption of electricity produced from renewable energy sources". Article 3 further indicates that if Member States' progress is insufficient, binding targets will be set.[169] The Directive also requires Member States to ensure that electricity produced from renewables is actually guaranteed to be produced from renewables (art. 5). Renewable energies are energies from sources which occur naturally and repeatedly in the environment; these include wind, waves, sun, biomass, tides, landfill gas and sewage treatment plant gas.[170]

4 – In light of the fact that buildings account for more than 40 per cent of final energy consumption in the EU (rec. 6), Directive 2002/91 on energy performance of buildings[171] requires Member States to set minimum requirements for the energy

[166] See Annex I for the complete list of industries.
[167] The relevant substances are sulphur dioxide and other sulphur compounds, oxides of nitrogen and other nitrogen compounds; carbon monoxide; fluorine and its compounds. If not all are not GHG, some contribute to the production of GHG (e.g. carbon monoxide contributes to the production of carbon dioxide and methane). For the 6 GHG listed in the Kyoto Protocol, see above section 1.1.2.1.
[168] Bell & McGillivray, above fn. 12, p. 211. See also Krämer, above fn. 7, p. 344.
[169] Thornton & Beckwith, above fn. 5, p. 69.
[170] Art. 2; Thornton & Beckwith, above fn. 5, p. 67.
[171] Note also Council Directive 93/76/EEC to limit carbon dioxide emissions by improving energy efficiency (SAVE), above and Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to

performance and certification of energy efficiency for all new buildings and large old buildings undergoing major renovation (art. 4-7).[172] The Directive also requires Member States to take measures so that boilers and air-conditioning systems are regularly checked by independent experts[173] in order to limit energy consumption and specifically CO2 emissions (art. 8-10).

5 - Directive 2003/30 on the promotion of biofuels or other renewable fuels for transport. The aim of this Directive is that by 2011, biofuels constitute 5.75 per cent of the transport fuel market.[174] The Directive reiterates that "the transport sector accounts for more than 30 per cent of final energy consumption in the Community" and that this is bound to increase.[175] The main responsibility for the increase of CO2 is road transport (84 per cent).[176] The Directive requires Member States to "ensure that a minimum proportion of biofuels and other renewable fuels is placed on their markets" and to that effect, they have to set national indicative targets (art. 3).

6 - Directive 2003/87/EC or ETS Directive amends the IPPC Directive, which already dealt with, among others, GHG emissions permits. The ETS Directive makes the EU emissions trading system take the Kyoto Protocol's targets into account.[177] In short, the ETS Directive obliges a number of industries (mineral oil refineries, coke ovens, the metal, mineral (this includes steel, glass and cement manufacture) and paper industries) to have a permit which states the maximum amount of greenhouse gases they can emit (art. 4).[178] These industries "will account for approximately 46 per cent of the estimated EU carbon dioxide emissions in 2010".[179] The Directive initially only deals with CO2 emissions from "installations" (i.e. stationary technical units) (art. 3). However, the Commission proposed that the ETS could be extended to other sectors and other GHG at a later date, the intention being that all GHG will eventually be tradable.[180] The scheme started on 1 January 2005 and works as follows. If an installation finds it difficult to comply with the cap set in its permit, it can purchase "allowances" (permit to emit CO2) from another installation which finds it easier to do so and therefore has not met its cap and has spare allowances to trade. If the installation emits more CO2 than permitted, it will have to pay a penalty per tonne (this penalty started to apply in 2008). Member States are given quite some flexibility to allocate allowances. They must designate a competent authority which will deliver

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construction products, OJ L40, 11.02.1989, p. 12 amended by Directive 93/68/EEC, OJ L 220, 30.08.1993, p. 1. Directive 93/76 required Member States "to draw up and implement programmes for the energy efficiency of buildings, the billing of heating, air-conditioning and hot water on the basis of annual consumption, thermal insulation of new buildings, and regular inspection of boilers, and energy audits of undertakings with high energy consumption". Krämer, above fn. 7, p. 342.

[172] Bell & McGillivray, above fn. 12, p. 643.

[173] For boilers, Member States have a choice to require them to be checked or to advise users on the replacement of boilers or other solutions. For air-conditioning systems, Member States must take measures which include both verification and advice.

[174] Bell & McGillivray, above fn. 12, p. 643.

[175] Recital 4.

[176] Recital 5.

[177] Recital 22. For details, see Streck & Freestone, above fn. 157, p. 104; Davies above fn. 153.

[178] Chemical and waste incineration industries are excluded. Thornton & Beckwith, above fn. 5, p. 72.

[179] Thornton & Beckwith, above fn. 5, p. 72, citing the Explanatory Memorandum of the Directive. Also mentioned by Krämer, above fn. 7, p. 340.

[180] Davies, above fn. 18, p. 299; Thornton & Beckwith, above fn. 5, p. 71. As suggested by Annex II of the Directive, the Directive applies to the 6 GHG listed in the Kyoto protocol. But initially, only CO2 is covered. Bell & McGillivray, above fn. 12, p. 643.

the permits (art. 18) and the authority must be satisfied when it delivers them that the operators are capable of monitoring and reporting the said emissions (art. 6.1). Member States must also establish a registry to write down the holding, transfer and cancellation of allowances. Any person may hold allowances (art. 19). The Directive does not prevent national trading schemes (rec. 16) and will be amended in light of future developments at international level (i.e. if future international conventions require the further reduction of GHG emissions) (rec. 22). In this respect, the EU recognises that in the long term emissions will have to be reduced by around 70 per cent compared to 1990 levels to properly tackle global warming (rec. 2). The EU emissions trading scheme therefore encourages the development of cleaner technologies.[181]

7 - Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity introduces minimum tax rates on all energy products. These include coal, gas, electricity, motor and heating fuels. "Member States are allowed to introduce reduced tax rates for biofuels and electricity produced from alternative energies."[182]

8 - Regulation 842/2006 on certain fluorinated greenhouse gases aims to reduce to a minimum the use of certain GHG, namely SF6, HFCs and PFCs. According to article 3, operators of the stationary applications (i.e. refrigeration, air conditioning, heat pump equipment and fire protection systems) which contain fluorinated gases shall use all measures which are technically feasible and do not entail disproportionate costs to prevent and repair leakage. Article 4 requires that gases be recycled, reclaimed or destroyed.

9 – Directive 2006/40 relating to emissions from air-conditioning systems in motor vehicles provides for the limitation of fluorinated gases in the air-conditioning system of cars, by limiting the type-approval of cars that contain gases with too high a global warming potential. The Directive has now entered into effect (art. 5) as a Regulation has been taken to adopt a harmonised leakage detection test.[183]

1.1.2.3. Conclusion

It can now be seen that EU environmental rules already play an important and increasing role in the reduction of GHG emissions. On the one hand, the several Treaty principles lay down a firm basis on which the EU must base its environmental policy. Sustainable development is also now part of the general objectives of all EU policies. Most importantly, the integration principle imposes that the treaty principles be respected in any EU policy having an impact on the environment. The vagueness of the principle waters down its legal force but the Community courts could definitely be more aggressive in the future in ensuring secondary legislation respects it, by reducing the institutions' margin of discretion.

[181] Thornton & Beckwith, above fn. 5, p. 74; Bell & McGillivray, above fn. 12, p. 653-654.
[182] Krämer, above fn. 7, p. 346.
[183] Commission Regulation (EC) No 706/2007 of 21 June 2007 laying down, pursuant to Directive 2006/40/EC of the European Parliament and of the Council, administrative provisions for the EC type-approval of vehicles, and a harmonised test for measuring leakages from certain air conditioning systems, OJ L 161, 22.6.2007, p. 33–52. See also Krämer, above fn. 7, p. 347.

Specific secondary legislation impose the reduction of GHG emissions by most industries (including those producing electricity), by road traffic (through the promotion of biofuels), by new buildings and establish a market for trading emissions, which works as an incentive to reduce GHG emissions as well. All these initiatives show not only a commitment from the EU to reduce GHG emissions but also constitute a sweeping arsenal of measures effectively forcing Member States to reduce their carbon footprint. This European swift (the most significant Directives for the reduction of GHG emissions were taken within a period of 3 years, between 2001 and 2003) and wide-ranging effort can only be applauded. The Council's goal in 1999 to significantly raise the profile of energy efficiency[184] is certainly close to being achieved. However, these measures do not go far enough to properly fight global warming. Environmental law's role remains in some way limited in this respect.

First of all, the legislation so far only imposes small emission reductions. The targets set by the Directives are generally indicative or non-existent or existing but still too low in view of the much higher targets that need to be achieved to have a significant effect. For instance, the Directive on promotion of electricity generated by renewable energies has only an overall 22 per cent target and national targets are indicative.[185] Similarly, the Directive promoting biofuels sets only a small and indicative target. Second, all industries are not covered (only heavy ones although neither chemical nor waste industries are covered) whilst there are no measures at all concerning emissions from air, sea and rail transport.[186] The obligation that most products and appliances consuming energy (such as electrical household appliances) emit less GHG is limited if non-existent. It is true however that if in the end, most energy is produced by renewables, it is not a problem. Emissions from farming are also not covered. In addition, most old buildings do not have to comply with Directive 2002/91. Third, there is still no European tax on GHG emissions[187] (although Directive 2003/96 deals with the taxation of energy products and electricity). Whilst the ETS Directive indirectly encourages the invention of cleaner technologies, it is not sufficient because, although its goal is to reduce GHG emissions, emission trading does not *in itself* reduce such emissions[188] (some industries can still pollute if they pay for it) and there is no real European control on the allowances, which are set independently by Member States and can therefore be more or less generous. Shell and other proponents of carbon capture and storage (CCS) have recently voiced that "the structure of the EU Emission Trading Scheme provide[sic] insufficient incentive for companies to build the multibillion solar plants that promise to convert dirty coal-fired polluters into low-emission generators."[189]

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[184] Davies, above fn. 18, p. 297.

[185] Arguably however, the fact that Member States may be required to produce electricity from renewable energy if they do not comply with the indicative targets and the fact that the targets will surely be reviewed in future could mean that within a reasonable amount of time, almost all electricity may be produced by renewables in the EU.

[186] Krämer, above fn. 7, p., 345 notes that the last reports from the Commission (Communication on the implementation of the first phase of the European Climate Change Programme ECCP, COM (2001)580 of 23 October 2001; COM (2005)655; COM (2006)658) highlighted that international progress on reduction of GHG emissions by ships and aircrafts is poor. Krämer, above fn. 7, p. 347 notes that "emission limits for industrial installations, households, ships, aircraft, inland navigation and other emitters are not envisaged."

[187] A proposal for a Directive on the taxation of passenger cars according to their CO2 emissions was proposed by the Commission in 2005 (COM (2005)261 final).

[188] Krämer, above fn. 7, p. 342.

[189] The Independent 16 May 2008, p. 40 (business section).

These initiatives are excellent first steps but are still not sufficient to fully and properly tackle global warming at EU level, let alone at international level. This is because not all industrial, agricultural and individual processes and products are required to emit less GHG. Therefore, the patent system has certainly a role to play to incentivise the invention of green technologies. But before determining the extent of this role, it is necessary to check the exact impact of environmental laws on patenting.

1.2. Implications of environmental law for patent law

We now have an overall picture of the general and specific environmental rules adopted by the EU to reduce GHG emissions. What is the impact on European and national patent laws? This section first envisages the implications of the general principles and then of the specific rules regulating GHG emissions.

1.2.1. Implications of the general principles

Whilst article 2 ECT is probably too vague to be as such enforceable, articles 6 and 174.2 ECT in any case force the EU and its Member States to develop in a more sustainable way and make sure that economic development does not harm the environment. This is because by definition the concept of sustainable development includes the integration principle. How can a country attain sustainable development if it does not integrate environmental protection within its economic rules?[190] The majority would agree that the combination of articles 6 and 174.2 means that patent laws (and for that matter, other intellectual property laws if necessary) must be revamped to take environmental concerns into account. As seen above, article 6 states that "environmental protection requirements must be integrated into the definition and implementation of the Community policies and activities referred to in article 3 in particular with a view to promoting sustainable development". Art. 3 lists (h) approximation of the laws of Member States to the extent requirement for the functioning of the internal market (m) strengthening of competitiveness of Community industry and (n) promotion of research and technological development, policies and activities which touch upon intellectual property laws.

Consequently, if an invention emits above a certain legal threshold of GHG, it would arguably breach both articles 6 and 174.2. This would be because of the patent laws' lack to integrate the principles contained in article 174.2. Such a patented invention would not respect the prevention (rather than precautionary)[191], polluter-pays and rectification at source principles. At present, there is no measure whatsoever in the EPC, the proposed Community Patent or national patent laws which try and integrate even a little any of the principles laid down in article 174.2, for instance by giving special treatment to "green" inventions or penalising non-green ones.[192] Therefore, the

[190] Davies, above fn. 18, p. 29, "the concept of sustainable development endorses an approach in which environmental and economic developmental needs are integrated."

[191] Global warming is now a certainty, so the prevention principle applies rather the precautionary principle. See fn. 1 above.

[192] Apart from the indirect and limited effect of article 53.a EPC through the relevant case law. On article 53.a (the morality and *ordre public* provision), see E. Derclaye, "Patent law's role in the protection of the environment - Re-assessing patent law's functions and justifications in the 21st century", forthcoming. See however, a recent Norwegian case involving a growth hormone for transgenic fish, where risk assessment and precaution issues were raised by the Norwegian advisory board on ethical aspects of patenting. The Norwegian board "addressed the precautionary principle and

ECJ could possibly rule that such omission is a breach of the Treaty.[193] The precautionary principle is already an integral part of EU medical (pharmaceutical) law and EU (GM) food safety law.[194] There is no reason why it could not become part of patent law in view of the dangers some technologies can pose, including pollution and GHG emissions.

The European Patent Office (EPO) has not fared better. As well explained by Pavoni in relation to biotechnological inventions, "in practice, in its decisions rejecting claims based on environmental risks of biotechnological inventions, the European Patent Office (…) has never undertaken the slightest effort to consider and evaluate principles and legal instruments of international environmental law. (…) On the other hand, the *precautionary principle* certainly represents the legal rule more appropriately connected with the lawfulness of commercial transactions over biotechnology products. The state of widespread disagreement about the environmental adverse impact of these products would in fact appear to be apt for a solution consistent with the principle's call for measures to minimise or avoid such scientifically uncertain risks. Unfortunately the EPO has disregarded the principle in a way similar to what has been done by WTO bodies. More importantly, it has endorsed conceptions which are completely at variance even with the timid recognition of the principle which has occurred at WTO level."[195] Unfortunately, the ECJ does not have jurisdiction over the EPO. Nevertheless, if the EPO goes against international conventions or even EU legislation with which its members have to comply, it will be forced to change its views.

Even if the Community institutions do not act to integrate environmental law in other policies and the ECJ does not have the opportunity to rule on the matter, it does not prevent Member States from acting to do so. In a case predating the introduction of the integration principle[196], the Advocate General considered that a national tax on aircraft fuel was compatible with the Directive on mineral oil taxes "if it provided demonstrable incentives for the use of environmentally friendly aircraft and therefore had an environmental orientation effect."[197] Thus, according to some, "if national protective measures have a useful effect on the Community environment and help to identify best practices, this fact should be taken into account."[198] This is because Member States can adopt a higher level of environmental protection. So, "article 6 [ECT], together with article 5.2 and 5.3, can provide for preference for an interpretation of Community law that opens a certain scope for national action, on the condition that: (i) the wording of Community law is open to such an interpretation,

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risk as to the event due to the potential negative impact of transgenic fish on world populations (for example farm fish escaping the nets). T. Sommer, "Interpreting *ordre public* and morality in a patent law context: which is the correct approach?" [2006/07] 2 BLSR 62, p. 70. He does not say if this was done after or before patent was granted.

[193] See above section 1.1.1.6.

[194] H. Somsen, "Some reflections on EU biotechnology regulation", in R. Macrory, *Reflections on 30 years of EU Environmental Law, A high level of protection?*, European Law Publishing, The Avosetta Series 7, Groningen, 2006, p. 331-332.

[195] R. Pavoni, "Biosafety and intellectual property rights: balancing trade and environmental security – the jurisprudence of the European Patent Office as a paradigm of an international public policy issue", in F. Franconi (ed), *Environment human rights and international trade*, Oxford, Hart, 2001, p. 91.

[196] C-346/97 *Braathens Sverige v. Riksskatteverket*, 10 June 1999 (national taxation of aircraft fuel).

[197] Wasmeier, above fn. 87, p. 172.

[198] Ibid., p. 176.

(ii) national measures can have a useful effect on the Community environment and (iii) other Community objectives are not severely affected."[199] Therefore, Member States are free to change their patent laws to integrate environmental protection, in the absence of EU or EPO initiative.

1.2.2. Implications of the specific rules

What about the implications of the specific measures regulating GHG emissions? Inventors will often have an incentive to "invent green" because of the European (and also of course national) environmental rules. More specifically, when an industry or producer has to comply with secondary legislation regulating GHG emissions, it will often have an incentive to use new processes or products that reduce its emissions. Thus, environmental rules have an indirect effect on the incentive to patent environmentally-friendly inventions. However, as stated above, environmental rules are still incomplete so whilst specific environmental rules regulating GHG emissions will indirectly generate more green inventions, patent law still has a role, namely to fill the gaps of current environmental legislation, as also mandated by article 6 ECT. For instance, Directive 2003/96 restructuring the Community framework for the taxation of energy products and electricity will encourage producers of energy to produce it from renewable sources as these are not taxed in comparison to those emitting GHG (coal, gas, motor and heating fuels). Therefore, it will entice them to invent technologies to produce this energy that do not involve sources of GHG as they will otherwise be taxed. However, it will not *force* producers to produce energy from renewables and thus, if need be, invent new technologies to do so. On the other hand, Directive 2002/91 on energy performance of buildings will force builders to use materials not emitting GHG. Therefore, it will encourage the invention of technologies permitting this. Likewise, Directive 2001/77 on the promotion of electricity produced from renewable energy sources in the internal electricity market and Directive 2003/30 on the promotion of biofuels or other renewable fuels for transport will encourage the invention of technologies allowing electricity and fuel to be produced from renewables. Recital 15 of Directive 2003/30 itself states that promoting use of biofuels whilst at the same respecting sustainable development could "open a new market for *innovative* agricultural products with regard to present and future Member States" (emphasis added). Recital 24 also says that "*research and technological development* in the field of sustainability of biofuels should be promoted" (emphasis added). One could see there an implicit encouragement to integrate environmental policy into patent law. Stretching it, it could arguably mean that a special regime should be established for such patentable inventions. The Directive also seems to implicitly apply the precautionary principle as it requires that the Commission monitors the impact of biofuels on sustainable development and on CO2 emissions.[200] Finally, in the same vein, the emissions trading scheme should

[199] Ibid., p. 177.

[200] Recital 25 states that "an increase in the use of biofuels should be accompanied by a detailed analysis of the environmental, economic and social impact in order to decide whether it is advisable to increase the proportion of biofuels in relation to conventional fuels." According to article 4.2, the Commission had to draft a report by 31 December 2006 and then every 2 years thereafter, which covers *inter alia*: "(b) the economic aspects and the environmental impact of further increasing the share of biofuels and other renewable fuels; (…) (d) the sustainability of crops used in the production of biofuels, particularly land use, degree of intensity of cultivation, crop rotation and use of pesticides; (e)

push the heavy industries to patent new technologies which allow them to reduce their GHG emissions as one of the Directive's recitals also hints.[201] However, as seen above, the current ETS scheme does not seem to be enough of an incentive according to some companies.[202] Like the Directive on the promotion of biofuels, it is interesting to note that the ETS Directive seems to apply the integration principle but here a bit more explicitly.[203]

This analysis confirms our conclusions in section 1.1.2.3 that patent laws have a role to play in the reduction of GHG emissions. How can both companies and individuals go further, beyond compliance with the current environmental rules to tackle global warming, and reduce their carbon footprint? In short, by producing less and/or by using less polluting materials and energies. This is where patent laws come into play. Inventors can reduce everyone's carbon footprint by inventing and patenting new technologies, be they more energy-efficient processes (e.g. inventions using wind or solar power, processes to absorb or transform GHG into neutral gases (i.e. not generating heat or even if possible generating coldness)) or products (e.g. that emit less GHG when used or are recyclable).[204] In sum, while environmental rules act as an indirect incentive to invent greener technologies, in light of the urgency of tackling climate change, in accordance with the integration principle and notwithstanding the current patent law rationales, patent laws can and should do more to further reduce GHG emissions in the earth's atmosphere.

1.3. No adversarial relationship: patent and environmental laws can work hand in hand

Before tackling how further GHG emission reduction can be achieved concretely though the patent laws (section 2), it is useful to respond to a possible objection. Some might say that patent and environmental laws are fundamentally in conflict as patent law supposes the development of new technologies that may inevitably pollute. The answer to this objection can in most part be found in the discussion of the previous sections. It is worth summarising them here as well as adding other reasons.

If one admits that the integration principle has some legal effect, European and national legislatures don't really have a choice. They must integrate pollution control including that of GHG emissions in their relevant policies in addition to their environmental policy. As explained above (section 1.1.1.5), if there is a clash between environmental and other interests, they must be reconciled whenever possible, as all objectives have equal footing in the Treaty.[205] It is only when it is impossible to

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the assessment of the use of biofuels and other renewable fuels with respect to their differentiating effects on climate change and their impact on CO2 emissions reduction."

[201] "The Directive will encourage use of more efficient technologies (…)" (rec. 20).

[202] See fn. 189 above.

[203] Recital 25 states that "Policies and measures should be implemented at Member State and Community level *across all sectors* of the European Union economy, and not only within the industry and energy sectors, in order to generate substantial emissions reductions" (*emphasis added*).

[204] See for instance the European Inventor of the Year 2008 award given to researchers at Audi for their invention consisting of production of lighter and therefore more energy-efficient cars by using lighter materials and the French team nominated for the same award which invented a system generating less noise by planes' engines, which incidentally also reduces GHG emissions. See http://www.epo.org/about-us/events/archive/2008/epf2008/inventor.html

[205] Krämer, above fn. 7, p. 21; Wasmeier, above fn. 87, p. 160.

reconcile different interests that exceptionally one will have to take over the other.[206] This balance would of course depend on the situation although it could be argued that in the case of global warming, environmental interests should generally prevail as the problem is so acute. That said, is there really a fundamental conflict between patent and environmental laws? Arguably not and for several reasons.

First of all, the "conflict" between intellectual property and environment, if there is any, is already internalised internationally in article 27.2 TRIPs and at European level in article 53.a EPC and the relevant case law.[207] Arguably however, they do not go far enough as they apply only to avoid *serious* damage to the environment and the precautionary principle establishes a stricter test. Second, the important and current justifications for patent laws are not hostile towards the greening of patent laws.[208] If the utilitarian justification encompasses progress in its broadest sense (i.e. not only material progress but also general (social and environmental/climatic) well-being), both patent and environmental laws co-habit harmoniously. Even Locke's labour theory, which entails that there must be enough and as good left in the commons, can be said to be congruent with sustainable development. Thirdly, environmental law's sustainable development concept by definition aims to conciliate economic growth and environmental protection. The two are not incompatible.[209] Even beyond, environmental protection can be seen as an incentive to invent new technologies. The global cooling goal should in fact spur patenting activity; thus environmental protection in fact breeds economic development, as has been hinted in the previous section. At least in part, new technology will allow further growth. If we carry on using old technology or simply our resources as we do now, inevitably economic development will have to considerably decrease or even stop. Related to this reason, climate change should also foster inventions, as an invention's aim is to find solutions to problems and this is the core test of patent law's requirement of inventiveness.[210]

This objection having been pushed aside, we can now examine how patent laws can do more to deal with climate change.

2. Implementation in patent law – how patent law can help reduce greenhouse gases emissions

The question this final section addresses is how patent law can concretely do something to cool the planet. There are three ways this can be achieved. First, it can be achieved "negatively", i.e. by preventing the patenting of polluting inventions or in other words, requiring that all inventions be eco-friendly. Second, it can be achieved

[206] Wasmeier, above fn. 87, p. 163.

[207] Article 53.a is reproduced above at fn. 3. Article 27.2 TRIPs provides that "Members may exclude from patentability inventions, the prevention within their territory of the commercial exploitation of which is necessary to protect *ordre public* or morality, including to protect human, animal or plant life or health or to avoid serious prejudice to the environment, provided that such exclusion is not made merely because the exploitation is prohibited by their law."

[208] See E. Derclaye, "Patent law's role in the protection of the environment - Re-assessing patent law's functions and justifications in the 21st century", forthcoming.

[209] Lee, above fn. 38, p. 35-37 ("It should be recalled that the reconciliation of economic growth and environmental protection is the *aim* of sustainable development"). Recital 5 of the ETS Directive clearly states that the EU wants to fulfil its international obligations "with the least possible diminution of economic development and employment".

[210] For the UK, see *Biogen v. Medeva* [1997] RPC 1 (HL). Inventiveness is the problem and its precise resolution.

"positively", i.e. by encouraging the patenting of green inventions or in other words, granting them a special treatment in comparison to other inventions. Third, this can be done through a mixed system combining the above mentioned positive and negative components. The section will weigh the pros and cons of each solution and propose one of the systems as the most suited.

Before examining the several possibilities, it must be noted that some provisions within patent laws, can sometimes have the effect of protecting the environment and reducing GHG emissions. These are namely: compulsory licences and the exhaustion principle. Compulsory licences force the inventor of an eco-friendly or more specifically carbon neutral invention to work it if he refuses to do so or to grant a licence to a subsequent inventor who has improved it substantially. The exhaustion principle allows the recycling of patented products.[211] These general provisions, which help reduce GHG emissions, have been explored in another contribution to which the reader is referred to.[212]

2.1. Negative system

The idea of negative and positive systems within patent laws can be compared with similar systems used in environmental laws. The ETS is a positive measure (if you agree to reduce CO2 we'll give you a financial incentive) whilst taxing polluting substances (e.g. the UK's climate change levy[213]) is a negative measure (if you don't reduce CO2 we'll tax you). Accordingly, under a negative patent system, the law would require that to be patentable, an invention be eco-friendly. No patent would be delivered for, in our specific case, inventions which increase the level of GHG in the atmosphere by a certain percentage. This percentage would be set in the law and revised if necessary. It could be based on the requirements of environmental laws (e.g. the Kyoto Protocol) or go further and be based on 1990 figures of the Intergovernmental Panel on Climate Change (IPCC) which stated that to stabilise concentrations of CO2, current emissions would have to be reduced between 60-80 per cent.[214] Alternatively, under a softer negative system, polluting patented inventions would be allowed but taxed. For instance, a fee in addition to the regular fees would be paid to a fund that would finance green inventions. It would thus be like a green tax and would allow society to recognise the utility of the patent regime.[215]

European and national patent laws already have a negative system in place through the *ordre public* provision of the EPC (article 53.a) and the case law interpreting it.[216]

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[211] The research exception may also allow other inventors to improve on already existing eco-friendly patents. See e.g. art. 60.5.b UK Patents Act 1977.

[212] E. Derclaye, "Intellectual property rights and global warming" [2008] 12(2) *Marquette Intellectual Property Law Review*, 264-297. Human rights may also to some extent help protect the environment. Ibid.

[213] On this see e.g. Bell & McGillivray, above fn. 12, p. 651.

[214] Thornton & Beckwith, above fn. 5, p. 55.

[215] Nitta, European Patent Forum, slide 11, http://www.epo.org/about-us/events/archive/2008/epf2008/forum-1/details2.html, adding that it would apply to all patents (it is unclear whether this would or not include green inventions though).

[216] D. Alexander, "Some themes in intellectual property and the environment" [1993] 2(2) *Review of European Community and International Environmental Law*, p. 116 (The *PGS* case "illustrates a negative approach to intellectual property protection for technology which affects the environment –

It is already an important tool to cool the earth as the case law could be applied to excessive release of GHG by an invention as it can potentially seriously damage the environment. However, the current interpretation of article 53.a does not go far enough as it does not properly integrate the prevention and precautionary principles. In addition, only where it is likely that the patented invention will seriously damage to environment will the invention be unpatentable or revoked. A closer look at the most relevant case, *Plant Genetic Systems (PGS),* will abundantly demonstrate this. In this case, the board somewhat contradicts itself on two points important points. First, the board did not apply the precautionary principle although it arguably implicitly refers to it. It says that there may be serious damage to the environment but finds the patent valid. Second, it says that article 53.a forces it to examine the *ordre public* implications of patents[217] but it cannot substitute for the relevant regulatory authorities. It is best to quote a number of passages of the decision to illustrate these two points. Concerning scientific studies that were presented before it, the board said: "These documents provide *fundamental evidence* of *possible* hazards from the application of genetic engineering techniques to plants, in particular regarding the production of herbicide-resistant plants. This is done in order to increase the readers' awareness of the need to exploit this technology with *caution*"[218] (emphasis added). Concerning the prejudice to the environment, it said: "Of course, such events may occur to some extent. This fact has even been admitted by the respondents."[219] It concludes: "The Board observes that the mere fact that (…) there may be inadequacies in the existing regulatory framework does not vest the EPO with authority to carry out tasks which should properly be the duty of a special regulatory authority or body constituted to that effect. However, in the Board's view, the quoted documents do *not lead to the definite conclusion that the exploitation of any of the claimed subject-matter would seriously prejudice the environment* and is, therefore, contrary to "ordre public". *It would be unjustified to deny a patent under Article 53(a) EPC merely on the basis of possible, not yet conclusively-documented hazards*"[220] (emphasis added). This statement is clearly not applying the precautionary principle as in the board's view, a "definite conclusion" that the environment would be seriously prejudiced would need to be drawn in order to revoke the patent.

One can nevertheless sympathise with the EPO's decision on the second point. It is forced by article 53.a to decide whether an invention is against *ordre public* but in many (complex) cases, does not itself have the tools to do so. This is maybe why it preferred to give the benefit of the doubt to the invention. Relevant specialised agencies would be better equipped to assess the dangers of an invention. Also, it has been argued that it may be inappropriate to leave such important matters to the EPO because it is not as democratic as a legislative body.[221] However, it can be counter-argued that jurisdictions everywhere are bound to apply such provision and are not elected either. Solutions to this problem will be proposed below. On the first point, it

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arguing that protection should be refused if exploitation of the invention threatens environmental damage" [sic]).

[217] The idea that patent law is sheltered from public policy considerations "was (although cautiously) rejected by the EPO itself, when it admitted that "patent offices are placed at the crossroads between science and public policy" and thus qualified to make value judgments about a given technology". Pavoni, above fn. 195, p. 93.

[218] Case T 0356/93, *PGS*, 21 February 1995 [1995] OJEPO 545; [1995] EPOR 357, at 373.

[219] Ibid., at 372.

[220] Ibid., at 373.

[221] Alexander, above fn. 216, p. 115-116.

may be argued that whether the EPO is or not bound by the precautionary principle, as the EU and the EU Member States members of the EPO are bound by it and must integrate it in their law, the EPO may be forced to take it into account in its case law.[222] If it did not, it would create discrepancies between the rulings of the EU Member States' national patent offices and courts, which are definitely bound by the principle. Unfortunately, it may well be that even *PGS'* timid interpretation does not develop further or is even abandoned. Whilst the previous EPO president was in favour of a broad interpretation of the morality and *ordre public* clause[223], this does not appear to be the view of the current one.[224]

The majority of commentators however seems to agree that article 53.a should stay and not be interpreted narrowly. There are arguably no legal grounds to support the argument that patents are not instruments of public policy and therefore should not enforce environmental law principles and rules in patent adjudicative proceedings.[225] In any case, we are stuck with article 53.a EPC and similar provisions in article 6.1 of the Biotech Directive and 27.2 TRIPs.[226] Pavoni powerfully argues that since the grant of a patent is "a *public reward* for a contribution to scientific progress and consequently to the well-being of humankind", inventions irreversibly threatening to damage the environment "do not fulfil this basic requirement" and therefore should not be patentable.[227] Article 53.a thus forces patent offices and courts to deny patentability to or revoke patents which damage the environment.[228] Other commentators also think that the patent system should not disregard ethical and moral concerns.[229]

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[222] Sommer, above fn. 192, p. 69, fn. 41 notes that a working group of the Danish Group of Technology in a report called "Recommendations for the patent system of the future" recommends that the patent laws consider the precautionary principle. See also the consideration of the principle by the Norwegian advisory board on ethical aspects of patenting in a case involving a growth hormone for transgenic fish. Ibid., p. 70.

[223] The fact that exceptions must be interpreted narrowly was questioned by Alain Pompidou in an invitation to comment on the *WARF* case. According to him, the Vienna convention clearly states "that the interpretation of an international treaty does not have to rely solely on retracing the original intentions of the contracting parties. (…) Article 52(1) EPC does not enshrine a general principle of narrow interpretation of exclusions. A presumption in favour of a narrow interpretation of exceptions to patentability would unduly limit the significance of the moral jurisdiction under article 53(a) EPC and rule 23d(c), the purpose of which is the incorporation of higher ranking legal and moral principles into European patent law, and would thus be in conflict with the general objective of those norms. (…) The principle of narrow interpretation of exceptions should not be generally invoked without stating any reasons as to its applicability." See Sommer, above fn. 192, p. 70. Pompidou's comments are available at www.cipa.org.uk/download_files/epo_warf.pdf

[224] The current president of the EPO, Alison Brimelow, prefers a narrow interpretation of article 53 (based on a personal conversation the author had with her at the European Patent Forum 2008). Consequently, the EPO may not be inclined to broaden or even follow its previous rulings.

[225] Pavoni, above fn. 195, p. 92, citing Alexander, above fn. 216, p. 113 and A. Wells, "Patenting new life forms: an ecological perspective" [1994] EIPR 111, 112-113 who also believe that patent law is a "servant of public policy".

[226] Pavoni, above fn. 195, p. 92. Directive 98/44/EC of the European Parliament and of the Council of 6 July 1998 on the legal protection of biotechnological inventions, OJ L 213, 30.7.1998, p. 13.

[227] Ibid., p. 93.

[228] Ibid.

[229] P. Drahos "Biotechnology patents, markets and morality" [1999] EIPR 441, 449, cited by Pavoni, above fn. 195, p. 92-93; G. van Overwalle, "Legal and ethical aspects of bio-patenting" in P. Drahos, *Death of Patents*, QMIPRI and Lawtext publishing, 2005, p. 222, fn. 18 (although adding that the patent system should only act as a moral "toolbooth" "to the extent that it concerns matters which are

Pros and cons

Several advantages to this system can be identified. First, it is ethical. Second, it avoids a conflict where the state through its patent office accepts the patentability of an invention and endorses this as a public reward for the inventor's efforts and then later on, rejects it, through its regulatory bodies. Third, it also avoids a waste of the inventor's money in fees. Finally, perhaps the strongest argument, which is linked to the first one, is that article 53.a is there to stay (it is unlikely to be deleted or revised from the EPC and/or national laws) and its very purpose is to discourage researchers from investing money in unethical inventions as they run the risk of not getting rewarded.

The main argument against this system is that patent laws should not be making ethical considerations, and that this should be left to other laws. In such a system, the inventor would still be able to obtain a patent and if the regulatory body refuses to give its exploitation authorisation, it may be possible to revisit its decision once more evidence is adduced or public policy or environmental standards have changed years later, with the patent being able to finally be exploited. In reply to this argument, it could be envisaged that inventors could still send (not properly file a patent application) documents recording their inventions to the patent office which would keep them until environmental evidence is more concrete and which would constitute proof of first to file. Once the evidence is positive, the patentee could then file its application. However, in some cases, this can take years and the technology may have become obsolete anyway.

Another at first sight powerful argument is that if polluting inventions are prohibited, they fall in the public domain so that everyone can exploit them, they become more spread out and as they cost less than the patented green ones, people use them more.[230] However, this argument does not hold true for two main reasons. First, if they are prohibited, those who wish to have exclusivity will not waste their money in investing in dirty or polluting inventions.[231] They will instead try and invent green ones to be rewarded with the exclusivity of a patent. Second, environmental laws also prohibit pollution so that even if some businesses may want to carry on using polluting products and processes, the law will fire back from another corner to punish them. This shows again that environmental and patent laws are complementary.

Accordingly, it seems that we (at least currently and realistically) cannot do without a negative system. Solutions for the negative system based on article 53.a EPC to apply can be elaborated so that the system works better than it currently does. First, on substance, changes in the national laws and ideally the EPC would be better for legal certainty. The easiest way would be to include damage to the environment within article 53.a so that environmentally damaging inventions are not patentable. This would include all and not only serious environmental damage. For clarity, the provision would also include excessive release of GHG within environmental damage. Second, on procedure, although it is clear that the EPO must check whether

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directly or inextricably linked with patents and the exercise of patents: patent law should not interfere when research is ethically undesirable"), cited by Sommer, above fn. 192, p. 73.

[230] E. Armitage & I. Davis, *Patents and morality in perspective*, Common Law Institute of Intellectual Property, London, 1994, p. 58.

[231] Armitage & Davis, above fn. 230, p. 58 (deterrence effect).

an invention does not offend public policy, what is less clear is how it should do this. It is a recurrent objection that the EPO should not perform this task because it "would interfere with other the relevant (sic) authorities applying the principle to the grant of authorisations, either to upstream research activities or the downstream marketing of products".[232] It has also been argued that patent offices are ill-equipped to make this assessment. But this is not an insolvable problem. Solutions can be envisaged. The easiest one is that the EPO or national patent offices should suspend their proceedings on the patentability of a potentially polluting invention until the relevant body or agency has ruled on this issue and then, follow their decision. Alternatively, if the EPO or national offices need help on this issue, they should ask a question to the relevant regulatory body, and suspend proceedings until the latter answers and then decide on the basis of the regulatory body's opinion. Similar systems could be used in infringement actions. The defendant could counterclaim and say the patent is contrary to *ordre public* and ask the court to refer a question to the regulatory body. Accordingly, article 53.a should also include a sentence referring to how it is to assess environmental damage.

Currently however, the law is unsatisfactory. Patent law caters for environmental protection very inadequately, let alone for the reduction of GHG emissions in the atmosphere. Article 53.a's case law does not go far enough and the integration principle is not (yet) implemented into European and national laws and decisions. The integration principle's current force is a hindrance to its better application. There may be a glimpse of hope however, in the *PGS* decision itself. The board uttered that "it would *undoubtedly* be against "ordre public" or morality to propose a misuse or a destructive use of these techniques. Thus, under article 53.a EPC, no patent may be granted in respect of an invention directed to such a use."[233] Therefore, if an opponent's argument that the invention seriously damages the environment fails to convince the EPO, national patent office or court, he or she could say that the proposed technology is misused or contributes to the destruction of the environment, e.g. by increasing GHG in the atmosphere above a certain percentage. It remains to be seen however, how these two sentences will be further interpreted by the EPO, national offices and courts.

2.2. Positive system

Under a positive system, green inventions would be encouraged through a special, preferential treatment within the patent laws. This system would not ban inventions which are not eco-friendly but simply encourage those which are. A number of measures can be envisaged to treat green inventions more favourably or in other words subsidise them:

- give green inventions priority over others by giving applicants administrative advantages: faster examination, reduced fees for the application, grant and maintenance of patents, removal of green inventions from deferred examination, earlier publication and/or priority at the opposition and infringement stages[234] (so-called "fast track" system[235])

[232] Sommer, above fn. 192, p. 69, fn. 41.
[233] *PGS*, fn. 218 above, p. 370.
[234] See R. Blum, "The threat to our environment and the protection of intellectual property" [1973] *Industrial Property* 243; F.-K. Beier, "Future problems of patent law" [1972] IIC 423, p. 443 (who recommends most of these measures and recommends following the American and Japanese special

- stronger protection[236] e.g. lengthen the term of green inventions. One example would be to give a SPC at the end of the normal patent term if it is proven that the patent had significant environmental benefits[237]
- compulsory licences[238], voluntary buy-outs of patents, purchasing commitments[239]
- research funded by the state to protect the environment[240] (this is already partially done by national and EU funding e.g. through university research centres funded by granting bodies and by the FP7 source of funding)
- "providing official assistance in exploiting inventions"[241]
- prizes or lump sums, which would be paid to the inventor in proportion with the invention's usefulness.[242]

Within a positive system, should there be specific sector priorities? First, a priority could be made between different types of pollution. As global warming is probably the most pressing environmental problem, those inventions which tackle it should be examined in priority.[243] Then within this specific sector, as the fastest growing source of GHG emissions is transport[244], there could be a further priority in this area of patenting, for instance for better fuel-efficient cars, fuels that emit less or no CO2 etc.

Pros and cons

The advantages of this system are evident (reduction of pollution including GHG emissions should ensue). However, such special regime "cuts two ways".[245] It provides a stronger incentive but on the other hand, it makes the technology more expensive to use.[246] It may also take longer for patents to be granted.[247] In addition, if this special treatment is given to green inventions, then patentees in other fields will claim they should also be treated favourably (e.g. pharmaceutical products).[248] Also, an entirely positive system would mean that article 53.a and similar national provisions would have to be repealed, which is unlikely and in our view, unhealthy.

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regimes for environmentally friendly inventions and extend the idea to other types of preferential treatment for socially useful inventions).

[235] Bastioli, slide 22, European Patent Forum 2008, above fn. 215. Verheugen in his speech at the European Patent Forum 2008.

[236] Beier, above fn. 234, p. 443.

[237] Alexander, above fn. 216, p. 116 (however doubting whether such system would necessarily incentivise firms to develop environmentally-friendly technologies).

[238] On these, see Derclaye, above fn. 212. But some would propose even more aggressive licences of green inventions which may have the counter-effect of deterring green inventions in the first place.

[239] De Boer, slide 12, European Patent Forum 2008, above fn. 215.

[240] Blum, above fn. 234, p. 248 who proposed the creation of state-owned research institutes for this purpose. We would add to update his views, and more specifically to reduce GHG.

[241] Beier, above fn. 234, p. 445.

[242] Blum, above fn. 234, p. 247. Under the proposed system, inventions would be classed by an international body according to the criterion of usefulness. Blum then discusses the funding of those prizes. He however thinks that such the system of prizes and state-funded research is not sufficient to encourage more green inventions and more needs to be done on the international level.

[243] Barton, European Patent Forum 2008, above fn. 215, slide 18, is in favour of this.

[244] Bell & McGillivray, above fn. 12, p. 646.

[245] Alexander, above fn. 216, p. 116.

[246] See also, J. Phillips, Editorial, "Green patents", Patent World, 1990, p. 2; S. Scotchmer, European patent forum, above fn. 215, slide 2: "patents are touted as both the solution and the problem" to global warming. "The problem with patents is that if a clean technology is expensive to use, it will not be adopted".

[247] Phillips, above fn. 248, p. 2; Armitage & Davis, above fn. 230, p. 63.

[248] Alexander, above fn. 216, p. 116. To solve the problem, Nitta, European Patent Forum, above fn. 215, slide 2 puts medicines into green technologies.

Some have also argued that sometimes an invention not connected to the environment could reveal being one later. Therefore, green inventions should not benefit from favoured treatment. This is not irremediable. If this is so the patentee could be rewarded *a posteriori* by a longer term for instance or a reimbursement of its patent fees or more. Finally, a preferential treatment may favour a race to make green inventions, which is good but of course, but can have side effects because inventors will try and fit in the criteria. This is why we need strict standards so there is no "rent-seeking". The strongest argument against the specific feature of a positive system which would prolong the term of the patent is its contradiction with the EPC. However, article 63.2.b EPC could be used to justify such prolongation as in every case an authorisation would have to be granted. On the other hand, TRIPs does not prevent a longer term (art. 33)[249] and specifically allows more protection if it does not contradict the TRIPs agreement (art. 1). Otherwise, it seems that the EU could "circumvent" article 63 EPC like it arguably did for the SPCs.

Finally, a mixed system would simply combine the elements of each, i.e. those of a positive and those of a negative system. Thus inventors would not be able to patent polluting inventions or else would be taxed and green inventions would benefit from a preferential treatment in comparison with the other types of inventions.

2.3. Which system is best?

Looking back at all the pros and cons, which system would be best? And how would a negative, positive or combined system fare under the several current and proposed new justifications for patent law?

There are more pros than cons or the cons carry less weight than they seem. The advantages speak for themselves. The con of the negative system has already been addressed under section 2.1. As to the cons of a positive system, it may be true that it may take longer to grant patents but in any case, the inventor has to have its invention first assessed by the relevant environmental agency. Only when it gets the green light would the patent be "properly" filed so that the term would not be affected. In many cases, for all sorts of inventions implying a danger (medicines, some food, some other technologies involving safety), patentees have to be wait to be able to exploit their invention. So this problem is not new (and has been resolved for some products with SPCs). The same goes for cost. For the same reason, it would not cost more than at present as the assessment would be done by the same regulatory body, and endorsed by the relevant patent office. The objection that inventions in other sectors such as the pharmaceutical sector, are also worthy of preferential treatment can easily be resolved by adopting a special treatment for them as well. As a matter of fact they already enjoy such treatment thanks to the SPCs.

Apart from the justice and fairness rationale, the current patent rationales do not seem in obvious contradiction with a positive and/or negative system. Some favour one or the other system more strongly than others. The labour theory's enough and as good requirement seems to be in accordance with a negative and maybe also a positive system. The fairness or justice rationale would probably dictate that all inventions deserve to be patented, even if they damage the environment. Therefore, neither a

[249] Article 33 TRIPs states "the term of protection available shall not end before the expiration of a period of twenty years counted from the filing date".

positive nor a negative system would be possible. Although a favoured treatment of green inventions could be argued. A negative system could be envisaged under the slightly more detailed reward theory (it seems contradictory to reward damaging inventions), and a positive system could be argued too as green inventions arguably deserve a greater reward. The utilitarian rationale, which still underlies most patent laws today, already agrees with a negative system (as illustrated by article 53.a EPC and corresponding national provisions).[250] A positive system however is not obvious because of the principle of neutrality although the justification does not *per se* prevent such system.[251] The disclosure function (under which, as a reminder, patents exist to provide information to the rest of the industry) would agree with a negative and also a positive system. A negative system would prevent the disclosure of damaging technology[252] and a positive system would encourage even more disclosure. Finally, the public sanction function of the patent system is definitely in favour of a negative system and possibly also of a positive one.

What about the proposed revisited or new justifications? If the utilitarian function of patent law is revised following the developments made in the previously published article[253], a negative system is mandatory. Accordingly, under this extended view of progress (i.e. the idea that the "progress" rationale includes not only material wealth but general wealth and therefore a good environment as well), *all* inventions and creations must be environmentally friendly and there need not be a special regime for environmentally friendly inventions and creations. Only a negative regime could therefore be envisaged. Of course, the view which proposes to simply take environmental concerns into account in patent laws accommodates both systems separately or combined.

What can be learned from this analysis? Apart from one justification (which is not currently trendy), all other traditional justifications seem to accommodate both a positive and negative system, although some (the disclosure and public sanction functions) do seem to agree with them more than others. Of course, the view which simply proposes to incorporate environmental issues is agreeable to both systems. The revised incentive theory may be going too much towards the other extreme. Therefore, at least, from the point of view of the environment, we could and should probably reform patent law under the disclosure and public sanction function. Of course, a more fundamental reform could be thought through which would incorporate the environmental concern as a function of patent law. In our view, a mixed positive and negative system seems the best system at least to tackle serious environmental problems such as climate change. A negative system is already good, as long as it is applied effectively and therefore taking the points made in section 2.1 above, into consideration. A positive system without a negative one would be somewhat effective but would send the wrong signal. In any case, it is not possible to envisage unless the EPC and national patents laws are revised to delete the *ordre public* provision. Purely negative systems could remain for less serious problems than global warming.

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[250] Despite the principle of neutrality attached to this justification.
[251] See Alexander, above fn. 216, p. 116 who says it can grant more incentive.
[252] At least its state support, as such information could always be revealed anyway (e.g. on the Internet etc).
[253] E. Derclaye, "Patent law's role in the protection of the environment - Re-assessing patent law's functions and justifications in the 21st century", forthcoming.

2.4. Ways to determine and prove an invention's eco-friendliness

In order for the positive and/or negative systems to work, standards need to be established to know what an environmentally-friendly invention is. How are we to set these standards? Concretely, how much less GHG should a patented product emit so that it is classified as an environmentally-friendly invention and can benefit from the advantages or the specific regime? Who is going to decide upon these standards and whether they are in each particular case fulfilled or not? A related issue this section also tackles is who should bear the burden of proof that the patented product or process respects these environmental standards.

2.4.1. Standards setting

Before tackling the standards issue, one important thing must be noted. In the field of climate change, it is the prevention principle that applies not the precautionary principle, if one makes a difference between the two. The distinction is important. As noted in section 1.1.1.2., the prevention principle applies when it is more or less certain that an event will occur. The IPCC report in November 2007 stated it was beyond reasonable doubt that humans contributed to global warming by emitting GHG. Therefore, the assessment of the risks to human, animal or plant health need not be made as it is already clear. Thus cost-benefit analysis (CBA) or other methods need not be used.[254] Moreover, if an assessment was made according to the *PGS* ruling, the threat to the environment of an invention emitting above a certain threshold of GHG would probably never be sufficiently substantiated. This is because it is the cumulative effect of all inventions doing so that substantiates the threat. This is another reason why this method is not appropriate in the case of the specific environmental problem of global warming. If one was not yet convinced, one could inspire oneself of the obligation that intellectual property laws do not run counter environmental security (article 16.5 of the Convention on Biodiversity), which "necessarily requires judicial bodies and legislatures to give precedence to biosafety concerns over trade values which are fostered by patents on potentially devastating inventions."[255] CBA and other assessment methods however may be appropriate for other environmental problems where the precautionary principle applies rather than the prevention principle. Such discussion is left to future research.

There are several ways to set the standards. The most straightforward way that comes to mind is to simply follow those already set in the environmental laws. For climate change issues, several targets have been set in the Directives and Regulations, which could be followed. More generally, it could be said that in order to be patented, every process or product that emits GHG should emit 8 percent less of them compared to the same product's emissions in 1990 (the target the EU agreed to respect in the context of the ratification of Kyoto Protocol, see above section 1.1.2.2.). The relevant regulatory body (e.g. European Environmental Agency)[256] could check whether the

[254] There are additional reasons why CBA may not be an appropriate method, at least in the relationship between the environment and trade, mainly because of the "potentially unfettered discretion it leaves to adjudicative bodies in the performance of the balancing exercise". See Pavoni, above fn. 195, p. 97 ff., 102.

[255] Ibid., p. 102.

[256] William Cornish & David Llewelyn, *Intellectual property: patents, copyright, trade marks and allied rights*, 5th ed., London: Sweet & Maxwell, 2007, p. 232, n. 5-83 note that there are regulatory bodies in the EU and the UK which determine whether some practices should be prohibited among others, to ensure the protection of the environment. For instance in the field of GMOs, Directive

product or process fulfils this requirement.[257] This would not prevent the applicant to file his or her patent. Examination would just be suspended until the relevant body issues its opinion. There could even be a possibility to amend the patent if the relevant body issues a negative statement. Whether 8 percent should be the relevant or general standard is debatable. In some fields, it may be more difficult to invent products or processes which release less GHG. So in those fields, a lesser percentage could be the standard. In other fields, where it is easier, a higher percentage could be set.

Another issue is whether this standard should be written down in the patent laws, and be revised every so often. It has already been argued that article 53.a should be revised to include that an invention cannot patented if it may prejudice the environment. In the same vein, in a combined negative and positive system, patent laws should provide that a patent cannot be granted if the invention does not meet the standard of 8 (or x as revised) percent less GHG compared to 1990 levels and that advantages (as listed above in section 2.2.) should be granted if the invention exceeds the standard or even better, is GHG or carbon neutral. Such advantages could increase or several advantages should be combined, the more eco-friendly the invention is. Sky is the limit in terms of flexibility the law can afford to various degrees of eco-friendliness. In this view, patent laws would encourage going beyond environmental law's targets. Patent laws could further provide that the prospective patentee must first contact the relevant agency to check if his or her invention complies with the standard.

For certain inventions, additional checks should be made. For instance, building on the Directive on the promotion of biofuels, before the patent is granted, assessment of sustainability of the invention (the specific biofuel in question) should be carried out. As is known, biofuels may reduce CO2 emissions when used to drive vehicles, but may *ex ante* deplete food resources and raise CO2 if forests need to be cut down to allow more agriculture of the raw materials that are used to make them. As has been said at the beginning of this article, only the issue of climate change is addressed here but protection of the environment more generally is in question. The same question should therefore be thought through for every issue within environmental protection, and therefore sustainable development.

2001/18 "establishes a Community authorisation procedure for the placing on the market of GMOs, as or in products, where the intended use of the product involves the deliberate release of the organism(s) into the environment." H. Somsen, above fn. 194, p. 338. Such procedure requires notification to the national competent authority and the deposit of a technical dossier. The GMOs cannot be released before the authority has given its consent. "The national competent authority should give its consent only after it has been satisfied that the release will be safe for human health and the environment." Ibid. A similar system could be used for inventions emitting GHG. G. Verheugen, the vice-president of the European Commission, when speaking at the 2008 European Patent Forum seemed to say that what is in place is good and works well and therefore that there is no need for a new standardisation organisation. Krämer, above fn. 7, p. 391 notes that the European Environmental Agency has already drawn a list of criteria to assess the integration of environmental actions into other policies (e.g. is there qualitative and quantitative identification of all environmental costs/benefits?; is there an environmental impact assessment of projects before implementation?; have eco-efficiency targets and indicators been developed and used to monitor progress?).

[257] Armitage & Davis, above fn. 230, p. 58 go further and see it as an obligation it seems. For them, "the ethical boundaries of acceptable technology are for governments to set and the patent system should operate within those boundaries".

This example highlights a related issue that the law could also envisage. So far the legal change would require that the proposed product or process, during its lifespan, does not emit more than x percent GHG (*ex post*). But the law could further require that the *manufacturing* of the product (*ex ante*) does not either. This is an additional question which should be posed. Perhaps the IPCC and ETS Directives already deal with this issue as products will generally be made out of heavy components.

There is however a problem with the proposed system above. Both article 27.2 TRIPs and article 53.a EPC provide that countries may not prevent the patentability of an invention simply because the exploitation of the invention is prohibited by their law.[258] The way around this is to say that the prohibition is one that is based solely on *ordre public* and not merely based on environmental law. But this will not do it seems. This means that a patent should still be granted even if its commercialisation depends on an authorisation (to meet certain requirements).[259] In other words, patent offices "should not leave patents pending on a decision concerning the invention's meeting of extra-patent law requirements (such as security and quality). Patents should be granted or rejected on grounds of patentability only."[260] Indeed, the law on security or quality may later be modified or repealed therefore allowing the exploitation (commercial or not) of the patented invention.[261] In our current system, this has a perverse effect. This means that all patent applications being treated equally, (potentially or even clearly) damaging inventions will be treated the same way as those deserving ones (e.g. eco-friendly). This can be seen as a waste of public time, money and resources (i.e. that of the patent offices) if the patent cannot in the end be exploited anyway.[262]

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[258] For the text of article 53.a EPC, see fn. 3. Article 27 TRIPs states: "Members may exclude from patentability inventions, the prevention within their territory of the commercial exploitation of which is necessary to protect *ordre public* or morality, including to protect human, animal or plant life or health or to avoid serious prejudice to the environment, *provided that such exclusion is not made merely because the exploitation is prohibited by their law*" (emphasis added). See also article 4 quarter of the Paris Convention. It is not exactly a rest cure to exclude an invention from patentability under 27.2 TRIPs. Members must comply with article 2 of the WTO Agreement on technical barriers to trade, which reads in relevant parts: "(2) Members shall ensure that technical regulations are not prepared or adopted or applied with a view to or with the effect of creating unnecessary obstacles to international trade. For this purpose, technical regulations shall not be more trade-restrictive than necessary to fulfil a legitimate objective (…) (3) Technical regulations shall not be maintained if the […] objectives can be addressed in a less trade-restrictive manner". "In other words, if the objective of excluding the commercial exploitation of inventions in a certain field of technology can be achieved in a way that does not require excluding inventions from patentability, then that way should always be preferred." See N. Pires de Carvalho, *The TRIPs Regime of Parent Rights*, The Hague, Kluwer Law International, 2002, p. 172-173.

[259] Pires de Carvalho, above fn. 258, p. 174.

[260] Ibid.

[261] See also Armitage & Davis, above fn. 230, p. 51. It may also be argued that if the regulatory authorisation is not granted, the patent is arguably not useless even if the invention cannot be exploited. As it is published, if someone improves it during the patent's term, and the necessary authorisation is thereafter conferred, the improver will have to pay royalties to the first inventor and the latter can have a licence to use the second invention.

[262] *The Budapest treaty and its applicability to human stem lines; the WIPO approach on ethical issues*, WIPO statement at the roundtable on the ethical aspects of patenting inventions involving human stem cells, European Group on Ethics in Science and New Technologies, Brussels, 20 November 2001, was cavailable on www.europa.eu.int/comm./european_groups_ethics which is now http://ec.europa.eu/european_group_ethics/archive/2001_2005/activities_en.htm This statement says that patents for unethical inventions are a waste of public time and resources of the patent offices

But in a mixed positive and negative system, this problem can be resolved. Indeed, nothing in the EPC or TRIPs prevents special treatment for some inventions. The European SPCs are a proof of this. Thus even if suspending the patent application until the regulatory body has given its opinion may breach international law, making those patent applications wait at the bottom of the pile does not.

2.4.2. Burden of proof

Who should bear the burden of proof that the patented product or process meets the standard? If we are to follow the environmental principles of rectification at source and polluter pays which should be integrated in EU policies, it should be the inventor. As a reminder the polluter pays principle means that the price of environmental damage should not be borne by society (through taxation) but by the polluter. The principle of the rectification of environmental damage at source favours the control of pollution at the point of emission rather than further down the chain. The problem however is the identification of the polluter and the source of the pollution. If the invention is a new engine for a car, is the polluter the oil producer, the inventor or the driver? We could take as a principle that it is inventor of the car. The oil may already be taxed anyway. This would mean that the inventor, not the regularity authority, will have to convince the regulatory authority that his or her invention meets the standard set. This also means that in opposition proceedings before national patent offices or the EPO, it should not be the opponent but the patentee who should bear the burden of proof. Currently, it is not the case.[263] This was illustrated in the *PGS* case, where the burden of proof that the exploitation of the invention would seriously prejudice the environment laid with Greenpeace, not PGS.[264] In its Communication on the Precautionary Principle, the Commission also favours the reversal of the burden of proof.[265] Indeed, "in this context it matters critically on whom the burden of proof lies. It is one thing to require a patentee to establish that the invention is environmentally safe (by some accepted criterion). It is a very different thing to require an opponent to a patent to establish that the invention is not safe." [266] This rule will not discourage the invention of green technology in a mixed negative and positive system, or even in a purely negative system. All inventors will have to comply with the rule that inventions must meet the Kyoto or even the stricter EU targets. If they do not, they will, not be patentable. If they go beyond, perhaps the burden of proof should be shifted back to the regulatory authority. So, as long as the applicant proves that his or her invention meets the standard, if he or she claims it is even more GHG-friendly, it would be for the regulatory authority to disprove it. This would maintain a good balance and provide further incentives to "invent carbon neutral" and generally, "invent green".

(which are often subsidised by public money as the fees that patent offices would charge would be too high for inventors otherwise).

[263] Pavoni, above fn. 195, p. 96 ("Claims based on the environmental adverse impact of inventions are normally presented in opposition and appeal proceedings where, as a rule, the burden of proof lies with the opponent or appellant").

[264] M. Llewelyn "Article 53 revisited" [1995] EIPR 509.

[265] See above section 1.1.1.2.

[266] Alexander, above fn. 216, p. 115.

2.5. Conclusion

The best system is a combination of both negative and positive, as in environmental law.[267] The current EPC and national patent laws would need to be revised as stated above to incorporate the changes. Therefore, article 53.a and corresponding national provisions should specifically write down the risk of prejudice to the environment as against *ordre public*, that the prevention or precautionary principle should be taken into account depending on the risk of the technology for the environment. These provisions or others that should be added, should also state that "green inventions" (those meeting standards set by the relevant agencies or bodies) receive preferential treatment. Which special regime (fast track, longer term etc.) is really up to the legislatures. This treatment can be modulated in function of the degree of eco-friendliness of the invention. Inventions which cut down GHG release should certainly receive the most advantageous regime. The burden of proof should be on the inventor but if he or she claims that his or her invention goes above the target set in the law, the burden would shift back on the regulatory body to prove it does not. This way, incentives should be kept balanced. So whilst it would not be possible to suspend patentability until the relevant authority hands down its verdict or refuse the patent if the verdict is negative (i.e. the invention is not environmentally-friendly), non-abiding inventions would be relegated to the end of the pile as those green ones would proceed on the fast-track. Whilst the best way to achieve this would obviously be amending the EPC and national laws, it may take considerable time. An alternative solution would be for environmental organisations such as Greenpeace and the like, to push the interpretation of article 53.a in the direction advocated in this article, as in the *PGS* case. However, a commitment from the legislature would be needed to grant a favourable regime to green inventions. It seems, from what was uttered by the European Commission and EPO officials at the 2008 European Patent Forum and from the EPO's vice-president, Manuel De Santes, at the 2008 ATRIP Annual Congress that this may not be impossible.

Conclusion

The answer to the question posed by this article is definitely affirmative. Patents can help cool the planet and, they also should. EU environmental law quasi obliges them too. Solutions have been proposed above and will not be repeated here. What should be said in conclusion is still more pragmatic. Europe, as one of the richest and most polluting regions in the world, where industrial revolution and its unfortunately bad effects started, should lead the way to find solutions to global warming. As we did before when we invented all these new machines in the 18th and 19th century, we should again be first not only in inventing but in inventing green, and thereby give the example to the rest of the world. It is not (only if at all) a question a pride though. It is a question of survival. The issue is intrinsically international as we are all dependent on the well-being of our eco-systems, and first of all the world's temperature and climates. Of course, the greening of patent law is not a panacea but it gives incentives (if not pressures) to invent mechanisms to cool the earth. Politically, it also sends the right signal. It will be seen that the patent system is not only a "monopoly-granting machine" and that "capitalists" can also be green. This rhetoric is not the prerogative of environmental organisations. The public will perhaps reconcile itself with intellectual property or at least patents, which have unfortunately gone down in popularity these last few years because of the excesses of right holders, to which the

[267] See above section 2.1 on the ETS Directive and the taxing of polluting substances.

legislature bowed almost blindly.[268] Such changes will also promote green awareness, behaviour and responsibility.

If the EU sets the trend, it will be good but of course, it will only be one step as the issue, to be effective, must be tackled globally. This article has focused largely on European law. However, the arguments developed and models advocated can also apply at international level. Accordingly, article 27.2 TRIPs should be revised in the same way as advocated in this paper. A declaration could be drafted and signed by prominent academics to convince political bodies to move in this direction.

Of course, environmental law must continue regulating activities as not all polluting products and methods are patented. Environmental and patent laws are complementary. There are also already many existing climate-friendly machines and processes not protected by patents.[269] These can already be put to practice. Conversely, there are patents which can be used free of charge thanks to the goodwill of their owners. The eco-patents commons private initiative can be noted.[270] Beyond law, other tools and initiatives can also regulate or prevent environmental damage including economic instruments (e.g. voluntary ETS), self-regulation (e.g. product labelling)[271] and voluntary agreements (see for instance the agreements of car manufacturers with the Commission).[272] Of course, prizes, awards, research grants etc. granted by the state or private sponsors can be used in addition to patents.[273] And there are a bunch of such initiatives out there already.[274]

So even if the mixed positive and negative system proposed is not put into place, which would be a shame, other instruments are already doing their bit to help us survive on this unique and wonderful planet. In the end, global cooling will be the result of joint efforts. Not only should we change the law, but also our habits and our ideology.[275] And growth, and capitalistic profits that go with it, should normally not

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[268] See e.g. after the extension of author's rights to 70 years after the author's death in 1993 (Directive 93/98/EEC harmonising the term of protection of copyright and certain related rights [1993] OJ L 290/9), the recent European Commission's proposal to further extend the term of protection of sound recordings and performers' rights whilst flimsy economic evidence was handed down justifying doing so. See http://ec.europa.eu/internal_market/copyright/term-protection/term-protection_en.htm

[269] De Boer, above fn. 239, slide 11; Childs, European Patent Forum 2008, above fn. 215, slide 2.

[270] See http://www.wbcsd.org/templates/TemplateWBCSD5/layout.asp?type=p&MenuId=MTU1OQ&doOpen=1&ClickMenu=LeftMenu

[271] Thornton & Beckwith, above fn. 5, p. 21.

[272] On these agreements, see Bell & McGillivray, above fn. 12, p. 647.

[273] As such grants are largely dependent on the will, interest and resources of the private or public sponsor, economists generally agree that they can only function alongside the patent system and not instead. For a nuanced view, see e.g. S. Shavell & T. van Ypersele, "Rewards versus Intellectual Property Rights" [2001] 44(2) Journal of Law and Economics, p. 525-547.

[274] Childs, above fn. 269, slides 9 and 10, citing among others the Virgin's prize to fight global warming http://www.associatedcontent.com/article/146302/virgins_prize_to_fight_global_warming.html, The Virgin Earth Challenge, Bright Tomorrow Lighting Prizes initiated by U.S. Senate S.1115 Energy Efficiency Promotion Act, s. 103. Other ideas include a prize for reducing carbon emissions funded by gasoline tax.

[275] Childs, above fn. 269, slide 3 thinks that "sometimes we are more in need of innovations in behaviour or better utilisation of existing technology than we are of new technology that would be too costly or rarely used." IPR are important but also other things such as government subsidies, taxes, regulatory standards, social norms.

have to be stopped to cool the earth[276]; they can be go on, but greened. That should make us (and other living beings, plants and the earth) live better and happier than ever before. Long live progress…

[276] The IPCC says that stabilisation of GHG emissions is possible through technology alone. See De Boer, above fn. 239, slide 5. This is not surprising as they are mainly composed of scientists. However, some think differently. See e.g. Stookes, above fn. 5, p. 27 (sustainable development "requires rethinking how we live our lives and not necessarily following current patterns of economic growth, consumption and travel." It means that we must take into account the capacity of the planet). See also Chris Green interviewing Dr Kate Rawles of the University of Cumbria, 'Technology alone won't solve climate change', The Independent of 1 May 2008, available at http://www.independent.co.uk/news/education/higher/against-the-grain-technology-alone-wont-solve-climate-change-818380.html, citing the World Wildlife Fund's Living Planet Report stating that 'if everybody on earth was to enjoy the lifestyle of the average Western European, we would need three planets' and that academics should play a stronger role in tackling the question of climate change and 'in encouraging critical thinking about the values that underpin Western industrialised societies'.