Received: 2 December 2020 | Revised: 15 February 2021 | Accepted: 19 March 2021

DOI: 10.1111/reel.12395

RECIEL Review of European, Comparative & International Environmental Law WILEY

ORIGINAL ARTICLE

To ban or not to ban carbon-intensive materials: A legal and administrative assessment of product carbon requirements

Timo Gerres | Manuel Haussner | Karsten Neuhoff | Alice Pirlot

Correspondence
Email: Alice.Pirlot@sbs.ox.ac.uk

By setting near-zero-emission requirements for the production of certain products to be sold on the European single market (product carbon requirements, PCRs), the European Union could accelerate the phase-out of carbon-intensive production processes. The announcement of such requirements would send a signal to producers, financing institutions and other relevant stakeholders, thus incentivizing them to prepare for the shift to a carbon-neutral society. This article analyses several European environmental standards and technical regulations to offer insights into the political, legal and technical background for the adoption of PCRs. It shows that PCRs would constitute a new development in technical regulations. Given the relevance of World Trade Organization law for the adoption of standards and technical regulations on products, the article analyses in further detail the compatibility of PCRs under WTO law, and argues that PCRs can be designed in line with the provisions of the General Agreement on Tariffs and Trade and the Agreement on Technical Barriers to Trade.

1 | INTRODUCTION

In 2015, the world community recognized the need for a rapid reduction of greenhouse gas emissions to limit the impact of global warming under the Paris Agreement. Against this background, in 2019, the European Commission proposed a European Green Deal aimed at making the European Union (EU) the first 'climate-neutral continent' by 2050.[1] This plan put economic activities which are challenging to decarbonize in the spotlight. Among others, reducing the carbon footprint of the production of basic materials such as steel, cement, aluminium and plastics is key, as these sectors are currently contributing about 17 percent of global greenhouse gas emissions.[2]

The predominant policy response to reduce industrial emissions has been the use of carbon pricing mechanisms, such as the EU emissions trading system (EU ETS).[3] Carbon pricing mechanisms are essential for basic material producers, as they can address incremental costs of climate-neutral production processes to make them economically viable for firms.[4] Although carbon pricing policies, together with innovation policies, may make climate-friendly production technologies financially viable[5], this may be insufficient to motivate firms to take the risk associated with a shift from existing carbon-intensive assets to new clean processes.[6] Therefore, additional policies are needed to prevent inaction.[7] A ban on carbon-intensive materials pursues this objec-

[1]See Commission (EU), 'A European Green Deal' (Communication) COM(2019) 640 final, 11 December 2019 (EU Green Deal).

[2]International Energy Agency (IEA), 'Tracking Industry 2020' (IEA 2020). Please note that the term 'carbon' is used as a generic reference to all greenhouse gas emissions released during the production process of basic materials.

[3]E Narassimhan et al, 'Carbon Pricing in Practice: A Review of Existing Emissions Trading Systems' (2018) 18 Climate Policy 967.

[4]RU Ayres, 'Sustainability Economics: Where Do We Stand?' (2008) 67 Ecological Economics 281; AV Kneese and BT Bower, *Environmental Quality Analysis: Theory & Method in the Social Sciences* (Routledge 1972).

[5]K Neuhoff et al, 'Building Blocks for a Climate-Neutral European Industrial Sector' (Climate Strategies 2019).

[6]M Grubb, JC Hourcade and K Neuhoff, *Planetary Economics* (Routledge 2014) 68.

[7]D Diaz and F Moore, 'Quantifying the Economic Risks of Climate Change' (2017) 7 Nature Climate Change 774.

tive by clarifying that enterprises that fail to shift to clean processes will face the risk of no longer being able to operate.

This raises the question whether countries can ban carbon-intensive materials. The shutdown of coal power generation in some EU Member States shows that countries can phase-out carbon-intensive production. A ban on carbon-intensive production might however be tricky in the case of basic materials because of the risk that domestic carbon-intensive materials could be replaced with imports. Therefore, a ban on carbon-intensive materials is only viable if it also involves a ban on the sale of carbon-intensively produced materials. This article explores how this could be implemented to complement the current climate policy agenda of the EU. This is in line with the European Green Deal, as the Commission has underlined that it will 'continue to work on new standards for sustainable growth and use its economic weight to shape international standards that are in line with EU environmental and climate ambitions'.[8] Hence, the question arises as to whether additional policy instruments should be adopted to support the phase-out of carbon-intensive production processes while effectively complementing the carbon pricing mechanism.

One innovative policy option response could be to ban the sale of carbon-intensive materials. This could be achieved through the adoption of product carbon requirements (PCRs). PCRs would establish near-zero-emission limits for basic materials such as steel, cement, aluminium, plastics or pulp and paper.[9] Consequently, only those products made from a climate-neutral (or near-climate-neutral) production process would be allowed for sale.[10] Only emissions released during the production process, for instance direct and electricity related emissions,[11] would be considered, excluding, for instance, emissions related to transport, since diffuse emissions need to be subject to other policies.[12]

The PCRs would apply both to domestic and imported products. The application of PCRs on imports would be necessary to achieve the economic objective but could be highly controversial. First, it would require importers to prove the climate neutrality (or near-climate neutrality) of the production process of imported products. The details matter. Only requesting a statement of conformity issued by the producer of basic materials might lead to fraud while relying on independent third-party certification might increase the overhead for producers.[13] Additionally, obliging foreign firms to adhere to EU regulations might lead to strong opposition from third countries. Second, other policy proposals aimed at targeting both domestic and imported products, such as border carbon (tax) adjustments, have been criticized in the past for being incompatible with World Trade Organization (WTO) law.[14] This article discusses in detail how to address these challenges.

In terms of timeframe, the implementation of PCRs would require that low-carbon production processes or substitute materials have reached a certain level of technological maturity. This is not likely to happen before the 2030s.[15] Expectations of the viability of PCRs and the announcement of their implementation may however matter already today. Empirical studies have demonstrated how regulation stimulates innovation.[16] Therefore, the announcement of PCRs could not only impact the long-term viability of carbon-intensive business models and investments as of today but would also potentially enhance the efforts of carbon-intensive sectors towards aligning their business models and technologies with EU and global climate objectives. PCRs would create a clear vision and defined targets in terms of the carbon dioxide emissions performance of the basic materials' sector within the coming 10–20 years.

The concept of PCRs has not been much discussed in the literature.[17] Thus, the objective of this article is to provide impetus on how climate policy can be designed to accelerate the decarbonization of the carbon-intensive industry, to encourage discussion about the feasibility of PCRs as a building block for industrial climate policies and to support investors, operators and policymakers in their understanding of PCRs. While this article primarily focuses on legal issues, our analysis is informed by a multidisciplinary approach, relying on economics, law but also background knowledge in engineering. The complexity of standards and technical regulations, often based on technological developments, requires a broad expertise not limited to the field of law.

[8]EU Green Deal (n 1) 22. See also Y Jadot, 'Report Towards a WTO-Compatible EU Carbon Border Adjustment Mechanism', 2020/2043(INI) (European Parliament 2020).

[9]Manufactured products containing significant shares of basic materials could also be subject to PCRs. See S Pauliuk, K Neuhoff and A Owen, 'Quantifying Impacts of Consumption Based Charge for Carbon Intensive Materials on Products' (2016). This paper does not analyse this specific case as it adds complexity to the design and legal analysis of PCRs. For basic materials covered by PCRs, see also IEA (n 2).

[10]Therefore, PCRs would qualify as 'consumption-oriented policy instruments'. See M Grubb et al, 'Consumption-Oriented Policy Instruments for Fostering Greenhouse Gas Mitigation' (2020) 20 Climate Policy S58.

[11]PCRs are intended for future implementation. Low-emission electricity generation is required by all 197 signing parties to comply with the Paris Agreement. Certification of origin for low-emission electricity is not seen as a hurdle since green certificate schemes are used globally for renewable capacity expansion; see IEA, 'Renewables 2020: Analysis and Forecast to 2025' (IEA 2020).

[12]On diffuse emissions policies, see A Runge-Metzger and T van Ierland, 'The Effort Sharing Regulation' in J Delbeke and P Vis (eds), *Towards a Climate-Neutral Europe: Curbing the Trend* (European Union 2019).

[13]Similar arguments have been made in other contexts, including in the context of the COVID-19 crisis. See E Proffitt, 'The Dangers of Fake PPE' (2020) 7 BDJ Team 20.

[14]For a recent overview on border carbon adjustment, see MA Mehling et al, 'Designing Border Carbon Adjustments for Enhanced Climate Action' (2019) 113 American Journal of International Law 433. See also Alice Pirlot, *Environmental Border Tax Adjustments and International Trade Law* (Edward Elgar 2017).

[15]C Bataille et al, 'A Review of Technology and Policy Deep Decarbonization Pathway Options for Making Energy-Intensive Industry Production Consistent with the Paris Agreement' (2018) 187 Journal of Cleaner Production 960.

[16]S Ambec et al, 'The Porter Hypothesis at 20: Can Environmental Regulation Enhance Innovation and Competitiveness?' (2013) 7 Review of Environmental Economics and Policy 2; R Calel and A Dechezleprêtre, 'Environmental Policy and Directed Technological Change: Evidence from the European Carbon Market' (2016) 98 Review of Economics and Statistics 173; J Pelkmans and A Renda, 'How Can EU Legislation Enable and/or Disable Innovation' (European Commission 2014).

[17]On related issues, see Laura Manson and Tracey Epps, 'Water Footprint Labelling and WTO Rules' (2014) 23 Review of European Community and International Environmental Law 329; CO Verrill Jr, 'Maximum Carbon Intensity Limitations and the Agreement on Technical Barriers to Trade' (2008) 2 Carbon and Climate Law Review 43. See also A Lovell, 'Carbon Intensity Standards as Technical Barriers to Trade: How the United States Can Lead Environmental Progress and Take Account of the Needs of Developing Countries' (2014) 26 Georgetown International Environmental Law Review 205; R Ismer, 'Like Products, Energy Standards and Labelling' in J Hoppe, W Kahlenborn and C Gather (eds), *Eco-Innovation, International Trade, WTO and Climate: Key Issues for an Ecological Industrial Policy* (Bundesministerium für Umwelt, 2009) 46.

The article first provides a review of several EU environmental standards and technical regulations to highlight how they regulate access to the EU internal market (Section 2.1–2.6). It shows that PCRs would constitute an innovative type of measures, given that no existing technical regulation so far distinguishes, in a comparable way, between products based on their production method. Based on these findings, a policy design for PCRs is proposed (Section 2.7). Second, given that such a policy design would constitute an innovative type of measure, the article analyses the compatibility of PCRs with WTO law and identifies possible risks concerning their implementation (Sections 3.1–3.4). Findings from both sections are used to evaluate policy design considerations necessary for ensuring that PCRs are compatible with WTO law (Section 3.5).

2 | ENVIRONMENTAL STANDARDS AND TECHNICAL REGULATIONS: EXAMPLES FROM THE EU

Regulations that set sustainability criteria for products, define emission levels or aim to ensure an environmentally friendly production process for products and services, have played an essential role in EU policymaking over the last decades, contributing to the definition of the European single market. This section provides an analysis of a (non-exhaustive) set of EU legislation relevant for products produced for and sold on the EU single market.[18] In these examples, rules are set for the market participation of domestic and non-EU market producers. Insights about existing EU legislation therefore provide the basis for the proposed policy design of PCRs.

2.1 | Conformity with safety, health and environmental protection requirements: CE marking

CE (Conformité Européenne) marking was introduced in 1985,[19] and it allows distributors to demonstrate the conformity of their products with the EU's safety, health and environmental protection requirements. Conformity is expressed by affixing the CE label to a product.[20] Compliance with voluntary harmonized standards provides a presumption of conformity.[21] CE marking is mandatory for all product groups sold on the EU market that are covered by the relevant CE directives and regulations.[22] It applies to both imported and domestically manufactured products. Non-compliance can lead to the permanent removal of the product from the EU market.[23] CE marking has been considered as a success story for end-consumer safety and producer liability. It not only applies to products traded in the EU but also to products traded between other jurisdictions, such as the United States and Japan.[24] CE marking is limited to physical product-specific characteristics. By contrast, the scope of PCRs would have to go beyond such product characteristics by addressing products' production processes with respect to their carbon intensity.[25]

2.2 | The Ecodesign Directive

The Ecodesign Directive and the Energy Labelling Regulation both target the operational and material characteristics of products and form part of the Ecodesign framework legislation.[26] The Ecodesign Directive covers a broad range of products, for which requirements are defined in product-specific regulations, such as heating equipment, electric motor systems, lighting, domestic appliances consumer electronics or standby losses.[27] For each product group, product-specific regulations contain binding requirements on product design and functioning. One example is Regulation 244/2009 on Ecodesign requirements for non-directional household lamps.[28] Its implementation resulted in the quasi phase-out of 60W and 100W incandescent light bulbs in Europe.[29] Similarly, Regulation 642/2009 resulted in binding resource efficiency criteria for televisions. This last example shows that the Ecodesign legislation might have a significant impact beyond the EU, given that televisions are mainly produced by non-European manufacturers.[30]

[18]For other examples, see, among others, E Kentin and H Kaarto, 'An EU Ban on Microplastics in Cosmetic Products and the Right to Regulate' (2018) 27 Review of European, Comparative and International Environmental Law 254; D Morgan and G Goh, 'Genetically Modified Food Labelling and the WTO Agreements' (2004) 13 Review of European Community and International Environmental Law 306.

[19]See Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93 [2008] OJ L218/30.

[20]ibid art 30(2) and (4).

[21]See Commission (EU), 'The 'Blue Guide' on the Implementation of EU Products Rules 2016' [2016] OJ C272/1 (Blue Guide) sections 4.1.2 and 4.5.1.

[22]For a complete list of the relevant directives, see <https://ec.europa.eu/growth/single-market/ce-marking/manufacturers_en>.

[23]Regulation (EU) 2019/1020 of the European Parliament and of the Council of 20 June 2019 on market surveillance and compliance of products and amending Directive 2004/42/EC and Regulations (EC) No 765/2008 and No 305/2011 [2019] OJ L169/1 art 26.

[24]D Hanson, *CE Marking, Product Standards and World Trade* (Edward Elgar 2005).

[25]Note, however, that module D of the Blue Guide (n 21) lays down quality management and assurance criteria, which apply for specific product categories.

[26]See Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products [2009] OJ L285/10; Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EC [2017] OJ L198/1.

[27]All product-specific Ecodesign regulations can be found at <https://ec.europa.eu/energy/en/list-regulations-product-groups-energy-efficient-products>.

[28]Commission Regulation (EC) No 244/2009 of 18 March 209 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for non-directional household lamps [2009] OJ L76/3.

[29]See Commission (EU), 'Market Assessment on Mains-Voltage Lamps as Required by Commission Regulation (EU) No 1194/2012' (Communication) COM(2015) 443 final, 11 September 2015.

[30]A Schlösser and L Stobbe, 'Short Market Analysis on Representative TVs (October 2014 Update)' (Austrian Energy Agency, Technische Universität Berlin 2014).

The Ecodesign framework primarily targets operational and material efficiency requirements and not the production process. Yet, the Ecodesign Directive provides legislators with the option to implement requirements which go beyond product characteristics, targeting recyclability and enhancing material circularity. This potential is considered to be untapped so far.[31] This could change in the future: the recent EU sustainable products initiative aims to revise the Ecodesign framework to make products consumed in the EU more sustainable.[32] Such an approach could be very similar to the idea underlying PCRs.

2.3 | Euro emission standards for road vehicles

The current Regulation for road vehicles emission standards was established with the introduction of the Euro 1 emission standard in 1992, later tightened by the introduction of Euro 2 to Euro 6.[33] The Euro emission standards set requirements for new cars, light commercial vehicles and heavy-duty truck engines sold in the EU. While the implementation of the standards can be considered a success, monitoring and compliance mechanisms needed to be improved.[34] The 'Dieselgate' scandal showed how due to loopholes regulation failed in effectively reducing NO_x emissions.[35] In the aftermath, the new 'Real Driving Emissions' (RDE) and the 'World Harmonised Light Vehicle Test Procedure' (WLTP) have been introduced in the EU.[36] The WLTP is the outcome of a global effort under the leadership of the United Nations.[37]

Similar to CE marking, the Euro emission standards concern the operational characteristics of vehicles (not the process intensity of vehicle manufacturing). One point of design, though, which could be useful for the development of PCRs, is the role of the United Nations in the development of the WLTP. If PCRs were to be developed in such an international forum, there is no doubt that it could facilitate global acceptance and improve the reach of this new legislation.

2.4 | The Eco-Management and Audit Scheme

The Eco-Management and Audit Scheme (EMAS) was introduced by Regulation 1836/93.[38] It aims to 'promote continuous improvements in the environmental performance of industrial activities'.[39] EMAS can be described as an audit scheme that requires certified organizations to monitor multiple environmental aspects of their organization, including greenhouse gas emissions.[40] It fulfils a similar role as the voluntary global ISO 14000 standard for environmental management systems,[41] which is published by the non-governmental International Organization for Standardization (ISO).[42] All private and public organizations can opt for being certified according to EMAS through an accredited third-party certifying body. Although EMAS is voluntary, it can be advantageous for organizations to be part of the scheme given that the EU's green public procurement guidelines advise public authorities to require evidence of an environmental management system from their contractor.[43] In contrast to the CE marking and the Ecodesign Directive, EMAS focuses on environmental process management (instead of products' physical characteristics), and it is entirely voluntary, which cannot be an option for PCR design.

2.5 | Biofuels certification

An EU system to certify the sustainability of domestic and imported biofuels became necessary in 2009 after the adoption of the Renewable Energy Directive.[44] This Directive sets sustainability criteria for biofuels to account for the different environmental impact

[31]C Dalhammar, 'Industry Attitudes towards Ecodesign Standards for Improved Resource Efficiency' (2016) 123 Journal of Cleaner Production 155.

[32]See <https://circulareconomy.europa.eu/platform/en/news-and-events/all-news/sustainable-products-initiative-give-us-your-feedback>.

[33]Council Directive 91/441/EEC of 26 June 1991 amending Directive 70/220/EEC on the approximation of the laws of the Member States relating to measures to be taken against air pollution by emissions from motor vehicles [1991] OJ L242/1. This directive is no longer in force as it has been repealed by Regulation (EC) No 715/2007 of the European Parliament and of the Council of 20 June 2007 on type approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicles repair and maintenance information [2007] OJ L171/1.

[34]Improved monitoring and compliance mechanisms is one of the objectives of the EU's new Clean Mobility Package (Directive (EU) 2019/1161 of the European Parliament and of the Council of 20 June 2019 amending Directive 2009/33 on the promotion of clean and energy-efficient road transport vehicles [2019] OJ L188/116).

[35]N Hooftman et al, 'A Review of the European Passenger Car Regulations: Real Driving Emissions vs Local Air Quality' (2018) 86 Renewable and Sustainable Energy Reviews 1.

[36]Commission Regulation (EU) 2017/1151 of 1 June 2017 supplementing Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicles repair and maintenance information, amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 and Commission Regulation (EU) No 1230/2012 and repealing Commission Regulation (EC) No 692/2008 [2017] OJ L 175/1.

[37]United Nations Economic Commission for Europe, 'Working Party on Pollution and Energy (GRPE)' (2019).

[38]See, now, Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organizations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC [2009] OJ L342/1.

[39]ibid art 1(2).

[40]ibid Annex 1.

[41]ISO 14000 encompasses various voluntary international standards developed by the ISO/TC 207 technical committee of the International Organization for Standardization, chaired by the Canadian Standards Association. The standard can be used to show compliance with regulatory environmental requirements, but is also used by companies as contractual requirements with suppliers to implement sustainable supply chains. See, for example, A Chiarini, 'Designing an Environmental Sustainable Supply Chain through ISO 14001 Standard' (2012) 24 Management of Environmental Quality: An International Journal 16.

[42]F Testa et al, 'EMAS and ISO 14001: The Differences in Effectively Improving Environmental Performance' (2014) 68 Journal of Cleaner Production 165.

[43]Commission (EU), *Buying Green! A Handbook on Green Public Procurement* (3rd edn, Publications Office of the European Union 2016).

[44]See Directive 2009/28/EC, now recast Renewable Energy Directive (EU) 2018/2001 (Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources [2018] OJ L328/82.

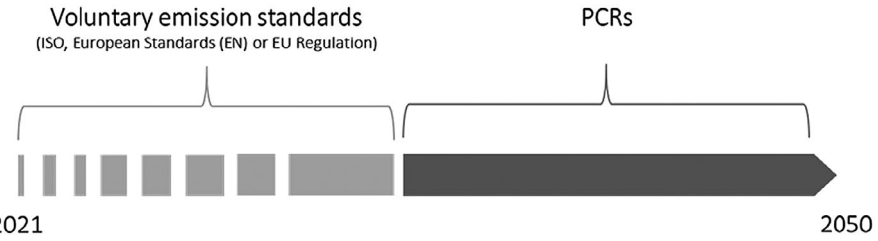

FIGURE 1 Schematic overview of PCR phase-in with increasing availability of low-emission production processes.

of land-use practices. Among others, the use of biofuels needs to result in greenhouse gas emissions savings of a certain percentage in comparison to fossil fuels, and it should not be from land with a high biodiversity value and high-carbon stock.[45]

The backbone of the EU system comprises voluntary sustainability certification schemes, which contain specific rules to certify biofuel production.[46] Both domestic and international producers can benefit from these schemes to certify their production processes. In practice, multiple issues regarding the European approach to biofuel certification remain unsolved. In 2016, the European Court of Auditors evaluated the implementation of voluntary certification schemes. It concluded that in its current state, 'the EU certification system for the sustainability of biofuels is not fully reliable'[47], pointing to weaknesses in the supervision of voluntary schemes and concerns regarding the transparency of the certification process. These issues are addressed in the recast Renewable Energy Directive 2018/2001, which formulates stricter sustainability criteria and calls for new regulation addressing biofuel certification.

As required for PCRs, biofuel certification goes beyond the assessment of biofuels' physical properties but also concerns their production process. In comparison to PCRs, however, biofuel certification has a less direct impact on products that can be sold on the EU market as it only applies to the imported biofuels that are used to comply with the renewable energy targets of the Renewable Energy Directive.

2.6 | FLEGT VPAs and EU Timber Regulation

The EU uses two complementary sets of policy instruments to prevent the import of illegally harvested timber and timber products: the Forest Law Enforcement, Governance and Trade Voluntary Partnership Agreements (FLEGT VPAs) and the Timber Regulation. FLEGT VPAs are bilateral trade agreements between the EU and third countries that oblige the partner country to implement national legislation and strengthen institutions to prevent illegal logging. Wood imported from these countries is considered, per se, as legally harvested. It has been argued that FLEGT VPA with countries like Indonesia and Ghana reduced illegal logging significantly.[48] The Timber Regulation (995/2010) is of special relevance for timber imported from countries without a FLEGT VPA in place.[49] This Regulation forbids placing illegally harvested timber and derived products on the EU market. Operators placing timber products on the EU market are required to exercise 'due diligence' and keep records of their suppliers and customers. Some voluntary certification schemes, like the FSC (Forest Stewardship Council), can be used by importers to comply with these due diligence requirements. The effectiveness of this approach is reviewed biannually by the European Commission, which evaluates Member States' implementation of the Timber Regulation.[50]

Like biofuel certification, the timber legislation targets the production process of goods placed onto the European single market. However, the Timber Regulation is implemented in direct relation to the legislation of the harvest country[51] and/or bilateral agreements, which would not be the case for PCRs. This could make PCRs much more controversial than the timber legislation.

2.7 | General design and implementation phases

The review of selected examples of EU legislation demonstrates that product-specific policies, such as CE marking, Euro vehicle emissions standards and the Ecodesign Directive, have a long history and are well established in EU policymaking. Moreover, it shows that the EU has experience with standards that relate to the production process, for example, to ensure the sustainability of biofuels and timber products. These findings can help to outline the general design of PCRs.

In comparison to reviewed legislation, PCRs would be mandatory and be implemented through an assessment of the carbon intensity of the production process. Only near-zero carbon products would be

[45]ibid art 29.

[46]See the list of approved schemes: <https://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/voluntary-schemes>.

[47]European Court of Auditors, 'The EU System for the Certification of Sustainable Biofuels' (Publications Office 2016).

[48]C Overdevest and J Zeitlin, 'Experimentalism in Transnational Forest Governance: Implementing European Union Forest Law Enforcement, Governance and Trade (FLEGT) Voluntary Partnership Agreements in Indonesia and Ghana: Transnational Forest Governance' (2018) 12 Regulation & Governance 64.

[49]Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010 laying down the obligations of operators who place timber and timber products on the market [2010] OJ L295/23 (Timber Regulation) art 3, which indicates that timber and timber products covered by FLEGT 'shall be considered to have been legally harvested for the purposes of this Regulation'.

[50]See, for example, Commission (EU), 'Report form the Commission to the European Parliament and the Council, Biennial report for the period March 2017–February 2019' COM(2020) 629 final, 2 October 2020.

[51]Timber Regulation (n 49) art 2(g), which defines 'illegally harvested' as 'harvested in contravention of the applicable legislation in the country of harvest'.

allowed on the EU market. Such a measure could be a drastic but necessary step towards a carbon-neutral Europe. An elaborate body of emission standards would be needed to determine the climate neutrality of production processes, which could be developed internationally through the ISO or under the umbrella of the United Nations (see Section 2.3) or at the EU level as EN standards or EU regulation (see Section 2.4).[52]

To smoothen the transition towards such a measure, initially these standards could be introduced as a labelling standard for basic materials linked to their emissions intensity. This could be a first possible (voluntary) step towards the implementation of PCRs. Such a standard would set emissions criteria for traditional carbon-intensive materials to evaluate whether their production is near climate neutral; as such, it would go beyond the provisions of EMAS, which only requires emissions auditing and does not set emission criteria (see Section 2.4). Materials complying with the standard and products exclusively containing such materials could obtain a label. This would benefit and enable businesses to provide evidence of the climate impact of their materials to final consumers and demonstrate the viability of their business model to financial investors in a carbon-constrained economy. Provisions for the introduction of such standards could be implemented as part of the EU sustainable products initiative, which aims to revise the Ecodesign Directive.[30]

In a second step, this voluntary standard could be complemented with mandatory PCRs (Figure 1). One option for implementation would be to allow companies to use the previously described voluntary standards to demonstrate the climate neutrality of their basic materials, adopting them as harmonized standards as used for EU product rules (see Section 2.1).

At the same time, lawmakers could draw from experience with non-product-related processes and production methods (PPMs), such as the sustainability criteria for biofuels production and timber products. For example, administrative complexity could be reduced to a minimum by obliging companies to exercise due diligence, as it is already done with CE marking (see Section 2.1) and the Timber Regulation (see Section 2.6). In parallel, carbon-intensive domestic production processes of basic materials would also need to be banned within the EU to avoid that producers export materials previously dedicated to the domestic market and therefore jeopardize the political legitimacy of PCRs.

3 | PRODUCT CARBON REQUIREMENTS AND WTO LAW

The mandatory character of PCRs combined with the fact that they would be based on a product's carbon footprint suggest that PCRs might be controversial under international trade law. This controversial character is not surprising taking into consideration that similar questions have arisen with regard to many of the measures analysed in the previous section.[53] Consequently, it is highly relevant to assess their conformity with international trade law.

Because PCRs have an international trade component, they are likely to fall under the WTO Agreements, in particular the General Agreement on Tariffs and Trade (GATT)[54] and the Agreement on Technical Barriers to Trade (TBT).[55] The former includes general rules on how international trade in goods is to be organized. The latter specifically addresses technical regulations, product standards and conformity assessment procedures.

If PCRs fall under one of these two agreements, countries should ensure that the design of PCRs does not violate any of these agreements to secure their long-term viability and, thus, relevance for innovation and investment choices. Against this background, this section provides a detailed analysis of PCRs under international trade law and proposes design recommendations so that PCRS unlikely violate the GATT or the TBT Agreement. The objective is to anticipate and prevent the risks of future international trade disputes. To this end, the analysis assesses different scenarios where legal insecurities prevail.

This section starts with a discussion of the application of the GATT and the TBT to PCRs (Section 3.1). If PCRs fall under the scope of one or both of these agreements, they will be subject to the requirements set in their provisions, including the prohibition of import restrictions (Article XI GATT) but also the national treatment obligation (Article III:4 GATT and Article 2.1 TBT Agreement) and the most-favoured-nation principle (Article I:1 GATT and Article 2.1 TBT Agreement) (Sections 3.2 and 3.3). If PCRs are in breach of substantive GATT provisions, they could still be justified under the general exception provision (Article XX GATT) (Section 3.4). In any

[52]European Standards (EN) are voluntary specifications for products, production processes, services or test-methods, developed by the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC) and the European Telecommunications Standards Institute (ETSI) to support EU single market legislation and policies (<https://ec.europa.eu/growth/single-market/european-standards_en>).

[53]On biofuels certification see, for example, MA Echols, 'Biofuels Certification and the Law of the World Trade Organization' (International Centre for Trade and Sustainable Development 2009); S Mayr, B Hollaus and V Madner, 'Palm Oil, the RED II and WTO Law: EU Sustainable Biofuel Policy Tangled up in Green?' (2021 fc) Review of European, Comparative and International Environmental Law; A Mitchell and C Tran, 'The Consistency of the European Union Renewable Energy Directive with World Trade Organization Agreements: The Case of Biofuels' (2010) 1 Renewable Energy Law and Policy Review 33; T Perišin, 'Pending EU Disputes in the WTO: Challenges to EU Energy Law and Policy' (2014) 10 Croatian Yearbook of European Law and Policy 371; S Ponte and C Daugbjerg, 'Biofuel Sustainability and the Formation of Transnational Hybrid Governance' (2015) 24 Environmental Politics 96. See also Indonesia's complaint against the EU (*European Union – Certain Measures Concerning Palm Oil and Oil Palm Crop-Based Biofuels*, 13 November 2020, DS593). On green public procurement, see G Van Calster, 'Green Procurement and the WTO – Shades of Grey' (2002) 11 Review of European Community and International Environmental Law 298. On the Timber Regulation, see D Geraets and B Natens, 'The WTO Consistency of the European Union Timber Regulation' (Leuven Centre for Global Governance Studies 2013); A Fishman and K Obidzinski, 'European Union Timber Regulation: Is It Legal?' (2014) 23 Review of European Community and International Environmental Law 258; CM Pontecorvo, 'The EU Legal Framework on Trade in Timber and Timber Products: Recent Developments in the Implementation and Enforcement of the Timber Regulation' in M Bungenberg et al (eds), *European Yearbook of International Economic Law* (Springer 2018) 229; B Saul and T Stephens, 'Not yet out of the Woods: Australia's Attempt to Regulate Illegal Timber Imports and World Trade Organization Obligations' (2012) 19 Australian International Law Journal 143. See also NL Dobson, 'The EU's Conditioning of the 'Extraterritorial' Carbon Footprint: A Call for an Integrated Approach in Trade Law Discourse' (2018) 27 Review of European, Comparative and International Environmental Law 75.

[54]General Agreement on Tariffs and Trade (adopted 15 April 1994, entered into force 1 January 1995) 1867 UNTS 187 (GATT).

[55]Agreement on Technical Barriers to Trade (adopted 15 April 1994, entered into force 1 January 1995) 1868 UNTS 120 (TBT Agreement).

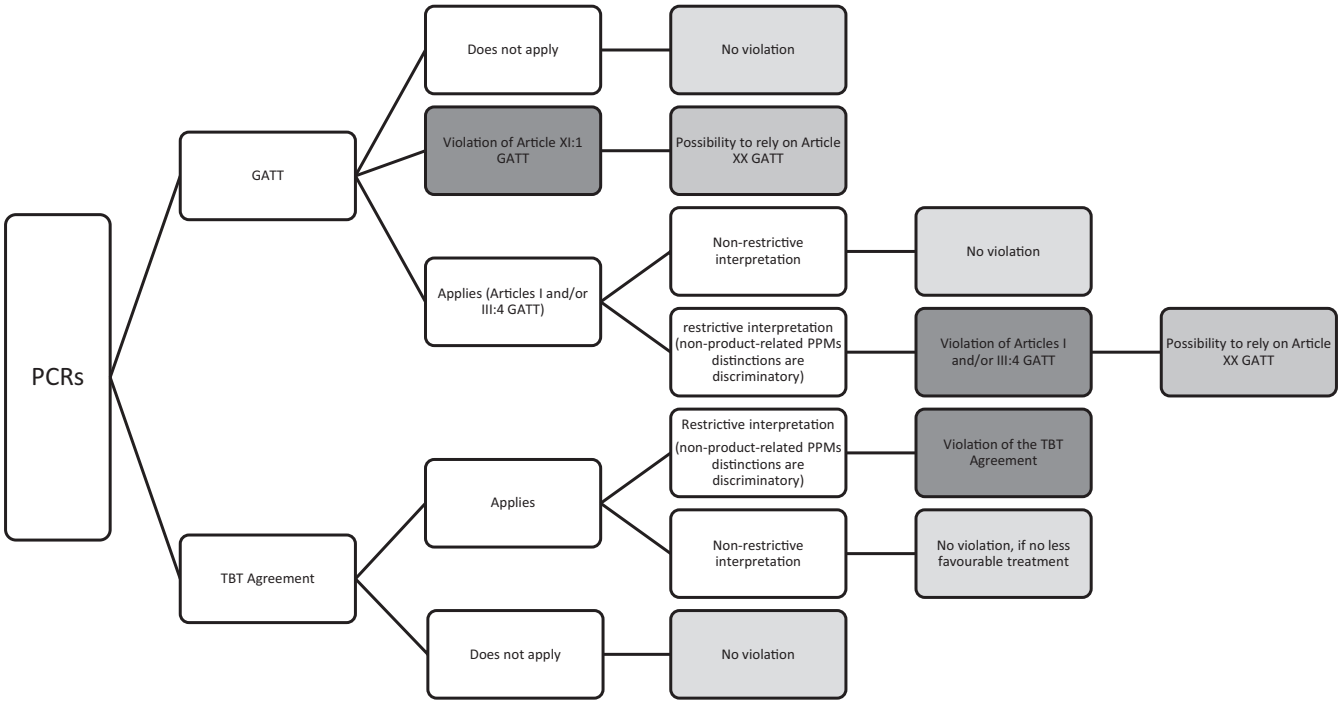

FIGURE 2 PCRs under the GATT and the TBT Agreement.

case, it is vital to draw the attention of policymakers to the design and administrative procedures that will help reduce the likelihood of WTO law violation by PCRs (Section 3.5). The different steps of our legal reasoning are summarized in Figure 2.

3.1 | Applicable legal regime: The GATT and the TBT Agreement

World trade law only puts constraints on PCRs if they fall within the scope of the WTO Agreements. Considering that PCRs apply to imported products, PCRs are most likely to fall under the GATT and the TBT Agreement, specifically Articles I:1, III:4 and XI GATT and Articles 2.1 and 2.2 TBT Agreement. Both agreements are not mutually exclusive but can apply at the same time once the measure falls within their scope.[56] While the GATT has a broad scope of application and clearly covers PCRs (Section 3.1.1), it is not fully clear whether PCRs would fall under the TBT Agreement (Section 3.1.2).

3.1.1 | General Agreement on Tariffs and Trade (GATT)

Under the most-favoured-nation principle (Article I GATT), WTO members are required not to discriminate against like products from different WTO members. Article I:1 GATT is formulated in very broad terms, referring to 'customs duties', 'charges of any kind imposed on or in connection with importation or exportation', 'all matters referred to in paragraphs 2 and 4 of Article 4' but also 'all rules and formalities in connection with importation and exportation'.[57] Therefore, it can be assumed that it would apply to PCRs.

Article III:4 GATT lays down the national treatment requirement. It mandates that imported products may not be treated less favourably than like domestic products. Article III:4 applies to all laws, regulations and requirements affecting the internal sale, offering for sale, purchase, transportation, distribution or use of imported products.[58] As this provision is drafted broadly, it would likely apply to PCRs. Consequently, it is critical to design PCRs to ensure that they do not discriminate against imported products. Otherwise, PCRs will face a high risk of being found incompatible with this provision.

Article XI:1 GATT covers quantitative restrictions that specifically target imports and/or exports. It is unclear whether PCRs would fall within its scope. It mandates, among other things, that no prohibitions or restrictions other than duties, taxes or other charges, shall be instituted or maintained on the importation of products. If PCRs qualify as an import ban, they would likely violate Article XI:1 GATT.[59] Given that PCRs are applied indiscriminately to highly carbon-intensive basic materials, it can nevertheless be argued that they should not qualify as import bans and, therefore, are not

[56]In case both agreements apply, but with a conflict in outcome, the TBT Agreement would likely prevail over the GATT. See General Interpretative Note to Annex 1A of the WTO Agreement (adopted 15 April 1994, entered into force 1 January 1995) 1868 UNTS 187. See M Du, 'Voluntary Ecolabels in International Trade Law: A Case Study of the EU Ecolabel' (2020) 33 Journal of Environmental Law 1, 15.

[57]GATT (n 54) art I.

[58]ibid art III:4. On the scope of Article III:4 GATT, see M Matsushita et al, *The World Trade Organization: Law, Practice, and Policy* (3rd edn, Oxford University Press 2015) 207–208.

[59]See *United States – Import Prohibition of Certain Shrimp and Shrimp Products* (Appellate Body Report) WT/DS58/AB/R (12 October 1998) (*US – Shrimp*).

covered by Article XI:1, but rather by Article III GATT, in line with the Note *Ad* Article III.[60] However, it is not always clear whether a measure falls under Article XI:1 and/or III:4 GATT. In *EC—Asbestos*, France's ban on asbestos was analysed under Article III:4 GATT and the Panel did not consider it necessary to examine the measure under Article XI:1.[61] By contrast, in *US—Shrimp*, which concerned an import prohibition on certain shrimp and shrimp products, the Panel's analysis focused on Articles XI and XX GATT.[62] In *India—Autos*, the Panel suggested that both Articles III and XI could be applied to a measure, stating that it

> cannot be excluded *a priori* that different aspects of a measure may affect the competitive opportunities of imports in different ways, making them fall within the scope either of Article III (where competitive opportunities on the domestic market are affected) or of Article XI (where the opportunities for importation itself, i.e. entering the market, are affected) ....[63]

In case PCRs violate general GATT provisions such as Articles III:4 and/or XI:1, they could still be justified under the general exemption provision (Article XX GATT). Under this provision, Members to the Agreement can justify measures that would otherwise have been found incompatible with other GATT provisions because they pursue goals that are deemed to be legitimate (e.g. social and environmental objectives) (see Section 3.4).

3.1.2 | TBT Agreement

The scope of the TBT Agreement has been drafted narrowly. It applies only to technical regulations, standards and conformity assessment procedures. Under the TBT, PCRs could be assimilated to a 'technical regulation', which Annex I of the TBT defines as a '[d]ocument which lays down product characteristics or their related processes and production methods, including the applicable administrative provisions, with which compliance is mandatory'.[64] According to WTO jurisprudence, a technical regulation 'applies to identifiable group of products', is 'mandatory', and lays down 'product characteristics or their related production and process methods'.[65]

While PCRs are undoubtedly mandatory and apply to a predefined group of materials and products containing such materials, it is not clear whether they lay down 'product characteristics *or their related production and process methods*'. Without doubt, PCRs do not qualify as 'product characteristics', but the question arises as to whether they could be considered as 'related processes and production methods'.[66] Product characteristics are defined as 'objectively definable 'features', 'qualities', 'attributes' or other 'distinguishing mark' of a product'.[67] Hence, only such regulation can qualify as 'characteristics' that deal with features that are directly and objectively related to the product itself. This includes, for example, 'a product's composition, size, shape, colour, texture, hardness, tensile strength, flammability, conductivity, density, or viscosity'.[68] By contrast, PCRs are non-product-related PPMs[69] and, as such, it is not entirely clear whether they would be considered as 'related processes and production methods' under the TBT Agreement.

In *EC—Seal Products*, which concerned an EU ban on the importation of certain seal products (except for seal products that were hunted by Inuit or indigenous communities or that were justified by marine resource management purposes), the Appellate Body rejected the findings of the Panel, which seemed to qualify certain PPMs (such as the requirement related to the identity of the hunter) as 'product characteristics'.[70] While the Appellate Body explicitly recognized that 'the line between PPMs that fall, and those that do not fall, within the scope of the TBT Agreement raises important systemic issues', it refused to rule on the matter as 'more argumentation by the participants and exploration in questioning would have been required'.[71] Considering the interpretation of the Appellate Body of the term 'product characteristics' in *EC—Seal Products*, the TBT Agreement should not apply to non-product-related PPMs. The argument is twofold and predominantly based on a semantic interpretation. First, the Appellate Body stated that only such features that are intrinsic to the products qualify as product characteristics. Second, the Appellate Body analysed the term 'and their related

[60]The question as to whether PCRs would qualify as import ban is intrinsically connected to the question as to whether or not products can be differentiated based on non-product-related PPMs (Section 3.2.1). If such differentiation is prohibited, PCRs are likely to be described as import bans. On the differentiation between Articles III:4 and XI GATT, see R Howse and D Regan, 'The Product/Process Distinction – An Illusory Basis for Disciplining 'Unilateralism' in Trade Policy' (2000) 11 European Journal of International Law 249; J Pauwelyn, 'Rien Ne Va Plus? Distinguishing Domestic Regulation from Market Access in GATT and GATS' (2005) 4 World Trade Review 131, 144.

[61]*European Communities – Measures Affecting Asbestos and Products Containing Asbestos* (Panel Report) WT/DS135/R (18 September 2000) (*EC – Asbestos*) paras 8.91–8.95 and 8.159.

[62]*United States – Import Prohibition of Certain Shrimp and Shrimp Products* (Panel Report) WT/DS58/R (15 May 1998).

[63]*India – Measures Affecting the Automotive Sector* (Panel Report) WT/DS146/R, WT/DS175/R (21 December 2001) paras 7.217–7.224, in particular 7.224.

[64]TBT Agreement (n 55) Annex 1, para 1. On the application of the provisions on conformity assessment procedures to PCRs, see Section 3.5.3.

[65]See, e.g., *European Communities – Measures Affecting Asbestos and Products Containing Asbestos* (Appellate Body Report) WT/DS135/AB/R (12 March 2001) (*EC – Asbestos*) paras 61–77.

[66]See R Bhala and KJ Kennedy, *World Trade Law: The GATT-WTO System, Regional Arrangements, and US Law* (Lexis Law 1998) 127. See also the discussion in J McDonald, 'Domestic Regulation, International Standards, and Technical Barriers to Trade' (2005) 4 World Trade Review 249, 255; and Ismer (n 17) 48–49. But see also Verrill (n 17) 46, referring to *European Communities – Trade Description of Sardines* (Appellate Body Report) WT/DS231/AB/R (26 September 2002).

[67]See *EC – Asbestos* (n 65) para 67; and *European Communities – Measures Prohibiting the Importation and Marketing of Seal Products* (Appellate Body Report) WT/DS400/AB/R (18 June 2014) (*EC– Seal Products*) para 5.11.

[68]*EC – Asbestos* (n 65) para 67; *EC – Seal Products* (n 67) para 5.11.

[69]The distinction between product-related and non-product-related PPMs is based on whether PPMs modify product characteristics.

[70]*EC – Seal Products* (n 67) paras 5.41–5.45 and 5.58. For a detailed discussion of this case, see G Marceau, 'A Comment on the Appellate Body Report in *EC-Seal Products* in the Context of the Trade and Environment Debate' (2014) 23 Review of European Community and International Environmental Law 318.

[71]*EC – Seal Products* (n 67) para 5.65.

production and process method', concluding that any PPM must 'have a sufficient nexus to the characteristics of a product'.[72]

Bringing these two interpretations together, one must conclude that only regulations on product-related PPMs can qualify as a technical regulation. Otherwise, no nexus to a product characteristic would exist which itself must be intrinsic to the product. Such a nexus would exist, for example, in case of a production process requirement that enhances the safety of a product. By contrast, PRCs would not impact product characteristics and would therefore not qualify as a technical regulation. However, one should note that this reasoning is speculative as no case has been settled on this specific issue.

Against this background, no clear conclusion can be drawn on the applicability of the TBT Agreement on PCRs. If, following our line of argument, PCRs fall out of the scope of the TBT Agreement, they can be designed regardless of the requirements mentioned in this Agreement. However, if PCRs fall within the scope of the TBT, they face the risk of being found incompatible with Article 2 of the TBT if they discriminate against or between imported products. This risk is analysed in the next sections.

3.2 | National treatment

This section discusses whether PCRs would stand the test of the national treatment principle. Both the GATT and TBT Agreement contain similar wording, which requires that imported products are not treated less favourably than 'like' domestic products.[73] However, the WTO dispute settlement bodies seem to apply the national treatment obligation slightly differently under the GATT and the TBT Agreement.

Article III:4 GATT rules out both *de facto* and *de jure* discrimination. Article 2.1 TBT Agreement also prohibits both kinds of discrimination. However, the Appellate Body seems to interpret Article 2.1. of the TBT less restrictively with regard to *de facto* discriminations.[74] Where an origin-neutral measure pursues a legitimate regulatory objective and where it is applied in an even-handed way, the Appellate Body seems to consider that the measure does not violate Article 2.1 of the TBT Agreement.[75] Further requirements are then set by Article 2.2 TBT Agreement, according to which a technical regulation shall not be more trade-restrictive than necessary to fulfil a legitimate objective.

3.2.1 | Likeness

One key question under both the TBT Agreement and the GATT is the definition of products' likeness. Indeed, products that are not 'like' can be subject to different legal requirements (different and 'less favourable treatment', in the words of WTO law). It is only when imports and domestic products are considered 'like' that imports may not be treated less favourably than domestic products.

In the case of PCRs, any difference in treatment for both domestic and imported products is made based on the emissions intensity of the product. Unlike current legislation that sets emissions standards based on how much emissions are released during the *use* of certain products (e.g. emissions standards for certain types of vehicles), PCRs set emissions standards that are based on how much emissions were released during the *production* of certain basic materials. Despite disagreement in legal scholarship, case law is rather clear that the production processes per se do not impact the likeness of products.[76] However, in the case of a differentiation based on the environmental impact of the production process at issue, there is a small chance that products would nonetheless be considered as 'not like' because they would not be in a competitive relationship.[77] This argument—which is not (yet) supported by case law—is based on the idea that the environmental impact of the production process can impact 'consumer's taste and habits', one of the parameters used to distinguish between products.[78]

Against this background, one could argue that high- and low-carbon materials should not be considered as 'like' products as they serve different markets. Indeed, over the last years, consumers and investors have become increasingly interested in their environmental footprint and have adapted their consumption decision to minimize their environmental impact. Evidence of the relevance of carbon embodied in products for consumers and investors exists for different sectors and products, including construction materials like

[72]ibid para 5.12.

[73]GATT (n 54) art III:4; TBT Agreement (n 55) art 2.1.

[74]See Section 3.2.2. See also S Hartmann, 'Comparing the National Treatment Obligations of the GATT and the TBT: Lessons Learned from the EC-Seal Products Dispute' (2015) 40 North Carolina Journal of International Law and Commercial Regulation 629, in particular 658–660.

[75]*United States – Measures Affecting the Production and Sale of Clove Cigarettes* (Appellate Body Report) WT/DS406/AB/R (4 April 2012) (*US – Clove Cigarettes*) paras 182 and 215ff. The legitimate character of a technical regulation was also discussed in the case *US – Tuna II (Mexico)* (*United States – Measures Concerning the Importation, Marketing and Sale of Tuna and Tuna Product* (Appellate Body Report) WT/DS381/AB/R (13 June 2012) (*US – Tuna II*)).

[76]Some earlier cases decided under Article III:2 GATT supported the view that the national treatment principle allows for distinctions based on PPMs (*United States – Measures Affecting Alcoholic and Malt Beverages* (GATT Panel Report) DS23/4–39S/206 (19 June 1992) paras 5.24–5.25, which introduced the so-called 'aims-and-effect' test). By contrast, later decisions of the WTO Dispute Settlement Body are usually interpreted as pointing into the opposite direction (e.g. *Japan – Taxes on Alcoholic Beverages* (Appellate Body Report) WT/DS8/AB/R, WT/DS10/AB/R, WT/DS11/AB/R (4 October 1996). The legal scholarship is divided as to whether or not WTO members are allowed to distinguish between domestic and imported products based on non-product-related PPMs, namely factors that are not directly related to the product and its physical features. While some authors suggest that products' differentiation cannot be merely based on PPMs under Article III GATT (e.g. Matsushita et al (n 58) 190–191 and 746–747), others seem to suggest that Article III GATT should be read to allow such form of differentiation as long as the objective is not a protectionist one (e.g. EB Lydgate, 'Consumer Preferences and the National Treatment Principle: Emerging Environmental Regulations Prompt a New Look at an Old Problem' (2011) 10 World Trade Review 165, 185; DH Regan, 'Regulatory Purpose and "Like Products" in Article III:4 of the GATT (With Additional Remarks on Article II:2)' (2002) 36 Journal of World Trade 443). See also CR Conrad, *Processes and Production Methods (PPMs) in WTO Law: Interfacing Trade and Social Goals* (Cambridge University Press 2011).

[77]See Matsushita et al (n 58) 191.

[78]See *EC – Asbestos* (n 67) paras 117–123. On this case, see Lydgate (n 76) 176–180. See also *US – Clove Cigarettes* (n 75) para 119.

cement and steel[79] and green electricity.[80] Moreover, new corporate reporting on the carbon intensity of electricity and other input factors also suggests that the embedded greenhouse gas emissions in products are one parameter against which consumption and investment decisions are taken.[81] Consumers choose 'environmentally friendly' products over high-carbon products. Products' carbon footprint helps to differentiate between 'near-carbon-neutral' and 'carbon-intensive' products. As such, the carbon footprint of products does affect tastes and habits. Consequently, high- and low-carbon products cannot be considered as like products. Based on this reasoning, WTO members would be able to implement policies, such as PCRs, that treat differently low- and high-carbon products.[82]

3.2.2 | Less favourable treatment

Both Article III:4 GATT and Article 2.1 TBT Agreement prohibit *de jure* and *de facto* discrimination. *De jure* discrimination refers to measures that differentiate based on the origin of the product. Such different treatment would in principle be ruled out under PCRs since they would apply indistinctively to both domestic and imported products, regardless of the origin of the products. Both provisions also prohibit *de facto* discriminations, namely when a formally neutral measure has more restrictive effects on imports than on domestic products.[83] In the context of PCRs, such *de facto* discrimination could arise if climate requirements lead to less favourable conditions of competition to imported products. Moreover, *de facto* discrimination could stem from administrative requirements imposed on imported products.[84] This could be problematic for PCRs if their implementation imposes higher compliance costs on importers than on domestic producers. For example, importers might face difficulties in providing the required information regarding the emissions intensity or production technology that was deployed during the production of input materials. Importers could then face high costs in obtaining this information, which would not have to be borne if the intermediary or final product were entirely produced within the EU. Consequently, the importation of such products would be potentially disfavoured. Policymakers should ensure that they keep these costs to a minimum and also ensure that they do not require pieces of information from importers that are not necessary to fulfil the climate objective of PCRs (see also Section 3.5.2).

Under the GATT

De facto discrimination is assessed by analysing whether the disputed measure 'modifies the conditions of competition' in the market to the disadvantage of imported products.[85] Therefore, it is important to design PCRs such that domestic and imported products are subject to equal 'competitive conditions'.[86]

There are two situations where this requirement to provide 'equality of competitive conditions' could be violated.[87] First, in the hypothetical situation that high-carbon and low-carbon products are considered 'like' products, PCRs would necessarily be problematic because 'like' imported products would be treated differently and allegedly less favourably than domestic products. Second, in the hypothetical situation where high-carbon and low-carbon products are not deemed to be 'like' products, a different (*de jure*) treatment would not render the scheme incompatible with the national treatment obligation. Nevertheless, as noted above, different administrative procedures for imported and domestic products of the same product category that put a higher burden on imports could *de facto* discriminate against imported products.

Under the TBT Agreement

Just like under Article III:4 GATT, *de jure* discrimination is prohibited under Article 2.1 TBT Agreement.[88] However, the analysis undertaken under the TBT Agreement seems to be slightly different: the national treatment principle is interpreted as 'not prohibiting

[79]Leadership in Energy and Environmental Design (LEED) is globally the most widespread building labelling system, and includes, since version four, the carbon footprint of building materials into rating criteria. See A Mangialardo, E Micelli and F Saccani, 'Does Sustainability Affect Real Estate Market Values? Empirical Evidence from the Office Buildings Market in Milan (Italy)' (2018) 11 Sustainability 1; MDC Gelowitz and JJ McArthur, 'Investigating the Effect of Environmental Product Declaration Adoption in LEED® on the Construction Industry: A Case Study' (2016) 145 Procedia Engineering 58. Environmental Product Declarations are used to determine the carbon footprint, in Europe based on common Product Category Rules from the European Committee for Standardization (EN 15804).

[80]See EK Stigka, JA Paravantis and GK Mihalakakou, 'Social Acceptance of Renewable Energy Sources: A Review of Contingent Valuation Applications' (2014) 32 Renewable and Sustainable Energy Reviews 100, who find that consumers are willing to pay up to 16.6% extra for green electricity; and S Sundt and K Rehdanz, 'Consumers' Willingness to Pay for Green Electricity: A Meta-Analysis of the Literature' (2015) 51 Energy Economics 1, who find that consumers are on average willing to pay a premium of about €12 per household per month for electricity from a higher share of renewable energy sources.

[81]The Task Force on Climate-related Financial Disclosure of the Financial Stability Board recommends that firms disclose not only direct greenhouse gas emissions (Scope 1) but also electricity input-related emissions (Scope 2), and, if appropriate, emissions along the value chain including from embodied carbon in inputs (Scope 3). See M Carney, 'Final Report: Recommendations of the Task Force on Climate-Related Financial Disclosures' (Financial Stability Board Bank for International Settlements 2017).

[82]Eisen reaches a similar conclusion but on the basis of a different reasoning (using a philosophical approach); N Eisen, 'Carbon Emissions As a Physical Property: Ontological Approaches to the WTO *Like Products* Debate' (2019) 51 New York University Journal of International Law and Politics 871.

[83]See also the discussion on *de facto* discrimination in L Ehring, 'De Facto Discrimination in World Trade Law National and Most-Favoured-Nation Treatment – or Equal Treatment?' (2002) 36 Journal of World Trade 921.

[84]See *United States – Certain Country of Origin Labelling (COOL) Requirements* (Appellate Body Report), WT/DS384/AB/R, WT/DS386/AB/R (28 June 2012) (*US – COOL*) para 349. This judgement does not rule out certificates of origin on the emissions intensity or production technology deployed per se. However, it suggests that recordkeeping is limited to a minimum.

[85]*European Communities – Regime for the Importation, Sale and Distribution of Bananas* (Appellate Body Report) WT/DS27/AB/R (9 September 1997) para 213; *Korea – Measures Affecting Imports of Fresh, Chilled and Frozen Beef* (Panel Report) WT/DS161/R (31 July 2000) paras 629–639; *Korea – Measures Affecting Imports of Fresh, Chilled and Frozen Beef* (Appellate Body Report) WT/DS161/AB (11 December 2000) para 144; *Turkey – Measures Affecting the Importation of Rice* (Panel Report) WT/DS334/R (21 September 2007) paras 7.227–7.240.

[86]*Japan – Measures Affecting Consumer Photographic Film and Paper* (Panel Report) WT/DS44/R (31 March 1998) para 10.379.

[87]ibid.

[88]See, e.g., *US – Clove Cigarettes* (n 75) paras 182 and 223ff.

detrimental impact on imports that stems exclusively from a legitimate regulatory distinction'.[89] To carry out this analysis, WTO case law suggests taking into account the 'design, architecture, revealing structure, operation, and application' of the measure to imports.[90] Moreover, the 'even-handedness' of the measure plays an important role in assessing whether there is a violation of Article 2.1 TBT Agreement.[91]

Consequently, it seems that any origin-neutral measure that in principle would be considered as *de facto* discriminatory under the GATT could still stand the national treatment test under the TBT Agreement.[92] For example, the Appellate Body held in *US – Clove Cigarettes* that 'where the technical regulation at issue does not *de jure* discriminate against imports, the existence of a detrimental impact on competitive opportunities for the group of imported vis-à-vis the group of domestic like products is not dispositive of less favourable treatment under Article 2.1'.[93] This, however, requires that the difference in treatment stems from a legitimate objective (rather than 'reflecting discrimination against the group of imported products') and that the measure at issue is applied in an even-handed way.[94] The condition of 'even-handedness' must be understood to mean that a measure credibly aligns with the regulatory objective and that the measure is 'calibrated' accordingly.[95]

Nevertheless, the allegedly less restrictive interpretation of the national treatment principle under the TBT Agreement does not mean that the requirements under the TBT Agreement as a whole are looser than under the GATT as a whole.[96] Indeed, Article 2.2 of the TBT Agreement also requires WTO members to design their technical regulation so as not to create unnecessary obstacles to international trade.[97] A measure is deemed to be an unnecessary obstacle to trade if it is more trade-restrictive than necessary to fulfil a legitimate objective.[98]

Applying the national treatment principle to PCRs, it seems reasonable to argue that they stem from a legitimate regulatory distinction. Indeed, PCRs are aimed at distinguishing between (i) basic materials and manufactured products that have been produced in a way that significantly contributed to climate change and (ii) basic materials and manufactured products that have been produced in a way that does not contribute to climate change. Such a distinction, linked to an environmental non-trade concern, seems in line with the objectives that are considered legitimate under the TBT Agreement. Under its preamble, the TBT Agreement explicitly recognizes that countries should not be prevented from adopting measures 'for the protection of human, animal or plant life or health of the environment'.[99]

To make sure that the measure is considered 'even-handed' or 'calibrated', PCRs should be designed in such a way that they 'make sense' in the light of their policy objective of mitigating climate change. This seems to be the case, considering that PCRs would be based on a requirement of climate neutrality (or near-climate neutrality). Moreover, under Article 2.2 TBT Agreement, countries should be able to explain why PCRs are the least trade-restrictive, reasonably available measure, they can use to achieve their policy objective.[100] PCRs would clearly be trade-restrictive but, given their long-term time frame and objective, it is unlikely that other less trade-restrictive measures could be used to achieve a similar goal.

3.3 | Most-favoured-nation treatment

In addition to the risk of violation of the national treatment principle, one could argue that PCRs violate the most-favoured-nation (MFN) principle. Indeed, if PCRs were adopted, only climate-neutral (or near-climate-neutral) basic materials would be allowed in the implementing country. Assuming that completely climate-neutral production processes are used in some WTO members, whereas in some other WTO members production processes are not climate neutral, PCRs could be seen as a discriminatory measures *vis-à-vis* basic products from those WTO members with no climate-neutral production processes.

The risk of a violation of the MFN obligation would likely be correlated to the risk of a violation of the national treatment principle. First, under the TBT Agreement, the national treatment and MFN principles are to be found under the same provision, namely Article 2.1.[101] Second, under the GATT, it is likely that the likeness

[89] ibid para 181. See also *US – COOL* (n 84). But see also Mehling et al (n 14) 462, whose interpretation of Article III:4 GATT is similar to the interpretation of Article 2 of the TBT Agreement.

[90] *US – Clove Cigarettes* (n 75) paras 182 and 206.

[91] See, e.g., ibid paras 182 and 223ff. See also *EC – Seal Products* (n 67) paras 5.117 and 5.125, where the Appellate Body clearly distinguishes between the test applied under Article III:4 GATT and the TBT Agreement with regard to regulatory purposes. See also *US – COOL* (n 84) paras 341ff on the even-handedness test.

[92] On the comparison between the test under Article III:4 GATT and Article 2.1 TBT Agreement, see *US – Clove Cigarettes* (n 75) paras 176–182. See also *US – COOL* (n 84) para 286.

[93] See *US – Clove Cigarettes* (n 75) para 182.

[94] ibid; see also paras 95 and 215.

[95] For example, in *US – Tuna II*, the Appellate Body found a lack of credibility in the United States' measure. While the dolphin-safe label took into consideration the fishing methods in the Eastern Tropical Pacific, it did not 'address mortality (observed or unobserved) arising from fishing methods other than setting on dolphins outside the Eastern Tropical Pacific'; *US – Tuna II* (n 75) para 297. See also *United States – Measures Concerning the Importation, Marketing and Sale of Tuna and Tuna Products – Recourse to Article 21.5 of the DSU by Mexico* (Panel Report) WT/DS381/RW (14 April 2015) (*US – Tuna II, Article 21.5*) para 7.116. The requirement of 'even-handedness' can also be found in cases on Article XX GATT. See *China – Measures Related to the Exportation of Rare Earths, Tungsten and Molybdenum* (Appellate Body Report) WT/DS431/AB/R, WT/DS432/AB/R, WT/DS433/AB/R (20 May 2015) para 5.131. See also F Deane, 'The WTO, the National Security Exception and Climate Change' (2012) 6 Carbon and Climate Law Review 149, 154; P Van den Bossche and W Zdouc, *The Law and Policy of the World Trade Organization: Text, Cases and Materials* (Cambridge University Press 2017) 902ff.

[96] TBT Agreement (n 55) art 2.2, first sentence. See *US – Clove Cigarettes* (n 75) para 96.

[97] See R Howse and PI Levy, 'The TBT Panels: US–Cloves, US–Tuna, US–COOL' (2013) 12 World Trade Review 327, 349–350.

[98] TBT Agreement (n 55) art 2.2, second sentence.

[99] ibid preamble; see also *European Communities — Trade Description of Sardines* (Panel Report) WT/DS231/R (29 May 2002) paras 7.119–7.120.

[100] Although, in case of a dispute, the burden of proof would initially rely on the complaining party.

[101] *US – Clove Cigarettes* (n 75) para 87.

test under Article I:1 GATT would be similar to its analysis under Article III:4 GATT and Article 2.1 TBT Agreement. In other words, if climate-neutral basic materials are considered to be like non-climate-neutral basic materials for the assessment of the national treatment principle under Article III:4 GATT and Article 2.1 TBT Agreement, the same conclusion should be reached under Article I:1 GATT and Article 2.1 TBT Agreement.[102] In that case, PCRs would likely violate Article I:1 GATT because they would prevent the implementing country from extending 'immediately and unconditionally' the 'advantage' they grant to climate-neutral products to non-climate-neutral products from other WTO members.[103] Therefore, as for the assessment of the national treatment principle, evidence that climate-neutral and non-climate-neutral basic products are 'unlike' will play a crucial role in the defence of PCRs under WTO law.

3.4 | Grounds for justification

In case PCRs constitute a breach of one of the substantive obligations under the GATT (either Article I, Article III:4 or Article XI:1), they can still be justified under Article XX. Indeed, subparagraphs (b) and (g) of Article XX allow, under certain conditions, a derogation from GATT obligations for environmental policy measures.[104] These derogations can be read in the light of the preamble of the Agreement Establishing the WTO, which explicitly refers to the objective of sustainable development.[105] Subparagraph (b) concerns measures that are necessary to protect human, animal or plant life or health. Subparagraphs (g) concerns measures relating to the conservation of exhaustible natural resources. Both subparagraphs (b) and (g) cover environmental policy, including measures that reduce air pollution and aim for clean air.[106] This seems to suggest that both provisions could also cover policies whose objective is to reduce carbon emissions. A similar argument has also been brought forward within the discussion of the world trade law compatibility of border carbon adjustments for emissions trading systems.[107] Consequently, Article XX GATT could serve as a justification for PCRs, provided that they comply with the additional requirements of both items and with the *chapeau* of Article XX.

To ensure that PCRs can be justified under subparagraph (b) of Article XX GATT, they need to be 'necessary' to achieve their ends.[108] Furthermore, a State should demonstrate that PCRs are the least trade-restrictive, reasonably available measures to achieve its policy objective.[109] Under subparagraph (g), States must ensure that the measure is applied 'even-handedly' so that both domestic and imported products are subject to similar restrictions.[110] To comply with the *chapeau* of Article XX, PCRs should not discriminate against Members to the Agreement where the same conditions prevail and should be designed so as to be consistent in their application.[111] If policymakers keep in mind the different conditions of GATT Article XX and design PCRs accordingly, our analysis suggests that PCRs could be justified under the GATT.

3.5 | Design issues

This section provides first guidance on the design of PCRs as laid down in the TBT Agreement to lower the risks that they would be found incompatible with WTO law. The TBT Agreement lays down a list of requirements—besides the national treatment principle—that must be considered when drafting technical regulations. This section draws attention to the following elements: (i) the role of international climate standards and the use of a precautionary approach; (ii) the need to draft administrative requirements that apply to importers in the least burdensome possible way and (iii) the requirement to notify the measure under the TBT Agreement.

[102] See *United States – Measures Concerning the Importation, Marketing and Sale of Tuna and Tuna Products – Recourse to Article 21.5 of the DSU by Mexico* (Appellate Body Report) WT/DS381/AB/RW (20 November 2015) paras 7.278 and 7.281.

[103] GATT (n 54) art I.

[104] Cf R Wolfrum, 'Article XX – General Exceptions [Introduction]' in R Wolfrum et al (eds), *WTO – Trade in Goods* (Martinus Nijhoff 2011) paras 1 and 5.

[105] Agreement Establishing the World Trade Organization (adopted 15 April 1994, entered into force 1 January 1995) 1867 UNTS 3, recital 1. See *US – Shrimp* (n 59) para 129; *China – Measures Related to the Exportation of Rare Earths, Tungsten and Molybdenum* (Panel Report) WT/DS431/R, WT/DS432/R, WT/DS433/R (26 March 2014) para 7.259.

[106] See *United States – Standards for Reformulated and Conventional Gasoline* (Panel Report) WT/DS2/R (29 January 1996) para 6.21; and *United States – Standards for Reformulated and Conventional Gasoline* (Appellate Body Report) WT/DS2/AB/R (29 April 1996) (*US – Reformulated Gasoline*, Appellate Body Report) 13. See also the reference to 'measures adopted in order to attenuate global warming and climate change' in *Brazil – Measures Affecting Imports of Retreaded Tyres* (Appellate Body Report) WT/DS332/AB/R (3 December 2007) (*Brazil – Retreaded Tyres*) para 151.

[107] See, e.g., J de Cendra, 'Can Emissions Trading Schemes be Coupled with Border Tax Adjustments? An Analysis vis-à-vis WTO Law' (2006) 15 Review of European Community and International Environmental Law 131, 144; R Ismer and K Neuhoff, 'Border Tax Adjustment: A Feasible Way to Support Stringent Emission Trading' (2007) 24 European Journal of Law and Economics 137, 152; J Pauwelyn, 'Carbon Leakage Measures and Border Tax Adjustments under WTO Law' in G Van Calster and D Prévost (eds), *Research Handbook on Environment, Health and the WTO* (Edward Elgar 2013) 448, 496. Finally, note that the United Nations Framework Convention on Climate Change was mentioned – unsuccessfully – in relation to Article XX(d) GATT in *India – Certain Measures Relating to Solar Cells and Solar Modules* (Appellate Body Report) WT/DS456/AB/5 (16 September 2016) paras 5.141 and 5.149.

[108] *Brazil – Retreaded Tyres* (n 106) para 156. See also IC Salinas Alcaraz, 'The Concept of Necessity under the GATT and National Regulatory Autonomy' (2015) 10 Via Inveniendi et Iudicandi 77; M Du, 'The Necessity Test in World Trade Law: What Now?' (2016) 15 Chinese Journal of International Law 817.

[109] See *Thailand – Restrictions on Importation of and Internal Taxes on Cigarettes* (GATT Panel Report) DS10/R (7 November 1990) paras 74ff; *EC – Asbestos* (n 65) para 172. See also C Herrmann et al, *Welthandelsrecht* (CH Beck 2007) para 528; PT Stoll and L Strack, 'Article XX – General Exception: (b) Necessary to Protect Human, Animal or Plant Life or Health' in Wolfrum (n 104) paras 38–41.

[110] *US – Reformulated Gasoline*, Appellate Body Report (n * MERGEFORMAT 106) 20ff; *US – Shrimp* (n 59) para 143. Cf Herrmann et al (n 109) para 532; N Matz-Lück and R Wolfrum, 'Article XX: General Exception – (g) Relating to the Conservation of Exhaustible Natural resources if Such Measures Are Made Effective in Conjunction with Restrictions on Domestic Production or Consumption' in Wolfrum (n 104) paras 32–34.

[111] Cf *Brazil – Retreaded Tyres* (n 106) para 227; *EC – Seal Products* (n 67) paras 5.306 and 5.318; *US – Tuna II, Article 21.5* (n 95) para 7.316.

3.5.1 | Reference to international standards

Where possible and available, PCRs should be based on relevant international standards.[112] If this is the case, the TBT Agreement rewards members with the rebuttable presumption that such technical regulations do not create unnecessary obstacles to trade provided that the technical regulation is used for environmental protection.[113] Two main arguments can be brought forward for the use of international standards. First, they reduce transaction costs and, as such, are beneficial to international trade.[114] Second, cooperation at the international level reduces the risk of lobbying for specific national advantages so that the rent-seeking behaviour of such groups can be limited.[115]

As there are no 'international climate neutrality standards', these provisions are not entirely relevant for a proposal like PCRs.[116] However, these rules indicate that countries that wish to adopt PCRs should invite all other members to discuss the level of emissions intensity for the non-product-related PPMs used to define PCRs. Discussions should involve developing countries as the TBT Agreement requires WTO members to 'take account of the special development, financial and trade needs of developing country Members' in the preparation and application of technical regulations.[117] Initiatives to reach an agreement at the international level could also have a positive impact on the legal analysis undertaken under the GATT. Previous case law indicates that international cooperation can affect whether or not the measure violates the GATT and, if so, be justified under Article XX GATT.[118]

3.5.2 | No burdensome administrative requirements imposed on importers

If conformity assessment procedures are established to implement PCRs, they should meet the requirements under the TBT.[119] Accordingly, they must be prepared, adopted and applied to grant access for suppliers of like products originating in the territories of other WTO members under conditions no less favourable than those accorded to suppliers of like products of national origin or originating in any other country, in a comparable situation.[120] Furthermore, conformity assessment procedures must be designed so as not to create an unnecessary obstacle to trade.[121] This means that they should not be stricter or applied more strictly than necessary.[122] They should also align with relevant guidelines or recommendations issued by international standardizing bodies for assessment procedures.[123] Where such harmonized procedures do not exist, States should support international standardization bodies to develop such procedures.[124] Similar to the setting of technical regulations, PCR regulators should accept conformity assessment procedures of other States if these differ from their own but are equivalent.[125]

3.5.3 | Notification and acceptance requirement in the absence of international standards as well as conformity assessment procedures

As already mentioned, PCRs should be based on international standards, if existent. Where an international standard does not exist, the regulating State should publish its intention to implement a technical regulation at an early stage.[126] This should include the objective and the rationale of the measure at stake as well as the products covered.[127] Furthermore, the regulating State should allow other States to comment on the technical regulation and take these discussions into account.[128] At the end of the drafting stage, the technical regulation is to be published.[129] In any event, the regulating State has to give reasonable time to allow producers of other States to adapt their products or their method of production to the technical regulation.[130]

Similar rules apply for conformity assessment procedures that are not based on international guidelines. In this case, the regulating State has to publish its intended procedures, must inform about the product scope, and take into account comments made by other States.[131] In any event, the regulating State should give reasonable time to allow producers of other States to adapt their products or

[112] TBT Agreement (n 55) art 2.4.

[113] ibid arts 2.5 and 2.2.

[114] PT Stoll and F Schorkopf, 'Trade in Goods' in Wolfrum et al (n 104) paras 382–383; M Matsushita, TJ Schoenbaum and PC Mavroidis, *The World Trade Organization: Law, Practice, and Policy* (2nd edn, Oxford University Press 2006) 487.

[115] See AO Sykes, 'Regulatory Competition or Regulatory Harmonization? A Silly Question?' (2000) 3 Journal of International Economic Law 257, in particular 262; Matsushita et al (n114) 486ff.

[116] The ISO provides guidance for the calculation of the carbon dioxide intensity of production processes, but it does not classify products based on their emissions intensity. See, e.g., ISO 14404:1 ('calculation method of carbon dioxide emission intensity from iron and steel production').

[117] TBT Agreement (n 55) art 12.3. On this question, see Lovell (n 17).

[118] See *US – Shrimp* (n 59) para 172. The duty to enter into bilateral or multilateral agreements is discussed by De Schutter in the general context of human rights. He also makes a reference to *US – Shrimp* (Human Rights Council, Working Group on the Right to Development, 'The International Dimensions of the Right to Development: A Fresh Start toward Improving Accountability' UN Doc A/HRC/WG.2/19/CRP.1 (22 January 2018) para 40).

[119] Conformity assessment procedure are defined in the TBT Agreement (n 55) Annex 1, para 3, as 'any procedure used, directly or indirectly, to determine that relevant requirements in technical regulations or standards are fulfilled'.

[120] TBT Agreement (n 55) art 5.1.1.

[121] See *European Communities – Measures Prohibiting the Importation and Marketing of Seal Products* (Panel Report) WT/DS400/R, WT/DS401/R (25 November 2013) paras 7.418–7.419.

[122] TBT Agreement (n 55) art 5.1.2.

[123] ibid art 5.4.

[124] ibid art 5.5.

[125] ibid art 6.1.

[126] ibid art 2.9.1.

[127] ibid art 2.9.2.

[128] ibid art 2.9.4.

[129] ibid art 2.11.

[130] ibid art 2.12.

[131] ibid art 5.6.1–5.6.5.

their method of production to the conformity assessment requirements.[132]

4 | CONCLUSION

This article has explored the possibility for countries to ban the sale of carbon-intensive materials through PCRs. First, it has analysed various product standards and technical regulations in the EU context and identified design element within current legislation, which could be used for implementing PCRs. Second, it has argued that WTO law would not be an obstacle to the adoption of PCRs, provided they are designed and adopted in a manner consistent with the main legal tests of the GATT and TBT. Both require PCRs not to discriminate against 'like' imported products; thus, one important issue is whether low- and high-carbon products would be considered 'like' products. The article has argued that the evidence that consumers are—or would be—willing to choose one product instead of another could be highly relevant in assessing the 'likeness' of those products. The measure should be designed in a way that does not discriminate against imports (e.g. administrative requirements should not be excessively burdensome for imported products) and it is recommended to favour international cooperation where possible. Other environmental product requirements have already been implemented and are politically accepted. They have not been challenged under WTO law. However, there is inevitably still some uncertainty regarding the interpretation of some of the relevant WTO provisions given that no *ex-ante* clearing process exists.

These findings suggest that PCRs can be designed in compliance with WTO law. PCRs could therefore be part of a pathway towards making the EU the first climate-neutral continent by 2050 and their design could already be taken into consideration by policymakers as part of the EU sustainable products initiative. PCRs, though, would only be one building block of a new industrial policy for a carbon-constrained basic material sector, but with high relevance for translating the stringent long-term emissions targets of the EU into a robust regulatory commitment to a low-emission society.

[132] ibid art 5.9.

ORCID

Timo Gerres https://orcid.org/0000-0001-9245-8032
Manuel Haussner https://orcid.org/0000-0002-1312-2862
Karsten Neuhoff https://orcid.org/0000-0002-0582-8072
Alice Pirlot https://orcid.org/0000-0003-1407-6260

AUTHOR BIOGRAPHIES

Timo Gerres is a research assistant at the Institute for Research in Technology, ICAI, Comillas Pontifical University, Madrid.

Manuel Haussner was a research associate at the Chair for Tax Law and Public Law at the FAU Erlangen-Nürnberg.

Karsten Neuhoff leads the Climate Policy Department at the German Institute for Economic Research (DIW Berlin) and is a Professor at the Institute for Economics and Law of Technical University Berlin.

Alice Pirlot is a Research Fellow in Law at the Centre for Business Taxation, Saïd Business School, University of Oxford.

The authors thank Roland Ismer, Oliver Sartor and the anonymous reviewers for their constructive comments. The usual disclaimers apply. The authors also thank Mistra Carbon Exit, DG Clima and Energie Campus Nürnberg for financial support.

How to cite this article: Gerres T, Haussner M, Neuhoff K, Pirlot A. To ban or not to ban carbon-intensive materials: A legal and administrative assessment of product carbon requirements. *RECIEL*. 2021;00:1–14. https://doi.org/10.1111/reel.12395