

## IV.4. CONTRIBUTION TO THE SUSTAINABLE DEVELOPMENT AGENDA BY CALCULATING AND REDUCING GREENHOUSE GAS EMISSIONS FROM THE WASTE MANAGEMENT SECTOR

### THE MAIN INTERNATIONAL AND REGIONAL AGREEMENTS AND/OR ACTS ON CLIMATE CHANGE MITIGATION AND IMPLEMENTATION OF THE SUSTAINABLE DEVELOPMENT GOALS

On 9 May 1992 the United Nations Framework Convention on Climate Change (hereinafter – the Convention or UNFCCC) was adopted in New York and was signed by 155 parties at the United Nations Conference on Environment and Development (also known as the Rio Earth Summit) in June of that year (O’Riordan and Jäger 1996, p. 361). Currently, there are 199 parties to the UNFCCC. The Convention entered into force on 21 March 1994. Currently, there are 199 parties to the UNFCCC. The ultimate objective provided in Article 2 of the Convention is “to achieve (...) stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system (...)” (United Nations [UN] 1992, p. 9). The Kyoto Protocol was adopted on 11 December 1997, but entered into force only on 16 February 2005. The Kyoto Protocol “operationalizes the [Convention] by committing industrialized countries and economies in transition to limit and reduce greenhouse gas (GHG) emissions in accordance with agreed individual targets. The Convention itself only asks those countries to adopt policies and measures on mitigation and to report periodically” (UN, n.d.-a).

With the Paris Agreement – which was adopted on 12 December 2015 and entered into force on 4 November 2016, and is often referred to as an essential international instrument for combating climate change because it is a legally binding international treaty – the parties agreed that “enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by: (a) Holding the increase in the global average temperature to well

below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change (...)" (UN 2015a, p. 3). As far back as 1987, the United Nations Commission on the Environment and Development's report "Our Common Future" defined sustainable development as "development that meets the needs of society today and does not diminish the ability of future generations to meet their own needs" (UN 1987, p. 54).

In 2019, in pursuit of the objectives of the Convention and the Paris Agreement, the European Commission presented the European Green Deal (European Commission [EC] 2019) – in other words, guidelines for action to promote resource efficiency in the transition to a clean circular economy, halt climate change and biodiversity loss and reduce pollution. Another important document is Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ("European Climate Law"). This was adopted on 30 June 2021, and set a legally binding objective for the European Union to reach climate neutrality by 2050 (European Parliament [EP] and the Council of European Union [CEU] 2021, p. 8). This directly applicable regulation also sets an intermediate target, which is also binding on Member States, to reduce net GHG emissions by at least 55% compared to 1990 levels by 2030 (EP and CEU 2021a, p. 8).

The legally binding objectives to reduce GHG emissions by 2030 to an appropriate extent and to become a climate-neutral region by 2050 stem from a sound understanding of the environment, climate change and the resulting and potential future consequences not only for the environment but also for human health. The idea of the need to preserve a healthy and clean environment for future generations is not new; the preamble of the Stockholm Declaration emphasized the need "to defend and improve human environment for present and future generations [...]" in 1972 (UN 1972, p. 2), but the importance of this idea is much greater today. In order for future generations to be able to exercise their right to a healthy and clean environment, and in order to achieve the ambitious goal of a climate-neutral region, today's societies need to make a major change in environmental protection, including waste management.

In 2000, the United Nations signed the Millennium Declaration, which set out eight goals to be achieved by 2015, such as supporting gender equality, reducing child mortality, and eradicating extreme poverty and hunger. One of the goals was also to protect the environment (UN 2000, p. 6) – to "ensure environmental sustainability" (UN, n.d.-b). At the end of the Millennium Development Goals, the United Nations adopted a new declaration for the period up to 2030, during which even more (seventeen) goals should be achieved. These goals in the new declaration were identified as the Sustainable Development Goals (UN 2015b, p. 14). The European Union has also contributed to the above-mentioned United Nations Declaration on the Sustainable Development Goals until 2030 (EC, n.d.-a), and the Sustainable Development Goals have been defined by 169 targets that further refine them (UN 2017).

The goals of sustainable development and the 169 targets that refine them cover many important areas, but in the case of GHG emissions, the thirteenth sustainable development goal (SDG13) on climate change mitigation must be emphasized. One of the SDG13 targets (13.2) is to "integrate climate change measures into national policies, strategies and planning" (UN 2017, p. 17). The mentioned target has two indicators, one of which is the "total greenhouse gas emissions per year"

(UN 2017, p. 17). As for the waste management sector, the twelfth sustainable development goal (SDG12) must ensure sustainable consumption and production patterns. Target 12.5 of SDG12 seeks to “(...) substantially reduce waste generation through prevention, reduction, recycling and reuse” (UN 2017, p. 16), and the indicator of target 12.5 is “national recycling rate, tons of material recycled” (UN 2017, p. 16). The connections and interlinkages between all the sustainable development goals and targets that can be seen visually (EC, n.d.-b) show that there is synergy between targets 13.2 and 12.5.

Addressing one goal could help to address some others at the same time (Mensah, 2019, p. 12), but “climate action [SDG13] is a critical pillar to achieving sustainable development, and all 17 Goals require efforts to address climate change. In its absence, it is virtually impossible to achieve them” (UN Global Compact, n.d.). Coenen, Glass, and Sanderink (2022) concluded that “the strongest links exist between TCIs [transnational climate actions] and SDG13 (*climate action*), followed by SDGs 12 (*responsible consumption and production*), 9 (*industry, innovation and infrastructure*), 7 (*affordable and clean energy*), and 17 (*partnerships for the goals*). (...) Thus, climate actions around sustainable production and consumption, energy, and industry and infrastructure appear to be key for combating climate change while simultaneously fostering sustainable development” (p. 1504).

The implementation of the interconnected sustainable development goals and the objectives of the international and regional documents related to combating climate change requires the calculation of GHG emissions and the evaluation and implementation of policies and measures (hereinafter – measures) to reduce GHG emissions. Therefore, measures (e. g. scope, efficiency) depend on the amount of calculated GHG emissions. In light of this, it is important to examine the specifics of GHG emissions from the waste management sector. Having in mind the intertwining of the waste management and energy sectors (especially when it comes to GHG emissions’ estimation and reporting to the Intergovernmental Panel on Climate Change (IPCC)), it is also important to answer what can be done to reduce the negative environmental impact of the waste management sector – in particular, to reduce GHG emissions and thus contribute to the sustainable development goals, climate neutrality and resource efficiency in the transition to a clean circular economy.

## GREENHOUSE GAS EMISSIONS: CALCULATION, REPORTING AND STATISTICS

The Member States of the European Union use the following key documents to calculate and report their GHG emissions: the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (hereinafter – IPCC Guidelines) (IPCC 2006a); and Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action (hereinafter – Regulation (EU) No 2018/1999) (EP and CEU 2018a), which was amended by the European Climate Law on 30 June 2021 (EP and CEU 2021b). Regulation (EU) No 2018/1999 does not establish specific methodologies for the calculation of GHG emissions, but directs the Member States to the Convention and Paris Agreement. For example, the preamble (41) of Regulation (EU) No 2018/1999 states that

“under the UNFCCC, the Union and its Member States are required to develop, regularly update, publish and report to the Conference of the Parties national inventories of anthropogenic emissions by sources and removals by sinks (hereinafter – GHG inventories) of all GHGs using comparable methodologies agreed by the Conference of the Parties. The GHG inventories are key to enabling the tracking of progress with the implementation of the decarbonisation dimension and for assessing compliance with the legislative acts in the field of climate, in particular Regulation (EU) 2018/842 of the European Parliament and of the Council (16) and Regulation (EU) 2018/841 of the European Parliament and of the Council” (EP and CEU 2018a, p. 7). Regulation (EU) No 2018/1999 also emphasizes cooperation between the Member States of the European Union, reporting frequency and other aspects. For example, in paragraph 1 of Article 1 of Regulation (EU) No 2018/1999 there is the objective to “c) ensure the timeliness, transparency, accuracy, consistency, comparability and completeness of reporting by the Union and its Member States to the UNFCCC and Paris Agreement secretariat” (EP and CEU 2021b, p. 2). Thus, Regulation (EU) No 2018/1999 directs Member States to follow *inter alia* the above-mentioned IPCC Guidelines, which provide a methodology for calculating GHG emissions and removals for different sectors (Energy, Waste, Industrial Processes and Product Use, Agriculture, Forestry and Other Land Use (AFOLU)).

The IPCC, which was established by the World Meteorological Organization and the United Nations Environment Programme in 1988, prepared the IPCC Guidelines. The main objective of the IPCC was to assess scientific, technical and socio-economic information relevant to the understanding of human-induced climate change, the potential impacts of climate change and options for mitigation and adaptation (IPCC 2021). The IPCC has 195 Member countries, including Lithuania (IPCC, n.d., p. 3). Anthropogenic emissions and removals mean that GHG emissions and removals included in national inventories are a result of human activities (IPCC 2006b, p. 4). It is said that it is *good practice* to use a calendar year for reporting GHG emissions (IPCC 2006b, p. 6). The IPCC Guidelines group GHG emissions into four main sectors (Energy, Waste, Industrial Processes and Product Use, and AFOLU) (IPCC 2006a).

Eurostat statistics show (Eurostat, 2022) that in 2020, twenty-seven Member States of the European Union emitted 3,354,115.06 thousand tonnes of GHG emissions. In the same year, Lithuania emitted 20,346.48 thousand tonnes of GHG emissions (without removals). GHG emission statistics are also provided in detail, i.e., the total sum of GHG emissions is divided into emissions of the five specific areas (energy, industrial processes and product use, agriculture, land use, land use change, and forestry (LULUCF) and waste management). For example, in the same year (2020) in Lithuania, 11,816.75 thousand tonnes of GHG emissions were emitted in the energy sector, 3,093.5 thousand tonnes of GHG emissions were emitted in the industrial processes and product use sector, 4,450.72 thousand tonnes of GHG emissions in the agriculture sector, and 821.58 thousand tonnes were emitted in the waste management sector (incidentally, in 2019 the number was higher – 838.6 thousand tonnes). In 2020, the LULUCF sector absorbed 5,407.39 thousand tonnes of GHGs.

Under the methodology of the IPCC Guidelines, member countries, including Lithuania, estimate that the Waste sector generates the least GHG emissions (e.g., the Waste sector in Lithuania accounted for 4.0% of the total GHG emissions in 2020). The percentage of emissions in 2020 in other sectors in Lithuania was as follows: Energy sector ~58%, Agriculture ~22%, Industrial Processes ~15%.

Information and data that make it possible to calculate the level of GHG emissions in a given Member State of the European Union or in a particular sector are becoming particularly important in implementing the change towards climate neutrality. Data and information are important in calculating the extent to which GHG emissions could be reduced if appropriate measures were taken in the relevant Member State, and are also important for projections and decision-making. According to Yin and Kaynak (2015, p. 2), “by the proper interpretation of big data, more efficient risk management systems can be created to help company management to make better-informed decisions and improve corporate governance.” This statement can be addressed not only to the companies of the public sector, but also to public institutions that make important decisions related to climate change, for example. However, without knowing the current level of GHG emissions, it cannot be clear how much GHG emissions need to be reduced by in order to achieve the objectives to reduce GHG emissions to an appropriate extent by 2030 and achieve climate neutrality by 2050. In order to make the calculations comparable, it is essential that different Member States use the same methods. It is also important that the relevant GHG emissions are not included in several different sectors, which would lead to higher calculated GHG emissions than they are in reality.

## INTERTWINING OF THE WASTE AND ENERGY SECTORS MAY DISTORT THE PUBLIC’S VIEW AND LEAD TO SMALLER MEASURES ON REDUCING GHG EMISSIONS THAN ARE NECESSARY

Statistics on reported GHG emissions from the waste management sector show that this sector generates the smallest amount (~4 %). Nevertheless, it is still necessary to emphasize that the methodology for calculating GHG emissions under IPCC Guidelines and the calculated GHG emissions in the Waste sector lead to a somewhat distorted public image – i.e., that the waste management sector is low-polluting and a very low contributor to climate change. As a result, ostensibly no substantial changes in the legal framework for waste management are required and / or no additional measures are required to manage waste at the highest possible levels in the waste hierarchy and / or to start waste management (operations, services) in a more sustainable, sound way. This is why it is necessary to analyse the existing methodology, the scope of the waste management sector, the connections and interactions between different sectors, especially the Waste and Energy sectors, and to assess the situation and suggest possible solutions.

Directive 2008/98/EC of the European Parliament and of the Council, which was amended by Directive (EU) 2018/851 (hereinafter – Waste Framework Directive), establishes a waste management hierarchy (EP and CEU 2018b, p. 6), which ranks waste management options according to what is best for the environment. It gives top priority to preventing waste in the first place. When waste is created, it gives priority to preparing it for re-use, then recycling, other recovery and last of all disposal (e.g., landfill).

The communication of the European Commission “The role of waste-to-energy in the circular economy” provides that “waste-to-energy processes encompass very different waste treatment operations, ranging from ‘disposal’ and ‘recovery’ to ‘recycling’”. For example, processes such as

anaerobic digestion which result in the production of a biogas and of a digestate are regarded by EU waste legislation as a recycling operation. On the other hand, waste incineration with limited energy recovery is regarded as disposal” (EC 2017, p. 4). Moreover, reprocessing of waste into materials that are used as fuels (solid, liquid or gaseous fuels) is classified in the waste management hierarchy not as “recycling” but as “other recovery” (EC 2017, p. 4), i.e., at a lower level in the waste management hierarchy.

It should be emphasized that, according to the communication of the EC, “waste hierarchy also broadly reflects the preferred environmental option from a climate perspective: disposal, in landfills or through incineration with little or no energy recovery, is usually the least favourable option for reducing greenhouse gas (GHG) emissions; conversely, waste prevention, reuse and recycling have the highest potential to reduce GHG emissions” (EC 2017, p. 4). For example, “operations throughout the plastics recycling chain require energy consumption in the form of diesel fuel, grid electricity and thermal energy, which contributes to GHG emissions as well as fossil resource depletion. On the other hand, the materials recovered as a result of recycling enable environmental benefits from the avoided production of virgin plastics and related impacts” (Hestin, Faninger and Milios 2015, p. 30). It is said that “recycling plastics releases only a fourth or even less of the GHG emitted by producing plastics from fossil-based primary feedstock” (EC 2017, p. 9), and that “the circular economy has the power to shrink global GHG emissions by 39% and cut virgin resource use by 28%” (Circle Economy 2021, p. 8). Therefore, it is essential to evaluate not only direct but also avoided GHG emissions, in this case resulting from the extraction and (or) production of primary raw materials.

The Waste Framework Directive also contains a definition of waste management. Waste management means “the collection, transport, recovery (including sorting) and disposal of waste, as well as the supervision of such operations and the follow-up of disposal sites, including such actions taken by the dealer or broker” (EP and CEU 2018b, p. 4). In order to clarify the definitions of *recovery* and *disposal*, the Waste Framework Directive refers to its annexes that set out non-exhaustive lists of recovery and disposal operations.

Aulakh and Thorpe, following a consultation programme with industry representatives, proposed a revision of the 2008 European Waste Framework Directive’s description of the waste management sector (A. Turner, Kemp and Williams 2011, pp. 677–678), whereby the waste management sector is defined as consisting of local authorities and businesses engaged in one or more of the following activities: (i) re-use of products to divert waste at source; (ii) collection and transport; (iii) brokerage of waste; (iv) sorting and storing; (v) disposal through landfill; (vi) disposal through incineration; (vii) treatment of waste; (viii) recycling and processing of recyclate; (ix) composting; and (x) energy recovery (Aulakh and Thorpe 2011, pp. 18–19). As can be seen, *treatment of waste* is distinguished as a separate waste management activity (for example, separate from recycling, energy recovery and others), but in fact can be understood very broadly; this term could be used for both recovery and disposal operations. This can be confirmed by the definition in Article 3 (14) of the Waste Framework Directive, which provides that “treatment” means “recovery or disposal operations, including preparation prior to recovery or disposal” (EP and CEU 2018b, p. 5).

IPPC Guidelines describe “in detail how to model greenhouse gas emissions from waste management (composting, anaerobic digestion in biogas facilities, incineration without energy recovery,



landfilling and waste water treatment)” (Bakas *et al.* 2011, p. 31), but “the Waste sector [under IPCC Guidelines] excludes several waste management activities like recycling or energy recovery of waste” (Bakas *et al.* 2011, p. 31). In the light of the provisions of the Waste Framework Directive, this statement regarding the exclusion of some waste management activities is partially accurate.

First of all, it should be mentioned that under the IPCC Guidelines the Waste sector is detailed by the following waste management operations: solid waste disposal (4A); biological treatment of solid waste (4B); incineration and open burning of waste (4C); and wastewater treatment and discharge (4D) (IPCC 2006b, pp. 33–34).

According to the waste management activities provided in the report prepared by Aulakh and Thorpe, “solid waste disposal” under the IPCC Guidelines can be specified as “disposal through landfill.” Since the IPCC Guidelines provide that “Incineration of waste and open burning waste, not including waste-to-energy facilities. Emissions from waste burnt for energy are reported under the Energy Sector, 1A. Emissions from burning of agricultural wastes should be reported under AFOLU (3C1). All non-CO<sub>2</sub> greenhouse gases as well as CO<sub>2</sub> from fossil waste should be reported here for incineration and open burning” (IPCC 2006b, p. 33), “incineration and open burning of waste” under IPCC Guidelines can be equated to the waste management activity of “disposal through incineration” provided in the mentioned report.

The IPCC Guidelines provide that the biological treatment of solid waste contains “solid waste composting and other biological treatment. Emissions from biogas facilities (anaerobic digestion) with energy production are reported in the Energy Sector” (IPCC 2006b, p. 33). However, anaerobic digestion in the light of the waste hierarchy is understood as one of the recycling operations. Also, the IPCC Guidelines (Chapter 6) provide that “if sludge is incinerated, landfilled, or spread on agricultural lands, the quantities of sludge and associated emissions should be reported in the waste incineration, SWDS [solid waste disposal sites], or agricultural categories, respectively” (IPCC 2006c, p. 18).

From the comparison of the scope of the waste management sector according to various documents (the Waste Framework Directive, the report prepared by Aulakh and Thorpe, the IPCC Guidelines), it is clear that the Waste sector under the IPCC Guidelines does not include such waste management operations as the collection, transport, and supervision of relevant waste management operations and the follow-up of disposal sites, including actions taken by the dealer or broker, as well as preparing for re-use, sorting and storing. The comparison also confirmed that the scope of the Waste sector under the IPCC Guidelines does not equally match the scope of waste hierarchy or waste management under the Waste Framework Directive, but since composting under the Waste Framework Directive is understood as one of the waste recycling activities, it cannot be said that the Waste sector under the IPCC Guidelines excludes recycling entirely. Nevertheless, it should be noted that the majority of waste recycling activities are excluded, and that energy recovery of waste is excluded from the Waste sector under the IPCC Guidelines entirely.

A question may arise as to whether the emissions generated in the waste management sector – as they are understood according to the Waste Framework Directive, and that are not attributed to the Waste sector under the IPCC Guidelines – are calculated at all, and if so, to which sector they are attributed. It can be argued that almost all emissions from the waste management sector are calculated, but most of the emissions that are not attributed to the Waste sector, as it is understood

according to the IPCC Guidelines, are attributed to the Energy sector (for example, GHG emissions from waste incineration plants that can produce both heat and electricity according to IPCC Guidelines should be reported under the Energy sector, but not the Waste sector) and some attributed to other sectors (for example, AFOLU).

As can be understood from the IPCC Guidelines, some emissions are being reported not under Waste but under a different sector, in order to avoid double counting or misallocation. This is understandable, but it means, at the same time, that if GHG emissions from the waste management sector, as it is understood according to the Waste Framework Directive, were calculated for the Waste sector (for example, if GHG emissions from waste incineration plants were calculated for the Waste sector), then the percentage of emissions from the Waste sector would be higher than it is now (as mentioned earlier, ~4 %). It also means that it is possible to reduce GHG emissions from the Waste sector by simply starting to recover energy from waste (for example, by incinerating (R1)). However, it is questionable whether the reduction of GHG emissions from the Waste sector by transferring such emissions to another sector is sustainable, because on the whole GHG emissions may not decrease. A different methodology that relies on life-cycle thinking to calculate GHG emissions can help answer this. Such transferring also could negatively affect the pursuit of resource efficiency in the transition to a clean circular economy and the achievement of the targets of SDG12 (for example, target 12.5: to “substantially reduce waste generation through prevention, reduction, recycling and reuse”).

The report prepared in 2013 by Tamas Kallay from the Regional Environmental Centre for the European Environment Agency provides information on municipal waste management (MSW) in Lithuania until 2010, including GHG emissions from MSW management in Lithuania, which were calculated using a life-cycle approach (Kallay 2013, pp. 9–10). In the report, GHG emissions from MSW are distinguished into direct and avoided emissions from various waste management activities, and there is also a conclusion regarding the very low level of recycling of MSW in Lithuania, which does not contribute substantially to the reduction of GHG emissions (Kallay 2013, pp. 9–10). After 2010, there were many positive changes in the waste management sector in Lithuania, including an increase in the amount of waste recycling, so the picture today would look different. Nevertheless, there are a number of challenges regarding the re-use and recycling of waste in the territory of the Republic of Lithuania. For example, the National Waste Prevention and Management Plan for 2021–2027, approved by Resolution of the Government of the Republic of Lithuania No.573, provides that: (i) the main motives and reasons for the export of waste from Lithuania to foreign markets are insufficiently developed infrastructure for processing certain wastes and a lack of capacity (...); and (ii) there is too little incentive to create and develop recycling facilities (Government of the Republic of Lithuania 2022, para. 19 and 201).



## THE PATHWAY TOWARDS NEUTRALITY IN THE WASTE MANAGEMENT SECTOR

It is clear that it is necessary to continue promoting waste management activities at the highest possible levels in the waste hierarchy, because such activities are directly related to the reduction of GHG emissions – for example, generating less waste and re-using and recycling as much as possible. Nevertheless, when it comes to sustainability in the waste management sector and GHG emissions from it, it is necessary to consider not only the methods of waste management at the higher levels of the waste management hierarchy, such as re-use and recycling and avoiding disposal, but also the improvement of waste management activities. For example: in waste recycling operations, this entails using energy that has the smallest negative impact on the environment, such as by consuming electricity from renewable resources instead of fossil fuels; in waste collection, this means using non-diesel-fuelled vehicles in favour of other, less polluting or zero-emissions vehicles, etc. These topics (renewable resources and energy, types of fuel) come from the different field of environmental law, but this once again proves the interconnectedness of environmental law, environmental protection, and the process which is called sustainable development.

It is worth mentioning that even though there is no separate transport sector according to the IPCC Guidelines, the Environmental Protection Agency of the Republic of Lithuania provides information on the amount of GHG emissions in the transport sector (Environment Protection Agency, n.d.). Thus, it is conceivable that, if necessary, information about GHG emissions provided to the public could be refined, such as by providing information on the amount of GHG emissions that is actually generated in the waste management sector (of course, subtracting the amount from the specific sector to avoid double counting). Or indicate that GHG emissions in the waste management sector are only partial, that other parts of GHG emissions are in other sectors, for example, indicate that waste incineration with energy recovery is classified into the Energy sector, and so on.

Considering the extent, established practice, and targets of the IPCC and its Guidelines, it is apparently impossible to amend the IPCC Guidelines drastically (for example, to define the scope of the Waste sector under the IPCC Guidelines as it is understood under the Waste Framework Directive). However, this does not mean that other regulatory measures cannot be taken at the national level. Having in mind the concepts of sustainability and sustainable development, other methodologies (for example, the life-cycle approach) could be used in order to truly understand the extent of GHG emissions from the waste management sector and possible ways to reduce these GHG emissions.

At the same time, the Urgenda Climate Case against the Dutch Government (Urgenda 2019) should be mentioned. This was the first case in the world in which citizens established that their government has a legal duty to prevent dangerous climate change. On 24 June 2015, the District Court of The Hague ruled that the government must cut its GHG emissions by at least 25% by the end of 2020 (compared to 1990 levels). The ruling required the government to immediately take more effective action on climate change (Urgenda 2019). The government responded by closing coal plants early, investing billions of dollars in renewables, putting solar panels on the roofs of all schools, lowering speed limits and more (R. Boyd 2021). Maxwell, Mead, and van Berkel (2022), in their article

entitled “Standards for Adjudicating the Next Generation of Urgenda-Style Climate Cases,” provide information about the many climate cases around the world. This proves that the climate crisis is real and that societies are asking their governments to do more and take action. A good start always comes from clear legal regulation, and it is for good reason that one of the SDG13 targets is to “integrate climate change measures into national policies, strategies and planning.”

Having in mind the expanding public interest in the climate crisis, the provisions of the United Nations Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) (UNECE 1998) and the target of the sixteenth sustainable development goal (SDG16) to “16.6 develop effective, accountable and transparent institutions at all levels” should be cited. Target 16.6 has synergies with the above-mentioned targets 13.2 and 12.5 and in a way reflects the possibility of the public to participate in decision-making. Without having important information, the public cannot adequately participate in the decision-making process and contribute to the creation of measures that could help achieve goals and objectives related to climate change.

Therefore, it is essential for societies as well as all entities that operate in the waste management sector not only to have information about reported GHG emissions from the Waste sector under the IPCC Guidelines, but also to understand the extent of the waste management sector and its GHG emissions under the Waste Framework Directive. For this reason, it is necessary to integrate measures *inter alia* into legal regulation on the reduction of GHG emissions from the waste management sector as it understood not only under the IPCC Guidelines, but also the Waste Framework Directive. Such clarity *inter alia* could contribute to avoiding situations where the concept of sustainability is being manipulated. Many efforts of the European Commission are aimed at controlling this – for example, new rules to empower consumers for the green transition (protection against greenwashing etc.) (EC 2022a) and corporate sustainability due diligence (EC 2022b).

## CONCLUSIONS

The scope of the waste management sector under the IPCC Guidelines is narrower than under the Waste Framework Directive, because some GHG emissions from waste management activities are not included into the Waste sector under the IPCC Guidelines at all (for example, energy recovery from waste attributed to the Energy sector), and some only partly (for example, GHG emissions from composting, as one of the recycling operations, are included in the Waste sector under the IPCC Guidelines, but other GHG emissions from recycling activities are not). This proves that the waste management sector is highly intertwined with the energy sector.

The amount of GHG emissions would be higher if all emissions from the waste management sector, as it is understood under the Waste Framework Directive, were accounted to the Waste sector as it is understood under the IPCC Guidelines. Despite the purpose of avoiding double counting or misallocation, it is noteworthy that this leads to a somewhat distorted public image – i.e., that the waste management sector is low-polluting and is among the lowest contributors to climate change. As a result, ostensibly no substantial changes in the legal framework for waste management are required and / or no additional measures are required to manage waste at the highest possible

levels in the waste hierarchy and / or to start waste management (operations, services) in more sustainable, sound way, when in fact the opposite is the case.

The intertwining of the waste management and energy sectors could negatively affect or contribute to the complexity of the implementation of interconnected sustainable development goals and the objectives of the international and regional documents related to combating climate change. This is because measures to reduce GHG emissions depend on both the amount of calculated GHG emissions and on the possibility for the public to effectively participate in decision-making processes and contribute to the selection of measures that could help achieve goals and objectives related to climate change. It is also important that the selected measures are accepted positively in society and implemented.

It is questionable whether the reduction of GHG emissions from the waste management sector – as it is understood under the IPCC Guidelines, through waste management activities from which generated GHG emissions are attributed to different sectors (for example, Energy) – is sustainable, because on the whole GHG emissions may not decrease. Such a form of reduction could also negatively affect the pursuit of resource efficiency in the transition to a clean circular economy, and the achievement of the targets of SDG12.

Therefore, the pathway towards the reduction of GHG emissions from the waste management sector as it is understood under the Waste Framework Directive and in the context of climate neutrality has two directions. One is to promote waste management activities at the highest possible levels in the waste hierarchy, because such activities directly relate to the reduction of GHG emissions – for example, generating less waste, and re-using and recycling as much as possible. The second, having in mind the concepts of sustainability and sustainable development, is to improve waste management activities as they are understood under the Waste Framework Directive. The integration of measures into legal regulation on the reduction of GHG emissions that come not only from the waste management sector as it is understood under the IPCC Guidelines but also from the Waste Framework Directive is needed.

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