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**INTERRELATIONSHIPS
BETWEEN
EU DATA PROTECTION LAW
AND
THE CIRCULAR ECONOMY**

-

**DATA PROTECTION AND ENVIRONMENTAL
CHALLENGES
RAISED BY THE INTERNET OF THINGS**

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ABSTRACT

Environmental and health-related risks deriving from electronic waste are well known. Nonetheless, the threats posed by this waste stream to privacy and data protection, that have increased with the widespread of the Internet of Things, have received very few insights both from academia and European institutions.

After the entry into force in Europe of the new data protection legal framework, that introduced stronger data protection obligations, and the adoption of the Commission Circular Economy Strategy, aimed at promoting a shift towards a circular economy, the conflicts between these two areas risk to exacerbate to detriment to the rights of European citizens.

On the one hand, reuse and recycling of electronic devices, promoted by waste hierarchy in compliance with a circular economy thinking, are necessary to reduce the amount of waste and protect the environment, but, on the other hand, they can be extremely risky from a data protection perspective. That is why it must be made clear that the deletion of personal data shall be an essential part of waste management.

The objective of this work is contributing in filling a gap in research, providing an analysis of the interrelationships between the data protection and circular economy, looking at the challenges posed by the Internet of Things, that, in their quality of “smart” e-waste, are particularly problematic from a data protection perspective, to suggest solutions capable to reconcile the inconsistencies between the data protection rules and the environmental legal framework rules applicable to them.

Adopting a fundamental right perspective, in Chapter 1, I will provide an overview on the evolution of data protection and environmental protection as fundamental rights in the history of the European Union, focusing on the Treaties, concluding that, to solve their inconsistencies, it is not possible to identify a hierarchy between them.

In Chapter 2, I will critically analyse some key provisions of the environmental waste framework related to Internet of Things, as amended with 2018 Circular Economy Package, to assess to which extent data protection needs have been there considered. I will propose a series of practical solutions to effectively embed data protection in the considered legal framework, to ensure a “General Data Protection Regulation (GDPR)-oriented interpretation of the concept Extended Producer Responsibility (EPR)”.

Finally, in Chapter 3, I will compare certain provisions and concepts of the GDPR, to outline the legacy of environmental law in it. To better reconcile the two legal frameworks, the other way around than in Chapter 2, I will propose an interpretation of key GDPR definitions in the light of EPR.

LIST OF ABBREVIATIONS

DPA	Data Protection Authority
DPbD	Data Protection by Design
DPIA	Data Protection Impact Assessment
ECFR	European Charter of Fundamental Rights
ECHR	European Convention on Human Rights
EDPB	European Data Protection Board
EDPS	European Data Protection Supervisor
ELVs	End-of-Life Vehicles
EPR	Extended Producer Responsibility
GDPR	General Data Protection Regulation
IoTs	Internet of Things
PbD	Privacy by Design
WEEE	Waste Electrical Electronic Equipment
WFD	Waste Framework Directive
WP29	Working Party 29

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INTRODUCTION

2018 represented a crucial year from a data protection perspective in the European Union. The General Data Protection Regulation (GDPR), after two years of transition, became applicable in all Member States. The time for the implementation of the Police Directive¹ elapsed. The European Institutions updated their own data protection rules².

At the same time, 2018 was significant also from an environmental protection point of view. After the launch of the 2015 Commission Circular Economy Strategy, a series of initiatives aimed at implementing a circular economy model in the European Union, the revised legislative framework on waste entered into force³.

Circular economy may be defined as “an industrial economy that is restorative or regenerative by intention and design” (Ellen MacArthur Foundation, 2013)⁴, built on the premise that, since the Earth is a closed and circular system with limited assimilative capacity, the economy and the environment should coexist in equilibrium (Boulding, 1966).

When it is about to operationalise this definition, the approaches can be very different. In some cases, circular economy is (regrettably) equated to recycling, whereas a more refined understanding of this concept encompasses the reduction, the reuse and the recycling of products, other than their energetic efficiency⁵. As I will better explain in Chapter 2, the European Commission opts for a comprehensive approach.

In the context of circular economy, data protection and environmental protection objectives, somehow, merge. The link between the two topics manifests when we think about the waste management and recovery of a specific type of electric and electronic equipment: the Internet of Things (IoT).

IoT is a broad and disputed concept⁶ that “refers to an infrastructure in which billions of sensors embedded in common, everyday devices – “things” as such, or things linked to other objects or individuals – are designed to record, process, store and transfer data and, as they are associated with unique identifiers, interact with other devices or systems using networking capabilities”⁷. In simple words, IoT may be understood as the ensemble of everyday objects -as mobile phones, cameras, wearable devices, cars, household appliances etc.- that, due to the advancement of technology, have become “smart” and therefore connected to the internet⁸. Refrigerators capable to do the grocery by themselves, based on the products that are about to expire; fitness trackers that notify their owner when the fitness goal of the day has been achieved; toys capable to interact with children and answering their questions; and many more.

¹ European Parliament and Council Directive (EU) 2016/680 on the protection of natural persons with regard to the processing of personal data by competent authorities for the purposes of the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, and on the free movement of such data, and repealing Council Framework Decision 2008/977/JHA [2016] OJ L 119/1

² European Parliament and Council Regulation (EU) 2018/1725 on the protection of natural persons with regard to the processing of personal data by the Union institutions, bodies, offices and agencies and on the free movement of such data, and repealing Regulation (EC) No 45/2001 and Decision No 1247/2002/EC [2018] OJ L 295/39

³ ‘Circular Economy-Implementation of the Circular Economy Action Plan’ (*ec.europa.eu*) <http://ec.europa.eu/environment/circular-economy/index_en.htm> accessed 8 December 2018

⁴ Martin Geissdoerfer et al., ‘The Circular Economy – a new sustainability paradigm?’ (2017)143 JCP 757

⁵ Julian Kirchherr, Denise Reike and Marko Hekkert, ‘Conceptualizing the circular economy: An analysis of 114 definitions’ (2017)127 RC&R 221, 232

⁶ Carsten Maple, ‘Security and privacy in the internet of things’ (2017)2 JCP 155

⁷ Article 29 Working Party, ‘Opinion 8/2014 on the Recent Developments on the Internet of Things’ [WP223] adopted on 16 September 2014

⁸ Maple (n 6)

The market of the IoT is one of the fastest growing in Europe, expected to exceed the value of one trillion Euro in 2020⁹. However, such boost in IoT would have consequences both in terms of environment and data protection.

Providing that smart devices quickly become obsolete, they need to be regularly replaced. If IoTs are among the fastest-growing markets in Europe, at the same time, electronic scraps are the fastest-growing waste stream in the World (40-50 million tons per year)¹⁰ and represent roughly the 5% of global solid waste. Environmental and health risks related to this kind of waste are well known, providing that they contain hazardous components suitable to contaminate soil and ground waters, other than plastic parts, that may release toxic gas if burnt¹¹.

From a waste perspective, IoTs may be reclassified to existing waste categories, as e-waste, hazardous waste and, to a certain extent, to End-of-Life Vehicles.

But, from a data protection perspective, they present specific challenges. Unlike “traditional” electric and electronic equipment, smart objects collect massive amount of information both on their owners and on any individual interacting with them. Those data can unveil several details of the life of their user, including extremely sensitive information (e.g. health related, children related, biometrics...).

Normally, IoTs collect information aggregated with other devices’ data and then transferred and stored in the cloud¹² (which implies consumption of energy). But data can also be saved in the hardware components of the IoTs, meaning that, if not removed from the device, they could end up in the hands of anyone and being stolen or sold. What is just garbage for someone could become an illicit source of gaining for others.

Data protection and environmental risks are even more severe considering the illegal e-waste flow to extra-EU countries without protective legislations on either aspect¹³.

Especially after the entry into force of the new European data protection legal framework, that introduced stronger data protection obligations, the conflicts between data protection law and the objectives pursued by the Commission Circular Economy Strategy risk to exacerbate to detriment to the rights of European citizens.

On the one hand, a non-GDPR compliant waste disposal can severely jeopardise privacy and data protection. On the other hand, reuse and recycling of IoT devices are necessary to reduce the amount of waste and therefore protect the environment. The sustainability goals risk to be negatively affected because it could appear safer for waste management actors, for instance, not to re-use or recycle the devices to avoid possible data breaches.

From a private person perspective, personal data protection (Art. 8 ECFR) and environmental protection (Art. 37 ECFR) are at stake. Whilst actors involved in waste management (e.g. second-hand electronics, sellers recycling companies) may see their freedom hampered by the need to comply with contradictory provisions.

The objective of this work is contributing in filling a gap in research, providing an analysis of the interrelationships between the data protection and circular economy, looking at the challenges posed by Internet of Things, that, in quality of “smart” e-waste, are particularly problematic from a data protection perspective, to suggest solutions capable to reconcile the inconsistencies between the data protection and the environmental rules applicable to them.

After providing an overview on the evolution of data protection and environmental protection in the history of the European Union in the Chapter 1, in the Chapter 2, I will analyse some key provisions of the environmental waste framework related to Internet of Things, as amended with 2018 Circular Economy

⁹ ‘The Internet of Things’ (*ec.europa.eu*) <<https://ec.europa.eu/digital-single-market/en/policies/internet-things>> accessed 9 December 2018

¹⁰ Oladele O. et al., Global Management of Electronic Waste-Challenges Facing Developing and Economy-in-Transition Countries, in Reed M. (ed.), *Metal Sustainability* (Wiley 2016) 52 ss

¹¹ David Lee et al., ‘Monitour: Tracking Global Routes of Electronic Waste’ (2018)72 WM 362, 362

¹² Rolf Weber, ‘Internet of Things: Privacy Issues Revisited’ (2015)31 CL&SR 618, 619

¹³ Amit Kumar et al., ‘E-Waste: an Overview on Generation, Collection, Legislation and Recycling Practices’ (2017)122 RCR 32

Package, to assess to which extent data protection needs have been there considered, namely: the Waste Framework Directive, because it provides definitions and introduces concepts common to the management of different types of waste; the Waste Electrical and Electronic Equipment (WEEE) Directive, probably the most directly relatable to IoTs appliances; the End-of-Life Vehicles (ELVs) Directive, which I deem interesting due to the growing use of software and electronic components in the automotive sector. I will also focus on the Basel Convention on hazardous waste, an international instrument to which the European Union is part, that, albeit not specific for electronic waste, is still relevant for them and suitable to serve also data protection purposes. I will propose practical solutions to embed data protection in the considered legal framework, providing also a GDPR oriented interpretation of the concept Extended Producer Responsibility (EPR)¹⁴.

In Chapter 3, I will investigate certain provisions and concepts of the General Data Protection Regulation (GDPR), to outline the legacy of environmental law in it and to assess if the needs not to hamper circular economy goals have been there embedded. To improve the coordination between the two legal frameworks, the other way around than in Chapter 2, I will propose an interpretation of key GDPR definitions in the light of Extended Producer Responsibility.

¹⁴ Very briefly, EPR is an environmental policy principle, and legal obligation for certain waste streams, that entails a shift of the administrative, physical and financial burden deriving from the treatment/disposal of post-consumer products from the public sector to private (producer) one. See 'Extended producer responsibility' (*oecd.org*) <<http://www.oecd.org/env/tools-evaluation/extendedproducerresponsibility.htm>> accessed 30 March 2019; 'Development of guidance on Extended Producer Responsibility (EPR)' (*ec.europa.eu*, January 2014) <http://ec.europa.eu/environment/archives/waste/eu_guidance/introduction.html> accessed 30 March 2019.

CHAPTER 1 FUNDAMENTAL RIGHTS AT STAKE

The first step of my research on the interrelationships between data protection and circular economy will be an historical analysis on the evolution of data and environmental protection in the Union. Understanding how those rights have appeared and have been protected in Europe, in particular in the Treaties, will enable me to assess their common features and their reciprocal hierarchical positions, providing me a solid basis for the critical analysis of the secondary law framework that I will perform in Chapter 2 and Chapter 3.

1.1. Brief history of environmental protection and data protection in the European Union

The European Union started as an economic project. Albeit the preamble of the Treaty of Rome (EEC Treaty, 1957) mentions, among its goals, “to lay down the foundations of an ever-closer union among the peoples of Europe”, “the economic and social progress of the [member] countries” and the preservation and enforcement of peace and liberty, the idea to protect fundamental rights will appear in the treaties many years later, culminating with the adoption of the Charter of Fundamental Rights of the European Union (ECFR)¹⁵. However, already in the 60s, precisely in privacy related cases, the European Court of Justice started arguing that fundamental rights, inspired by the common constitutional traditions of Member States and by the international treaties on human rights of which Member States were signatories, were embedded in Community law¹⁶.

1.1.1. From the Treaty of Rome till the Treaty of Amsterdam

In the silence of the Treaty of Rome, it was thanks to the European Court of Justice’s interpretation of Articles 100 and 235 EEC Treaty (nowadays, Articles 115 and 352 TFEU) that the action of the Community in environmental matters was justified, to the extent it could fulfil internal market objectives or improve the quality of life of European peoples¹⁷. Already in the early 1980s, it was understood that the lack of harmonization of rules on environmental protection could lead to distortions of competition. The elaboration of the Court went even further, defining environmental protection an essential objective of the Community¹⁸.

However, it is only with the Single European Act (SEA, 1987), amending EEC Treaty and introducing Title VII on Environment, that environmental protection was recognised in the Treaties. The Single European Act enounced the subsidiarity principle in environmental matters (Art. 130r(4) EEC Treaty) and other principles, already elaborated in previous policy documents¹⁹, such as “preventive action”, “environmental damage should as priority be rectified at the source” and “polluters pay” (Art. 130r(2) EEC Treaty) that still fundamental for present European environmental law. For instance, the concept of Extended Producer

¹⁵ For a different perspective on the history of fundamental rights in the European Union, see Gràinne De Búrca, ‘The road not taken: the European Union as a global human rights actor American Journal of international law’ (2011)105 AJIL 649

¹⁶ E.g. Case 29/69 *Erich Stauder v City of Ulm- Sozialamt* [1969] ECR 419 [7]; Case 11/70 *Internationale Handelsgesellschaft mbH v Einfuhr- und Vorratsstelle für Getreide und Futtermittel* [1970] ECR 1125 [4]; Case 4/73 *J. Nold, Kohlen- und Baustoffgroßhandlung v Commission of the European Communities* [1974] ECR 491 [13], Gloria González Fuster, ‘Fundamental Rights and the European Union’ (Lecture, Institute of European Studies, Brussels, 22 November 2018)

¹⁷ Emanuela Orlando, ‘The Evolution of EU Policy and Law in the Environmental Field: Achievements and Current Challenges’ (April 2013) Transworld working paper 21, 3

¹⁸ Case 92/79 *Commission v Italy* [1980] ECR 1115 [3], [8]; AG Capotorti Joined Opinion on Cases 68/81 to 73/81 *Commission v Belgium* [1982] ECR 153; Case 240/83 *Procureur de la République v Association de défense des brûleurs d’huiles usages (ADBHU)* [1985] ECR 531 [13] as mentioned in Orlando (n 17) 3,5

¹⁹ Christian Hey, ‘EU Environmental Policies: A short history of the policy strategies’ in Stefan Scheuer (ed.), *EU Environmental Policy Handbook - A Critical Analysis of EU Environmental Legislation* (European Environmental Bureau 2005) 20

Responsibility (see Chapter 2) derives from “polluters pay”²⁰ but it is also related to the idea to prevent and correct damages at the source.

As outlined by the procedures on decision taking applicable to environmental matters, the SEA maintained and strengthened the link between environmental protection and common market created by the European Court of Justice. Whereas the rule on purely environmental protection issues was the unanimity in the Council upon consultation (Art. 130s), when a measure aimed at eliminating distortions of competition and contributing to the completion of the single market, the legal basis *ex Art. 100a*, based on qualified majority vote in the Council and on co-operation procedure with the Parliament, would apply²¹. States remained free to fix higher standards of environmental protection, providing that they did not constitute arbitrary discrimination or arbitrary restrictions to trade (Art. 100a (4) EEC Treaty).

The Treaty of Maastricht (1993) extended qualified majority voting of the Council (acting on proposal of the Commission and after having obtained the opinion of the Parliament) as a rule also to purely environmental matters (procedure *ex Art. 189c*)²², showing a willingness of the Community to have more and more weight in this field. However, at the same time, the subsidiarity principle became a general one, applicable to the areas not belonging to exclusive competence of the Union²³.

In the preamble, Maastricht Treaty linked environmental protection with the objective to promote economic and social progress for the people of the Community. The promotion of sustainable growth respecting the environment became a task of the Union (Art. 2 EEC Treaty) and the activities of the Community started to include policy in the sphere of environment (Art. 3 (k) EEC Treaty). Environmental protection should have been embedded in other community policies (Art. 130r), meaning that, from being a just a “component” of community policies, it became an element to be considered in the definition and implementation of all community policies²⁴. The “precautionary principle” was codified and the “regionalisation” of environmental policies, which still exists nowadays and may affect both data and environmental protection, was strengthened, to the extent that that regional differences could have been considered either in a positive way (in the sense that States were free to maintain or introduce more protective environmental rules) and in a negative way (exemptions or support from the Cohesion Fund whereas environmental measures were too costly for a Member State)²⁵.

Notwithstanding these novelties, environmental protection in Europe did not receive the expected boost, especially due to the generalisation of subsidiarity principle coupled with the strengthening of regional exceptions. Conversely, the system of waivers legitimised the creation of a “multi-speed Europe” in environmental matters²⁶. Notwithstanding the auspicated “ecological structural change”, environmental policies remained deeply interlinked with the objectives of internal market²⁷. After Maastricht Treaty, there were no significant developments at Treaty level, until the proclamation of the Charter of Fundamental Rights.

The history of data protection was different. Albeit it is only with 1999 Treaty of Amsterdam that data protection appeared in the treaties, it evolved much more steadily than environmental protection.

²⁰ Thomas Lindhqvist, ‘Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems’ (IIIIEE, Lund University, 2000) IV

²¹ Eileen Barrington, ‘European Environmental Law: Before and After Maastricht’ (2015)2 UMICLR 79, 82, 83

²² Henrik Selin and Stacy VanDeveer, ‘EU Environmental Policy Making and Implementation: Changing Processes and Mixed Outcomes’ [2015] Conference Proceedings 19

²³ Birgit Spießhofer, ‘Maastricht and the Environment -German Perspective’ [1994] 20

²⁴ *ibid* 19

²⁵ *ibid* 21

²⁶ *ibid* 20

²⁷ Hey (n 19) 23

At national level, in the late 60s, some member States of the Communities (France, Germany, Denmark and Luxembourg) had already adopted *ad-hoc* data processing rules²⁸. The number of States adopting rules to protect personal data within their borders²⁹, or even recognising data protection in their constitutional provisions (Portugal, Austria and Spain)³⁰ further increased after the first wave of computerisation of the 70s³¹.

In the same period, the European Parliament and the Commission started expressing concerns about the dominance of the United States in the growing computing and processing industry, and about the possible consequences that divergent rules on data protection may have on fundamental rights³². However, the uncertainty on the role of European Institutions in this field, coupled with the approval within the framework of the Council of Europe of 1981 Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data (Convention 108), whose protection was deemed adequate for several years, determined a delay in adopting common European rules³³.

For a long time, data protection was approached exclusively in its individual right dimension, aimed at granting a fair treatment of personal information and ensuring citizens' protection³⁴, and excluded from the competences of the Community.

This vision was fostered by the Convention 108, focused on the human right aspect of data, being the notion of "free flow of personal data" understood as "free flow of information between people"; and by the judgements of the European Court of Human Rights, that had started protecting personal data under Article 8 of the European Convention on Human Rights and Fundamental Freedoms (ECHR)³⁵.

The relations between data protection and internal market remained unexplored until 1990, when the Commission issued a package of proposals on data protection, encompassing the data protection directive (i.e. Directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free movement of such data), suggesting that, other than the fundamental right dimension, data processing had also an internal market element³⁶. Data protection directive represented the first attempt of harmonisation of those data protection rules that had proliferate in Member States and whose divergence was posing significant obstacles to the internal market³⁷. Although there was not a specific legal basis legitimising the adoption of data protection rules under the subjects belonging to the former first pillar, the European legislators relied on the harmonisation clause of the internal market, adopting the same technique that had been used for introducing the first rules on environmental protection before the SEA³⁸.

However, Directive 95/46/EC legal basis excluded its applicability to police sector and the Community Institutions. That why Amsterdam Treaty (1999), the first one introducing provisions on data protection, stressed the need to protect personal data in the field of Police cooperation (Art. K.2) and specified that community acts aimed at protecting individuals with regard to personal data and the free movement of data should have been applied also to Community Institutions (Art. 213b).

²⁸ Gloria González Fuster, 'The surfacing of national norms on data processing in Europe', in *The Emergence of Personal Data Protection as a Fundamental Right of the EU* (Springer, 2014) 59 - 66

²⁹ FRA/ECHR/EDPS, *Handbook on European data protection law* (Publications Office of the European Union, 2018) 18

³⁰ González Fuster (n 28) 66, 68

³¹ Joel Reidenberg, 'Resolving Conflicting International Data Privacy Rules in Cyberspace' (1999)52 SLR 1315, 1316

³² Gloria González Fuster, 'The Beginning of EU data protection', in *The Emergence of Personal Data Protection as a Fundamental Right of the EU* (Springer 2014) 155

³³ *ibid*

³⁴ Joel R. Reidenberg, 'E-Commerce and Trans-Atlantic Privacy' (2001)38 HLR 717, 731

³⁵ See e.g. case *Klass and others v Germany* App No 5029/71 (ECHR, 6 September 1978); *Malone v UK* App No 8691/79 (ECHR, 2 August 1984) as mentioned in FRA/ECHR/EDPS (n 29) 23, 24

³⁶ González Fuster, (n 28) 124

³⁷ Joel Reidenerg and Paul Schwartz, 'Data protection law and online services: regulatory responses' [1998] 139

³⁸ Herke Krankenburg, 'Art. 8 Protection of Personal Data' in Steve Peers et al. (eds.), *The EU Charter of Fundamental Rights - A Commentary* (Hart Publishing 2014) 223

1.1.2. The Charter of Fundamental Rights of the European Union

It is with the Charter of Fundamental Rights of the European Union that data protection and environmental protection were officially considered fundamental rights in the European Union. In the beginning, the Charter did not have the same legal status as the Treaties. It was solemnly proclaimed by the Parliament, the Council and the Commission in December 2000, but it became legally binding, for European Institutions and for Member States insofar as they apply European law, only with the Treaty of Lisbon of 2009³⁹.

The Charter mentions both environmental protection (Art. 37) and data protection (Art. 8). For the definition of the latter, made autonomous from the right to privacy, the influence of the European Court of Human Rights' case law and its interpretation of Art. 8 of the European Convention of Human Rights (ECHR) on the right to respect for private and family life, home and correspondence played a fundamental role, being the Treaty of Amsterdam and the data protection directive the only legal instruments referring to it. However, although the drafters of the Charter decided not to draw inspiration from that, it must be said that the interpretation of Art. 8 ECHR was relevant also in terms of environmental protection⁴⁰. Strasbourg judges, indeed, stated that, in certain circumstances, States had the positive obligation to protect individuals from environmental factors directly and seriously affecting their home or private and family life⁴¹, meaning that environmental law may have an individual right dimension.

The influence of the Strasbourg system on the European Union one was made possible by Art. 52 para 3 of the Charter, that grants the rights contained in the Charter a protection at least equivalent to that one afforded under the ECHR⁴².

Art. 37 was deemed to belong to the category of "principles", whereas Art. 8 to that one of "rights"⁴³. The difference between rights and principles was introduced by the drafters of the Charter in Art. 51 and strengthened afterwards, in 2002, with the addition of para 5 to Article 52 on the scope and interpretation of rights and principles: if rights shall be "respected" by the Union and the Member States, principles shall be "observed".

I believe that the difference between "principles" and "rights" drew inspiration from the categorisation of human rights in different generations.

Data protection, as derived from the right to privacy, is indeed a first generation right. First generation rights are basically classical political and civil rights developed in XVII-XVIII century at the advent of liberalism in Europe and United States. Considering their individualistic connotations and their long-lasting theorisation, they do not pose particular problems as regards their enforceability and they are those ones normally included in International human rights treaties. Conversely, third generation rights, as environmental protection, have only appeared in the 60s and they are also known as collective rights. From a legal perspective, they have been deeply criticised, especially due to their vague content, the difficulties in

³⁹ David Anderson and Cian Murphy, 'The Charter of Fundamental Rights: History and Prospects in Post-Lisbon Europe' [2011] EUI Working Papers 2,3

⁴⁰ Elisa Morgera and Gracia Marín Durán, 'Art. 37 Environmental Protection' in Steve Peers et al. (eds.), *The EU Charter of Fundamental Rights - A Commentary* (Hart Publishing 2014) 987

⁴¹ See e.g. cases *Apanasewicz v Poland* App No 6854/07 (ECHR, 3 May 2011), where the Court found a violation of Art. 8 for having Polish Authorities remained ineffective after the plaintiff obtained a Court order to close concrete works causing her environmental harm; *Guerra and others v Italy* App No 14967/89 (ECHR, 19 February 1998), where the Italian government was condemned for failing to provide information concerning the environmental risk related to live in proximity of a fertiliser plant; *Hatton and others v UK* App No 36022/97 (ECHR, 8 July 2003), where the Court observed that, for environmental cases (in this case, noise pollution), State's responsibility may also arise from a failure to regulate private industry in a way adequate to secure respect for the rights enshrined in Article 8. For further cases, see Press Unit of the European Court of Human Rights, 'Environment and the European Convention on Human Rights' [2019]

⁴² Elisa Morgera and Gracia Marín Durán, 'Art. 37 Environmental Protection' and Herke Krankenberg, 'Art. 8 Protection of Personal Data' in Steve Peers et al. (eds.), *The EU Charter of Fundamental Rights - A Commentary* (Hart Publishing 2014) 223, 986

⁴³ *ibid* 223, 983

identifying the collectivities actually capable to action them and the entities against which these rights can be invoked. That is why, normally, they are not contained in binding human rights treaties⁴⁴.

Providing that, generally, principles can be used by Courts only as means of interpretation or legality standards, this creates a sort of hierarchy between rights and principles, considering that turning principles into direct and judicially enforceable claims is not so straight forward as in the case of rights⁴⁵.

Also looking at the wording of the two articles, the differences are significant. Whereas Art. 8 states a right to data protection, which includes the right to access and rectification, and imposes obligations, as fair processing based on a legitimate legal basis and purpose limitation, Art. 37 appears to limit the scope of environmental protection to a mere policy objective, without introducing a right to environmental protection claimable by individuals, reflecting the lack of consensus at Member State level over the existence of a substantive human right to the environment⁴⁶.

That is why, in my opinion, the system laid down by the Charter created, in practice, a hierarchy between rights and principles, between the right to data protection, individually justiciable, and environmental protection, mere interpretative criteria and policy principle. Existing a hierarchy, in case of contrasts, data protection right could be considered the prevailing one.

However, such a solution would be probably too simplistic and disregard the reality. Indeed, at practical level, the line between rights and principles is so blurred that there are no fixed criteria to distinguish them, so much that the European Court of Justice has used the notions of rights, freedoms and principles in an interchangeable way⁴⁷. Moreover, the idea of hierarchy clashes with the novelties introduced by the Lisbon Treaty that I will discuss in the following subchapter.

1.1.3. Lisbon Treaty

Nowadays, under the Treaty of Lisbon (2009), a high level of protection and improvement of the quality of the environment are objectives of the Union (Art. 3(3) TFEU). Environment is a shared competence between the Union and the Member States pursuant to Art. 4(2)(e) TFEU. Art. 191 TFEU is also important, providing that it mentions the principles of environmental policy as consolidated through the years.

Even if it is not explicit in the Treaties, also data protection is a shared competence, in so far as it is not included in the exhaustive catalogues of exclusive and supporting, coordinating and supplementing competences⁴⁸.

Both data protection and environmental protection are contained in the Title II, Part I of the TFEU "Provisions having general application", more precisely in Art. 11 TFEU, affirming that "environmental protection requirements must be integrated into the definition and implementation of the Union's policies and activities, in particular with a view to promoting sustainable development"; and in 16 TFEU, that states data protection right and fixes the competence of the Parliament and of the Council to lay down rules disciplining data protection and free flows of data pursuant to the ordinary legislative procedure, except for the field of Common Foreign and Security Policy, where the procedural rule is Council decision (Art. 39 TEU). The collocation of the two rights in Title II means that, in absence of specific derogations, they should apply across all policy sectors and Union activities⁴⁹. This is a first argument clashing with the idea of having a hierarchy between data protection and environmental protection.

⁴⁴ Serge Guthwirth 'Generations of Rights' (Lecture, Institute of European Studies, Brussels, 13 and 14 November 2011)

⁴⁵ Steve Peers and Sacha Prechal 'Art. 52 – Scope of Guaranteed rights' and Elisa Morgera and Gracia Marín Durán, 'Art. 37 Environmental Protection' in Steve Peers et al. (eds.), *The EU Charter of Fundamental Rights - A Commentary* (Hart Publishing 2014) 995, 1505

⁴⁶ Morgera and Marín Durán (n 40) 991

⁴⁷ Chris Hilson, 'Rights and Principles in EU Law: A Distinction without Foundation?' (2008)15 MJE&CL 193 195

⁴⁸ Hielke Hijmans, 'The mandate of the EU under Article 16 TFEU and the perspectives of legitimacy and effectiveness' in *The European Union as Guardian of Internet Privacy - The Story of Art 16 TFEU* (Springer 2016) 133

⁴⁹ Marise Cremona, 'The two (or three) Treaty solution: the new Treaty structure of the EU' in Andrea Biondi, Piet Eeckhout and Stefanie Ripley (eds.), *EU Law After Lisbon* (Oxford University Press 2012) 48

Moreover, from an analysis of the above-mentioned provisions on environmental protection, read in conjunction with Art. 37 ECFR and with the European Court of Justice's case law, it is possible to infer that, although neither here environmental protection was constructed as directly enforceable by individuals in front of European Institutions, it was nonetheless strengthened. First, environmental protection must be embedded in every step of legislative process and in the following phase of enforcement, of both European policies and activities in general.

Bringing this consideration further, this broad principle of environmental integration can be regarded as a way to indirectly overcome the lack of direct enforceability of environmental protection. Being obliged to embed environmental considerations in every policy and activity, European legislators are in principle prevented from negatively affecting the environment⁵⁰ because, in theory, a violation of Art. 11 could trigger an action of annulment pursuant to Art. 263(2) TFEU. Moreover, the preliminary ruling procedure has also been used by national courts to review the validity of European legislations and acts in relation with e.g. polluter pays principle or the high level of environmental protection⁵¹. Furthermore, the lack of direct enforceability in case of environmental matters by individuals is becoming questionable. As anticipated, the European Court of Human Rights equipped Art. 8 ECHR and other ECHR provisions with an environmental dimension, and, pursuant to Art. 52(3) ECFR, the protection afforded by the Charter should be at least equivalent to Strasbourg system. This positively influenced the European Court of Justice that rendered several judgements legitimising the existence of both procedural and substantial rights stemming from European environmental law (albeit within the framework of violations perpetrated by Member States and not by European Institutions)⁵². The Commission itself is insisting on the need to strengthen the access of private citizens and environmental association to environmental justice in the Member States⁵³.

Therefore, even the lack of legal accountability, one of the aspects differentiating principles from rights, and that could legitimise the existence of a hierarchy between rights and principles, is more and more questionable⁵⁴.

In conclusion, notwithstanding the wording of the Charter, after the Treaty of Lisbon, the relation between data protection and environmental protection should be considered equal, and not hierarchical.

This overview on the history of data and of environmental protection in the European Union provides a basis to better understand the reasons that led to the approval of the Circular Economy Strategy and the Data Protection Reform.

1.2. Circular Economy Strategy

When I speak about the Circular Economy Strategy of the Commission, I refer to all those initiatives taken by this institution to implement a circular economy model in the European Union.

The concept of circular economy was born in the 1970s and it is founded on this premise: providing that the Earth as a closed and circular system with limited assimilative capacity, the economy and the environment should coexist in equilibrium (Boulding, 1966). Therefore, the circular economy may be understood as "an industrial economy that is restorative or regenerative by intention and design" (Ellen

⁵⁰ Morgera and Marín Durán (n 40) 992, 994

⁵¹ See e.g. Case C -293/97 *Standley* [1999] ECR 215 and C-284/95 *Safety Hi Tech* [1998] ECR 352 mentioned in the Commission Communication C(2017) 2616 final 'Commission Notice on Access to Justice in Environmental Matters' 43

⁵² E.g. cases C-237/07 *Janecek* [2008] ECR 447 and Case C-240/09 *LZ I* [2011] ECR 125 for the *locus standi* also of environmental association, Case C-72/95 *Kraaijeveld* [1998] ECR 404 on the centrality of procedural rights for the effectiveness of environmental law mentioned in the Commission Communication C(2017) 2616 final 'Commission Notice on Access to Justice in Environmental Matters' 13-16

⁵³ Commission Communication C(2017) 2616 final Commission Notice on Access to Justice in Environmental Matters

⁵⁴ Hilson (n 47) 208

MacArthur Foundation, 2013)⁵⁵. However, scholars and practitioners often disagree over the scope of this definition, questioning e.g. whether circular economy should be just about recycling or presuppose a systemic approach, and therefore a combination of reduce-reuse and recycle; if its final goal should be economic prosperity or merely environmental protection etc.⁵⁶.

At the end of 2015, consistently with the objective set in Art. 3 TFEU, the European Commission launched the EU Circular Economy Action Plan, aimed at triggering a transition towards this model, with the ultimate goals of increasing global competitiveness, boosting sustainable economic growth, promoting innovation and creating job places. The Action Plan was the first Commission program aimed at promoting a *systemic approach* over the entire *value chain* (design phase and production process, consumption and waste management) for the adoption of a circular economy paradigm in the European Union, involving economic actors -businesses and consumers-, national authorities and European Institutions⁵⁷.

The program reflected a broad understanding of the notion of circular economy, not only focused on recycling but also on the need to optimise the value of products and materials; to minimise the creation of waste and the use of resources; to use again the product at the end of its life to create further value⁵⁸. Moreover, the objectives were not just environmental protection related but connected with economic growth⁵⁹. However, the Strategy does not refer to data protection challenges raised by e-waste.

The Action Plan encompassed 54 actions covering several sectors (e.g. plastic, food waste, critical raw materials...) and having a different degree of bindingness: together with the undertake to adopt new legislative proposals and reviews of existing legislation, there were commitments on adoption of soft guidance, monitoring and reporting etc.

For the purpose of this research, the program is important because it promoted the adoption of a revised legislative framework on waste, including the Directive (EU) 2018/849 of the European Parliament and of the Council of 30 May 2018 amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment; the Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste.

1.3. Data protection reform

Officially, the 2016 data protection reform package included the GDPR and the Police Directive⁶⁰. In a broader sense, the revision of the previous Directive 95/46/EC and Council Framework Decision 2008/977/JHA triggered other legislative changes that resulted in the 2017 Proposals to update the ePrivacy Directive and the Regulation (EC) No 45/2001⁶¹.

It is possible to notice that, although the former pillar structure introduced by Maastricht Treaty was abolished, it left tracks in the present data protection legal framework. Even if pursuant to the Treaty of Lisbon there are only two possible legal basis for the adoption of data protection legislation (one *ex Art. 16 TFEU* and one *ex Art. 39 TEU*, the only difference between the two regarding the decision taking system in the sector of Common Foreign and Security Policy), the European legislators decided to maintain the patchwork of instruments specific for various policy areas (e.g. law enforcement, communication...), instead of opting

⁵⁵ Geissdoerfer (n 4)

⁵⁶ Kirchherr, Reike and Hekkert (n 5) 232

⁵⁷ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Closing the loop - An EU action plan for the Circular Economy' COM(2015) 614 final

⁵⁸ 'Circular Economy' (*ec.europa.eu*, 2018) <https://ec.europa.eu/growth/industry/sustainability/circular-economy_en> accessed 15 December 2018

⁵⁹ Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Implementation of the Circular Economy Action Plan COM(2019) 190 Final

⁶⁰ European Commission Press Release 'Data Protection Reform Package' Brussels, 24 May 2017

⁶¹ FRA/ECHR/EDPS (n 29)

for a comprehensive framework, with the risks of contradictions and overlaps among the various instruments⁶².

The reasons leading to the data protection reform depend on the fact data, on the one hand, is the “new oil of Digital Economy”⁶³ and, consequently, it represents a fundamental tool for the development of the European Internal Market. Nevertheless, on the other hand, privacy and data protection are fundamental rights recognised in the European Charter and in other international instruments (e.g. Universal Declaration on Human Rights, European Convention on Human Rights and Modernised Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data)⁶⁴. Considering the rapid technological development, that boosted data sharing and collection, and the frequency of international data transfers, the European Union wanted to settle international standards⁶⁵ to either better protect these rights and to increase the trust and safety in online environment to unleash the potential of the digital market. Also, data protection and confidentiality in internet-based communication services need to be ensured⁶⁶.

Therefore, the data protection reform poses itself in continuity with the system built by the ECJ case law and Lisbon Treaty that codifies the role of human rights’ actor, other than simple economy and monetary stakeholder, of the European Union, being the main values pursued by the European legislators and embedded in the new legal framework either the protection of the rights to privacy and data protection and the free flow of data, finalised to the growth of the internal market.

Therefore, as in the case of the circular economy strategy, also for data protection reform human rights objectives were merged with the goal to foster economic growth and innovation in the Union. However, neither in the case of data protection reform the idea that stricter data protection rule could discourage e.g. recycling of e-waste was considered.

1.4. Summary and conclusions

This excursus over the history of environmental protection and data protection in the European Union proves that there are some points of convergence between the two rights. They are both fundamental rights included in the European Charter and in the “Provisions having general application” of the TFEU. At European Union level, they both started to be regulated to achieve the internal market objectives (even if, for data protection, the individual right aspect was for a long time considered predominant). They are both particularly challenged by the evolution of technology⁶⁷. They are the two main fields where the European Union aims to be at the forefront and to provide global standards.

Nevertheless, their evolution was different, and somehow opposing, depending also on their nature that affected their enforceability: data protection is a first generation -individual- right, whereas environmental protection a third generation -collective- one⁶⁸.

Still, in Strasbourg system, data protection and, to some extent, environmental protection were both derived from Article 8. That is because the Court interpreted Article 8 to give an individual dimension to environmental protection⁶⁹.

⁶² Krankenberg (n 38) 239, 240, 265

⁶³ European Consumer Commissioner Meglena Kuneva Keynote Speech SPEECH/09/156, ‘Roundtable on Online Data Collection, Targeting and Profiling’ Brussels, 31 March 2009

⁶⁴ FRA/ECtHR/EDPS (n 29) 18

⁶⁵ European Commission Press Release ‘Data Protection Reform Package’ Brussels, 24 May 2017

⁶⁶ Proposal for a European Parliament and Council Regulation on the protection of individuals with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation) COM(2012) 11 final; Proposal for a European Parliament and Council Regulation concerning the respect for private life and the protection of personal data in electronic communications and repealing Directive 2002/58/EC (Regulation on Privacy and Electronic Communications) COM(2017) 10 final

⁶⁷ Michiel Rohen, ‘Rear view mirror, crystal ball: Prediction for the future of data protection law based on the history of environmental protection law’ (2017)33 CLSR 603

⁶⁸ Serge Guthwirth, ‘Generations of Rights’ (Lecture, Institute of European Studies, Brussels, 13 and 14 November 2011)

⁶⁹ Krankenberg (n 38); Morgera and Marín Durán (n 40)

But, the other way around, also data protection presents a collective dimension, deriving from the potentiality that new technologies, data analytics and big data offer for large scale data processing and mass surveillance⁷⁰.

Environmental protection, for a long time considered a mere policy objective closely related to internal market issues, was for this reason included in the treaties before data protection, but its evolution was slower. Even if, with the Treaty of Maastricht, environmental protection had started to gain more autonomy, considering that decision making on internal market was “communitarised”, this was not sufficient to trigger a structural change. The legitimisation of a regional approach affected the evolution of environmental protection, leading to such fragmentation that, at the moment of drafting the Charter, European Member States could not agree on giving a more defined content to this right, that remained formulated in terms of policy objective⁷¹.

Nevertheless, with the case law of Strasbourg and Luxembourg Courts and the entry into force of the Lisbon Treaty, coupled with the initiatives of the Commission aimed at promoting the access to environmental justice in the Member States, the justiciability of environmental protection has increased.

Conversely, data protection was understood, for long time, both at international and at Member State level, only in its individual right dimension. Being its relationship with the internal market underestimated, it was introduced later in the treaties. Nevertheless, it managed to receive in the last years an incredible boost, especially considering the new role of the European Union in the protection of fundamental rights and the elaboration of the Strasbourg Court. Indeed, even if data protection is a shared competence, as environmental protection, it is almost complete⁷².

Even if in the Charter of Fundamental Rights data protection is qualified as right and environmental protection as principle, this is not enough to justify the existence of a hierarchy between the two. The blurred line between rights and principles⁷³, coupled with the placement of the two rights in the “Provisions having general application” of the Treaty on the Functioning of the European Union, meaning that environmental and data protection considerations should be mainstreamed in all policy and activities of the Union, support the idea that establishing a hierarchy between the two is not the right approach to solve eventual inconsistencies.

Both at the basis of Data protection reform and Circular Economy Strategy there was the idea to connect human rights related goals with more economic objectives, showing the link between data protection and environmental protection with other policy areas. However, when it is about to consider data protection and environmental protection in their reciprocal relations, there are gaps. The Circular Economy Strategy, for instance, notwithstanding the hint on the “digital circular economy”⁷⁴ seems not adequately consider the data protection challenges raised by the spread of IoTs. Nor data protection reform appears concerned by the possibility that the need to protect personal data could jeopardise certain environmental goals.

After this overview on history and primary sources, in the following chapters, I will move my analysis to the secondary legislation level, to assess how the “Provisions having general application” are implemented in practice.

First of all, in Chapter 2 I will investigate a selection of the existing environmental legal framework applicable to Internet of Things appliances, which I deem the most relevant to highlight the possible clashes

⁷⁰ Alessandro Mantelero, ‘Personal data for decisional purposes in the age of analytics: From an individual to a collective dimension of data protection’ (2016)32 CL&SR 238, 245; Rohen (n 67) 604

⁷¹ Hey (n 19) 23

⁷² Hielke Hijmans, ‘The mandate of the EU under Article 16 TFEU and the perspectives of legitimacy and effectiveness’ in *The European Union as Guardian of Internet Privacy - The Story of Art 16 TFEU* (Springer 2016) 133; Birgit Spießhofer, ‘Maastricht and the Environment -German Perspective’ [1994] 20

⁷³ Chris Hilson, ‘Rights and Principles in EU Law: A Distinction without Foundation?’ (2008)15 MJE&CL 193

⁷⁴ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions ‘Closing the loop - An EU action plan for the Circular Economy’ COM(2015) 614 final

between data protection and circular economy, to assess whether data protection considerations have been there embedded, providing also suggestions for a better coordination. The sources are: the Waste Framework Directive 2008/98/EC, for its encompassing nature; Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), being IoT a subset of electrical and electronic equipment; the Directive 2000/53/EC on End-of-Life Vehicles, that I deem particularly interesting considering the increasing relevance of software components in automotive sector; the Basel convention on hazardous waste, that, albeit it is an international instrument, it has been ratified by the European Union and can still be relevant for data protection purposes.

CHAPTER 2 THE EUROPEAN ENVIRONMENTAL LEGAL FRAMEWORK APPLICABLE TO THE INTERNET OF THINGS

From the analysis of Chapter 1, I concluded that, being equally important provisions having general application, after the entry into force of the Treaty of Lisbon, data protection and environmental protection should be mainstreamed in all policies and activities of the Union.

In this chapter, I will assess to which extent, in the light of the most recent legislative developments, data protection considerations have been concretely embedded in environmental provisions implementing a circular economy thinking, as required under the TFEU.

I will focus on those rules more related to the Internet of Things, namely: Waste Framework Directive (WFD), Waste Electrical Electronic Equipment (WEEE) Directive, End-of-Life Vehicles (ELVs) Directive, Basel Convention on Hazardous Waste⁷⁵.

Whereas data protection concerns were not taken into account, I will give suggestions to improve the coordination between the two fields.

At European level, there is not a unique legal framework regulating Internet of Things appliances, due to the general approach of European law towards waste, on the one hand, and the heterogeneity of IoT devices⁷⁶, on the other hand.

As regards the first point, the European Union follows a kind of sectoral approach towards environmental matters⁷⁷, and specifically waste management. Next to the Waste Framework Directive, that sets a series of definitions and common principles for all types of waste, each waste stream is object of specific rules. Waste stream is defined as “complete flow of waste from its domestic or industrial source through to recovery, recycling or final disposal”. Although waste streams are divided into two main categories, material-related (e.g. plastic, metal, wooden...) and product related (e.g. electronic waste, end-of-life vehicles...), each of them has a specific legislation applicable, and characteristic treatment methods, hazardousness, recovery and recycling possibilities⁷⁸.

As regards the second point, Internet of Things include not only smartphones and computers, but also e.g. fridges, vacuum cleaners, cameras, connected cars, TVs... basically all kinds of devices embedded with sensors enabling them to connect to the internet or among each other.

Nevertheless, there is a lowest common denominator for all IoT appliances: they are necessarily electrical, since they depend on electric currents or electromagnetic fields to work properly, or they are equipment for the generation, transfer and measurement of such currents (definition pursuant to Art. 3 WEEE Directive). In this sense, IoTs can be considered a subset of electrical and electronic equipment (EEE). However, not all EEE are IoTs: e.g. hairdryers, blenders, flatirons... are electronic equipment, but they are not “smart”: since they do not collect data on their users, they do not pose the same threats to data protection as e.g. computers or smartphones).

Being electrical, IoTs contain hazardous components⁷⁹. Therefore, data protection risks are coupled with environmental health-related ones. However, since the adoption of Directive 2002/95/EC on the Restriction of Hazardous Substances, the European Union has strived to limit as much as possible the use of cadmium, chromium, brominated flame retardants or polychlorinated biphenyls in EEE, requiring their

⁷⁵ Albeit it is an international instrument, I have decided to analyse it because the European Union is part of that. It also triggered the adoption of European legislation, as I will specify further.

⁷⁶ In the introduction, I defined IoT as the “ensemble of everyday objects -as mobile phones, cameras, wearable devices, cars, household appliances etc.- that, due to the advancement of technology, have become “smart” and therefore connected to the internet”.

⁷⁷ Hey (n 19) 19, 21, 23

⁷⁸ Didier Bourguignon, ‘European Parliament Research Service Briefing ‘Understanding waste streams-Treatment of specific waste’ (europarl.europa.eu, July 2015) <<http://www.europarl.europa.eu/EPRS/EPRS-Briefing-564398-Understanding-waste-streams-FINAL.pdf>> accessed 23 March 2019

⁷⁹ ‘Electronic waste’ (*who.int*) <<https://www.who.int/ceh/risks/ewaste/en/>> accessed 21 March 2019

substitution with safer alternatives⁸⁰. With the adoption of the Directive 2011/65/EU (RoHS 2), as amended by Directive (EU) 2017/2102, the rules have become stricter and the exceptions more limited, so much that, starting from 23rd July 2019 they will involve all EEE, except those ones explicitly excluded (e.g. equipment used for military purposes, to be sent in space...)⁸¹. Nevertheless, EEE containing hazardous components in compliance with RoHS1 but not with RoHS2, albeit prohibited on the first market, may still be present on the secondary market (Recital 2 2017 Directive).

Whereas IoTs are produced by households (e.g. smart fridges, smart TVs etc.), they are considered municipal waste (Art. 3 (2) WFD), except End-of-Life Vehicles (Whereas 10 WFD).

Understanding which kind of products IoTs are is fundamental to assess the rules applicable to them, the best options to prevent their transformation into waste, to recycle and dispose them and to assess data protection challenges.

2.1. Directive 2008/98/EC Waste Framework Directive: before and after Directive (EU) 2018/851

The Waste Framework Directive is the most comprehensive European piece of legislation concerning waste. Although, pursuant to the sectoral approach, different types of waste are disciplined by different rules (e.g. WEEE Directive, End-of-Life Vehicles Directive etc.), the WFD sets some principles common to all waste streams, as the notion of waste hierarchy, and provides a series of definitions, including waste and waste management, recovery and recycling, extended producer responsibility. Moreover, it has provisions specifically related to electrical and electronic equipment (EEE). That is why is worthy to be analysed.

Waste hierarchy is a cornerstone for European policies and legislations concerning waste and integrates the “life-cycle thinking”, a conceptual approach that considers the entire life-cycle of goods and services, from the extraction of natural resources to the treatment of waste, passing through material processing, manufacturing, marketing, distribution and use⁸². It is consistent with a broad understanding of the notion of circular economy. Even if I will come back on this point in Chapter 3, it is worthy to notice already a parallel between environmental protection and data protection: in data protection law, the life-cycle thinking has been transposed into the notion of data protection by design⁸³.

With waste hierarchy (Art. 4), a priority order of waste management is set up, based on prevention, preparing for re-use, recycling, other recovery (e.g. energy recovery), and disposal⁸⁴. In practice, this means that, for design and manufacturing, less materials in general and, eventually, less hazardous substances should be used, and products should be kept for longer time and reused (prevention step). Then, either entire items or spare components must undergo checking, cleaning, repairing and refurbishing operations (preparing for reuse step). To the extent possible, waste should be turned into a new substance or product (recycling step). When recycling is not possible, the material should undergo operations that grant e.g. energy recovery, as incineration, gasification, pyrolysis (other recovery step). Only as *extrema ratio*, landfill and incineration without any recovery (disposal) must be allowed⁸⁵.

States are entitled to derogate from waste hierarchy in so far as justified by life-cycle thinking (Art. 4 (2)). For example, looking at the environmental impact of a washing machine, pursuant to a life-cycle thinking, it may be better to replace an old energy inefficient but functioning appliance with a new model, notwithstanding the waste generated⁸⁶.

⁸⁰ ‘The RoHS Directive’ (*ec.europa.eu*) <http://ec.europa.eu/environment/waste/rohs_eee/index_en.htm> accessed 15 April 2019

⁸¹ ‘RoHS 2 FAQ’ (*ec.europa.eu*, 12 December 2012) <http://ec.europa.eu/environment/waste/rohs_eee/pdf/faq.pdf> accessed 15 April 2019

⁸² Ivan Petarčić, ‘Life cycle thinking in sustainable waste management’ (*Hi4CSR.com*, 2016) <<http://www.hi4csr.com/en/blog/life-cycle-thinking-in-sustainable-waste-management/>> accessed 31 March 2019

⁸³ EDPS Preliminary Opinion on Privacy by design [5/2018] adopted on 31 May 2018 para 9; EDPS Opinion on the Proposal for a Directive of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE) adopted on 14 April 2010 para 32

⁸⁴ Commission Guidelines on the interpretation of key provisions of Directive 2008/98/EC on waste (DGENV, June 2012) 48, 49

⁸⁵ DEFRA (Department for Environment, Food and Rural Affairs) Guidance on applying the Waste Hierarchy (*defra.gov.uk*, June 2011) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69403/pb13530-waste-hierarchy-guidance.pdf> accessed 30 March 2019

⁸⁶ Petarčić (n 82)

A possibility to ensure better coordination with data protection goals would be to broaden this exception. Since respecting waste hierarchy may clash with other fundamental rights, it should be possible to legitimate derogate from it also when it is necessary to, for instance, protect personal data. For example, whereas there is a high risk related to the re-use of a device because the state-of-the-art does not ensure the complete erasure of data from the device (e.g. company laptops that may contain trade secrets etc.), waivers to waste hierarchy, as jumping from the prevention step to the recycling one, should be allowed. Nevertheless, the exception should be narrowly interpreted to avoid frustrating circular economy goals.

Extended producer responsibility (EPR) is another fundamental concept for waste management. It is an environmental policy approach introduced in Sweden in the 70s that received an academic elaboration in the 90s by the Swedish Scholar Thomas Lindhqvist. Pursuant to EPR, and in application of “polluter pays” principle, for certain goods, the responsibility for the post-consumer phase, namely treatment and disposal, should be borne by producers. It entails a shift of the administrative, physical and financial burden deriving from the treatment/disposal of post-consumer products from the public sector to private (producer) one. It was progressively mainstreamed in almost all OECD countries and nowadays, in the European Union, such scheme is mandatory under WEEE and ELVs Directives, plus other waste streams in different Member States. The success of this theorisation derives from the fact that, such responsibility shift, gives, in principle, more incentives to prevent wastes at the source, promoting product design, and to support public recycling and materials management objectives⁸⁷. At practical level, EPR may be implemented in different ways: there are liability models, that focus on the responsibility for proven environmental damages caused by producers; economic responsibility models, pursuant to which the producer is supposed to cover expenses related to e.g. collection, recycling or disposal; physical responsibility models, occurring when manufactures directly deal with the physical management of the products, and in this sense they may retain the ownership of the good for the entire life cycle of the product; informative responsibility models, pursuant to which producers shall supply information on the environmental properties of the manufactured products⁸⁸.

As I will suggest in Chapter 3, EPR could be also used to interpret the notion of data controller in the GDPR, to ensure better consistency between data protection and environmental protection.

WFD explains that implementing extended producer responsibilities schemes means for producer to incorporate end-of-life costs into products prices (Recital 22 Directive (EU) 2018/851) and then decide if setting up an own scheme or rely on organisations acting on their behalf (Recital 21 Directive (EU) 2018/851). Whereas 14 Directive (EU) 2018/851 clarifies that the obligations of extended producer responsibility, that can be fulfilled by producers individually or collectively, can also include organisational responsibility and contribution to waste prevention and to the reusability and recyclability of products.

Therefore, in terms of accountability, the general rule is that “producers of products should cover the costs necessary to meet the waste management targets and other targets and objectives, including on waste prevention, defined for the relevant extended producer responsibility scheme”. It is only under strict conditions that “those costs can be shared with the original waste producers or distributors where justified by the need to ensure proper waste management and the economic viability of the extended producer responsibility scheme” (Recital 26 Directive (EU) 2018/851).

Waste is defined as “any substance or object which the holder discards or intends or is required to discard” (Art. 3). Although this definition is extremely important to define the scope of application of WFD and of the other waste related legislations, it is not so straightforward, being based on three different situations: an actual action of the holder, an intention or the holder, a legal obligation, regardless the fact that the discarded item has still a commercial value or not⁸⁹. Moreover, it is not irreversible, providing that a

⁸⁷ ‘Extended producer responsibility’ (*oecd.org*) <<http://www.oecd.org/env/tools-evaluation/extendedproducerresponsibility.htm>> accessed 30 March 2019; ‘Development of guidance on Extended Producer Responsibility (EPR)’ (*ec.europa.eu*, January 2014) <http://ec.europa.eu/environment/archives/waste/eu_guidance/introduction.html> accessed 30 March 2019. Elisabeth Roman ‘WEEE management in Europe: Learning from Best Practice’ in Vanessa Goodship and Ab Stevels (eds.), *Waste Electrical and Electronic Equipment Handbook* (Woodhead Publishing 2012) 503, 504

⁸⁸ Thomas Lindhqvist, ‘Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems’ (Dphil Thesis IIIIEE Lund University 2000) 38, 39

⁸⁹ Commission Guidelines on the interpretation of key provisions of Directive 2008/98/EC on waste (DGENV, June 2012) 10, 11

substance/object may also lose the status of waste, e.g. when it is used for specific purposes, a market or demand exist for that product, it fulfils legal or technical requirements to be considered a product... (Art. 4). That is why, pursuant to the need to Europeanise the notion of “end of waste” status, 2018 amendments to WFD established that Member State shall take appropriate measures (e.g. legislation, guidance documents, case by case decisions etc.) to ensure that waste which underwent recycling or recovery operation ceases to be deemed waste (if certain conditions are complied with, as e.g. there is a market for the second hand product, or the product can be so considered pursuant to existing legislation etc.).

2018 amendments to WFD also made explicit the intention to shift to a circular economy: new Art. 1 outlines the importance of the goals of preventing and reducing the generation of waste, the adverse impact of the generation and management of waste and the overall impact of resource use and improving the efficiency of such use for the transition towards a circular economy and to guarantee EU competitiveness.

The definition of “waste management” (understood as the collection, transport, recovery -including sorting and disposal of waste, including the supervision of such operations and the after-care of disposal sites, and including actions taken as a dealer or broker) was refined, as well as the notion of “material recovery”, encompassing any recovery operation (inter alia, preparing for re-use, recycling, backfilling), other than energy recovery and reprocessing into materials to be used as means to generate energy.

Hence, also entities collecting second hand products in order to sell them may be considered performing waste management within the meaning of the Directive.

The definition of “extended producer responsibility scheme” was added, meaning a set of Member State measures aimed at ensuring that producers of products bear financial responsibility or financial and organisational responsibility for the management of the waste stage of a product’s life cycle (including separate collection, sorting and treatment operations). To provide guidance to Member States, general minimum requirements for extended producer responsibility schemes are introduced⁹⁰. For instance, Member States are required to clarify the roles and responsibilities of all stakeholders involved, as producers, organisations implementing extended producer responsibility on their behalf, private and public waste operators, reuse and preparing for reuse operators...; set waste management targets and make sure that reporting systems are in place to assess them; ensure equal treatment for all producers/products without posing disproportionate regulatory burdens...

I believe that the schemes for implementing EPR should clarify the role and responsibilities of the stakeholders involved also from a data protection perspective. The applicability of the GDPR to waste management/recovery actors is not questioned, but, as I will better explain in Chapter 3, the interpretation of the notions of e.g. data controllers and processors may not be so clear. That is why clearer rules on data protection responsibilities will be useful. Still, I doubt that, in the silence of the WFD, Member States will do it by their own initiative. Even if this would happen, differences on the responsibilities of the stakeholders involved may create situations where data protection is more protected in a Member State than in other, because of more stringent data protection rules on waste management.

That is why it is regrettable that WFD did not explicitly take position on data protection.

Furthermore, WFD acknowledges the great importance of data collection for the assessment of the compliance with the targets. But data collection in waste sector is relevant also for another aspect: big data analytics, indeed, could transform waste management sector, making it more efficient and therefore contribute to achieve the auspicated shift towards a circular economy⁹¹. Even in this case, it must be kept in mind that with big data comes big responsibility, from a data protection perspective.

As I anticipated, WFD also contains provisions on EEE, introducing rules on waste prevention and recovery more extensively elaborated comparing with the previous version of the directive. Concerning

⁹⁰ EXPRA ‘Extended Producer Responsibility at a glance’ (*expa.eu*, 2016) <http://www.expra.eu/uploads/downloads/EXPRA%20EPR%20Paper_March_2016.pdf> accessed 21 March 2019

⁹¹ Parag Kedia, ‘Big data analytics for efficient waste management’ (2016)5 IJRET 208; Fredrik Kekäläinen, ‘IoT& Big Data solving problems for the waste & recycling industry’ (Presentation to ITRE Committee, 13 June 2016) <http://www.europarl.europa.eu/cmsdata/103427/4_enevo.pdf> accessed 25 April 2019

electrical and electronic equipment, Art. 9(d) affirms that Member States are required (“shall take measures”) at least to encourage their re-use and the setting up of systems promoting repair and re-use activities. However, the challenges arising from a data protection perspective related to this approach were not considered, neither the Article nor in the recitals.

Also in this case, it will be therefore left to the sensitivity of the single Member States to implement the Directive in a way not to jeopardise both environmental and data protection goals.

The new WFD represents an improvement for environmental protection compared with its previous version, fixing new goals and harmonising definitions, introducing also legally binding minimum requirements on extended producer responsibility schemes.

Nevertheless, in this respect, there is an important downside: it is still up to Member States, preliminarily, to decide to which kind of waste streams extended producer responsibility shall be applied (except in the case of WEEE, ELVs and Batteries and Accumulators, where the establishment of extended producer responsibility schemes is a legal obligation)⁹². Indeed, EPR is still elaborated in terms of policy (“Member states may...”), rather than in terms of legal obligation.

Moreover, to ensure the enforcement of those schemes, Member States are required to introduce “effective, proportionate and dissuasive” measures applicable to the infringements of the Directive (Art. 36), and to send reports on the implementation of the Directive (Art. 37). Hence, the possibility for the European Union to intervene in the enforcement is only indirect, in so far as Member States do not adequately implement the Directive. Since enforceability of EPR has always been problematic⁹³, I believe leaving so much discretionary powers to Member States in terms of implementation risks to undermine the effectiveness of the provisions, slowing down the transformation of EPR into a homogeneous legal obligation for all Member States.

Another downside is that the WFD, acknowledging the large existing differences between Member States in terms of waste management performances, allows low-performing Member States to postpone recycling targets up to five years, attitude that still legitimises the regionalisation of waste management and the existence of a multiple speed Europe in terms of waste management⁹⁴. As I anticipated, the effects may be negative both from an environmental and data protection perspective, whereas, together with recycling targets, a “softer” approach towards data protection compliant waste management/recovery operations was legitimised.

Therefore, WFD seems completely unaware of data protection challenges posed by waste management and recovery operations. It just refers to the importance of collecting data for the assessment of the reach of the targets. Albeit not all waste streams pose the same challenges (for instance, plastic, metal and food waste are not problematic in this sense), the Directive enounces principles as waste hierarchy and extended producer responsibility which should be common for all waste streams and whose interrelation with data protection, in case of e-waste, have been mentioned. Considering that, legislators should have demonstrated at least an understanding of the problematic. In the following subchapter, I will focus on the specific rules applicable to WEEE and ELVs to assess if the situation is different.

⁹² EXPRA (n 90)

⁹³ Elisabeth Roman ‘WEEE management in Europe: Learning from Best Practice’ in Vanessa Goodship and Ab Stevels (eds.), *Waste Electrical and Electronic Equipment Handbook* (Woodhead Publishing 2012) 503, 504

⁹⁴ Paul Davies, Eun-Kyung Lee, and Patrick Braasch, ‘The EU Adopts Four Directives to Solidify Europe’s Leading Position in Waste Management’ (*Latham & Watkins LLP*, 6 July 2018) <<https://www.globalelr.com/2018/07/the-eu-adopts-four-directives-to-solidify-europes-leading-position-in-waste-management/>> accessed 10 March 2019

2.2. Directive 2012/19/EU on Waste Electrical and Electronic Equipment: before and after Directive (EU) 2018/849

WEEE Directive is probably the most important one in relation with IoT appliances, and the data protection challenges posed by this kind of waste stream are the most insidious ones, as high-lightened already in 2008 by the Italian Data Protection Authority⁹⁵ and in 2010 by the European Data Protection Supervisor⁹⁶. Consistently with the idea of waste hierarchy enounced in the Waste Framework Directive, this piece of legislation is aimed both at the prevention and reduction of e-waste, favouring reuse, recycling and recovery of e-waste.

As opposed to other types of waste, the application of extended producer responsibility schemes is mandatory for WEEE⁹⁷. Indeed, Member States shall ensure the implementation of the ‘producer responsibility’ principle, and, on this basis, also minimum collection rates (Art. 7), even if goals are different for certain Member States. However, the considerations over the opportunity to leave to Member States the power to set penalties to ensure compliance with extended producer responsibility schemes made for the WFD are valid also in this case.

Moreover, Member States have the obligation to ensure that separately collected WEEE undergo proper treatment, as specified in Annex VII (e.g. removal of batteries, removal of external cables...), and recovery in accordance with best available techniques (Art. 8). Nevertheless, this proper treatment does not mention operations aimed at removing all personal data from the appliances, which is an important gap for a GDPR compliant waste management/recovery.

Since 15 August 2018, the Directive has adopted an open-scope approach, meaning that any electrical and electronic equipment, except for the categories expressly excluded (e.g. equipment designed to be sent into space, large scale stationary industrial tools, large scale fixed installations, equipment necessary for security of Member States etc.) is covered by it.

Additionally, WEEE Directive scope has an element of extraterritoriality: it is applicable also to third Countries sellers and manufacturers of EEE, insofar as they also provide products directly to end-users located in a Member State by means of distance communication. If those conditions are satisfied, third countries sellers and manufacturers are deemed ‘producers’ within the meaning of the Directive, and therefore they have to register in the national registry of Member States where they sell, fulfil take-back obligations, report on the quantities placed on the market of each Member State. Conversely, if a third country manufacturer or seller sells EEE to a professional seller in a Member State, then the latter is considered a producer⁹⁸. This provision is particularly important for extended producer responsibility purposes, considering that major world exporter of electronics are non-EU countries (namely, Hong-Kong, China, South Korea, Singapore, China, United States)⁹⁹.

As I will better explain in Chapter 3, the extraterritoriality is an element that WEEE Directive has in common with the GDPR that can be used to mainstream at global level European values related to data and environmental protection.

⁹⁵ Italian Data Protection Authority Decision on Electrical and Electronic Waste and Data Protection [1583482] adopted on 13 October 2008

⁹⁶ EDPS Opinion on the Proposal for a Directive of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE) adopted on 14 April 2010

⁹⁷ ‘Development of guidance on Extended Producer Responsibility (EPR)’ (*ec.europa.eu*, January 2014) <http://ec.europa.eu/environment/archives/waste/eu_guidance/introduction.html> accessed 30 March 2019

⁹⁸ ‘Frequently Asked Questions on Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE)’ (*ec.europa.eu*, April 2014) <<http://ec.europa.eu/environment/waste/weee/pdf/faq.pdf>> accessed 23 March 2019

⁹⁹ Daniel Workman, ‘Electronic Circuit Component Exports by Country’ (*worldtopexports.com*, 13 February 2019) <<http://www.worldtopexports.com/electronic-circuit-component-exports-country/>> accessed 24 March 2019; ‘Production and international trade in high-tech products’ (*ec.europa.eu*, 2017) <https://ec.europa.eu/eurostat/statistics-explained/index.php/Production_and_international_trade_in_high-tech_products#EU_imports_of_trade_in_high-tech_products> accessed 24 March 2019

Producers have several obligations of information, either towards users (e.g. *ex Art. 14*, duty to inform consumers of private households that WEEE shall not be disposed as unsorted municipal waste) and towards Member States, e.g. about preparation for re-use and treatment in respect of each type of new EEE placed for the first time on the Union market (*Art. 15*); to set up the register to monitor compliance with the targets set by the Directive (*Art. 16*).

These duties of information may also serve data protection purposes. For instance, the information to be given to users *ex art. 14* could encompass a warning on the importance of erasing data from the device before its re-use and disposal, eventually including suggestion on the best available techniques to ensure this. Indeed, e-waste are dangerous for the environment but may endanger also data protection. This will not excessively burden producers and could be useful to provide guidance either for consumers, organisation acting on behalf of producers and for waste recovery actors. Together with the preparation for re-use treatment, information towards Member States should include a specific part on data removal, because this could help also monitoring compliance with the GDPR.

The directive also opens to the possibility of shipment of EEE, to be re-used, and stresses the importance to distinguish it from WEEE. To ensure that no WEEE is shipped, Annex VI fixes certain minimum requirements for shipment (e.g. copy of invoice/contract of sale and/or transfer of ownership of the EEE, stating that the equipment is destined for direct re-use and that it is fully functional; declaration made holder arranging the transport that none EEE within the consignment is waste etc.).

Very regrettably, nor in this case the legislators considered appropriate to include e.g. a certificate that data contained in the EEE were removed. This gap is particularly severe, considering that EEE may be shipped in countries that do not ensure data protection standards as severe as European ones.

Therefore, neither in the case of WEEE Directive, data protection considerations have been embedded in this piece of legislation, nor after 2018 (marginal) amendments. Notwithstanding the limited scope of the amendments, it is still surprising this lack of consideration of data protection issues, considering that the Directive (EU) 2018/849 entered into force few months after the GDPR, when the debate over data protection had already been largely mainstreamed in Europe. Moreover, as I mentioned before, the European Data Protection Supervisor, already in 2010, when Directive 2012/19/EU was still a proposal, had warned on the opportunity to involve the European Data Protection Authority in the debate of the recast and on need to put the new WEEE Directive in line with data protection requirements of the Directive 95/46/EC¹⁰⁰. However, the opinion remained unheard at the time and neither at present the situation has change. Yet, I have demonstrated how there would have been room to insert provisions aimed at protecting personal data, without disproportionately burdening the stakeholders involved. For instance, the proper treatment referred to in *Art. 8* and Annex VII, basically aimed at removing hazardous component from WEEE, could have encompassed the erasure of personal information from the devices. Also, producers have already several information duties towards users, as provided for in *Art. 14*. Within this framework, they could also provide for data protection disclaimers, stressing the fact that EEE collect a massive amount of personal data and that therefore users should take this into account when they get rid of the EEE. Furthermore, the shipment of EEE for their re-use could pose important data protection challenges, especially where EEE are shipped towards extra EU Countries with less protective data protection standards. Nevertheless, no provisions of Annex VI ensure that the EEE has undergone a treatment suitable to remove all personal data.

2.3. Directive 2000/53/EC on End-of-Life Vehicles before and after Directive (EU) 2018/849

Another waste stream deserving attention for the challenges that it poses both from an environmental and data protection perspective is represented by vehicles at the end of their life. Nowadays,

¹⁰⁰ EDPS Opinion on the Proposal for a Directive of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE) adopted on 14 April 2010

cars and vehicles in general are becoming more and more smart, being equipped with electronic systems capable to make them interact with other vehicles or with the surrounding reality¹⁰¹.

These software and electronic components, that have been estimated to represent approximately the 10% of vehicle content in large cars¹⁰² and between 30% and 50% of total vehicles costs¹⁰³, are those ones I will focus on my analysis.

The first version of the Directive, dating 2000, did not specifically refer to scrap electronic components of cars, nor it mentioned software ones. However, this gap may be explained by the marginal role that electronic and software components had in the automotive sector at the time: indeed, until the end of the 90s, the main electronic components of cars, namely electronic ignition, cruise control and climate control, were basically analogical and installed only in most luxurious models¹⁰⁴. Nevertheless, neither the amendments of 2018, that basically established monitoring and reporting requirements for Member States concerning the reuse and recovery goals for end-of-life vehicles and collection targets¹⁰⁵, introduced provisions to the treatment of electronic components and software ones. The fact that the growth of connectivity and automation of European cars would lead to a correspondent increase of electronic hazardous components in vehicles has been completely underestimated.

Therefore, nowadays, management of electronic and software components of ELVs escapes both from ELVs Directive, whose scope of application covers vehicles and end-of life vehicles, including their components and materials, and from WEEE Directive, not applicable to means of transport for persons and goods¹⁰⁶. Filling such a legislative gap is of utmost importance, both for environmental and data protection perspective, considering that the automotive sector is shifting towards more and more software-defined vehicles¹⁰⁷.

Indeed, to act in compliance with circular economy objectives, legislators should have amended accordingly ELVs or WEEE Directives, to ensure the respect of waste hierarchy principle also for electronic scrap automotive, to ensure that they were reused where possible or, at least, the material they were built with was recovered.

However, as I anticipated, this kind of components of ELVs poses also data protection threats. If hacked, software of vehicles may reveal lots of information about owners. For example, many vehicles are equipped with GPS system, and GPS data provide details about life habits of an owner of vehicle (that can be used e.g. to program a burglar or as basis of extortion whereas the vehicle owner is visiting certain compromising locations). The risks are even more severe when automotive computers are for instance synchronised with smartphones, because this way hackers can access all data stored there, as e.g. contacts, phone numbers, credit card numbers, passwords...¹⁰⁸.

Due to the lack of waste management and recovery rules on electronic scraps of ELVs, it is even more difficult to assess and ensure that electronic and software components of vehicles undergo a data protection erasure treatment.

Providing that ELVs Directive establishes extended producer responsibility as legal obligation for this waste stream, clarifying that the burden related to the delivery of ELVs to treatment centres must be borne especially by the producers (intended as vehicle manufacturer or professional importer), the considerations

¹⁰¹ Federica Cucchiella et al., 'Scrap Automotive Electronics: A Mini-Review of Current Management Practices' 'Scrap Automotive Electronics: A Mini-Review of Current Management Practices' (2016)34 WM&R 3

¹⁰² Ondrej Burkacky et al., 'Rethinking car software and electronics architecture' (*McKinsey*, 2018) <<https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/rethinking-car-software-and-electronics-architecture>> accessed 21 March 2019

¹⁰³ Cucchiella et al (n 101) 3, 4

¹⁰⁴ Colin Wals, 'Software in cars' (*embedded.com*, 20 July 2016) <<https://www.embedded.com/design/operating-systems/4442406/Software-in-cars>> accessed 22 March 2019

¹⁰⁵ Davies, Lee and Braasch (n 94)

¹⁰⁶ Cucchiella et al (n 101) 3

¹⁰⁷ Burkacky et al. (n 102)

¹⁰⁸ Richard Kam, 'Connected cars: security and privacy risks on wheels' (*iapp.org*, 22 February 2016) <<https://iapp.org/news/a/connected-cars-security-and-privacy-risks-on-wheels/>> accessed 31 March 2019

on a data protection-oriented interpretation of EPR made in relations with WEEE Directive, are valid also here. For example, since a certificate of destruction of the vehicle must be issued to holder/owner of the vehicle once it is transferred to a treatment facility (Art. 5), producers could also issue a certificate of erasure of data from the electronic components.

2.4. Basel Convention on hazardous waste

Although it is an international instrument, I have decided to mention Basel Convention because the European Union is part of it and the Convention has led to the adoption of Regulation (EC) No 1013/2006 on Waste Shipment. As I will better explain *infra*, the Convention gives more sources of reflection under a data protection perspective than Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011, that is very technical and regards the restriction of the use of certain hazardous substances in electrical and electronic equipment.

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, promoted by the United Nation Environmental Program (UNEP) was adopted on 22 March 1989 and entered into force, for the European Union, on 8 May 1994¹⁰⁹. Since it concerns an area of shared competences, also European Member States had to ratify it. The Convention was adopted to combat the “toxic trade” that had begun in the 70s, when, due to the rise of an environmental consciousness in the industrialised world, coupled with the widespread of *Not In My Back Yard* (NIMBY) movements, Western countries had started to address to developing countries for disposing their hazardous waste at low price¹¹⁰. From the Preamble, it is stated that the Convention is aimed at reducing either the generation and the movement of hazardous wastes, encouraging their disposal within the boundaries of the producing State and, in case of transfer, ensuring an environmentally sound management of waste, suitable to protect human health and the environment.

In this sense, Basel Convention could serve also data protection goals. Indeed, if the disposal of hazardous waste, that includes electronic waste, is performed within the European Union, this makes easier to apply the safeguards of the GDPR.

Albeit the Convention does not refer specifically to IoT appliances, electronic waste falls within its framework, providing that it contains toxic materials. Since 2002, due to their exponential increase, e-wastes have been subject of specific analysis, initiatives and projects (e.g. Mobile Phone Partner Initiative and Partnership for Action on Computing Equipment) within the Basel system¹¹¹. However, none of them acknowledge the data protection risks together with the environmental ones.

The Convention provides a broad definition of hazardous waste, encompassing both waste with the characteristics of Annex I and those ones so qualified by domestic laws of import, transit and export State (Art. 1), but it excludes radioactive waste from the scope of its application. The notion of hazardousness is constructed on the basis of the substances contained in this kind of waste. However, I propose that, at least in case of e-waste deriving from IoT appliances, it should be broadener interpreted, in order to encompass also the aspect of “data protection hazardousness”.

In principle, Basel Convention forbids waste streams between Parties and not Parties, unless other Treaties, not incompatible with Basel Convention, are in force between them.

Among Parties, waste streams are allowed in so far as the Prior Informed Consent procedure has taken place. First of all, the exporter has to inform the importer of his/her intention to perform the transboundary transfer of hazardous waste (notification phase). To do so, the exporter needs to provide the Competent Authority of his/her own State the contract concluded with the disposer, containing the

¹⁰⁹ ‘History of the negotiations of the Basel Convention’ (*basel.int*) <<http://www.basel.int/TheConvention/Overview/History/Overview/tabid/3405/Default.aspx>> accessed 18 March 2019

¹¹⁰ *ibid*

¹¹¹ ‘E-Waste’ (*basel.int*) <<http://www.basel.int/Implementation/Ewaste/Overview/tabid/4063/Default.aspx>> accessed 20 March 2019

description of the environmentally sound management measures to be taken. If the Competent Authority of the exporting State allows the transfer, then the Competent Authorities of the import/transit State receive a notification document, specifying the nature of the waste, the proposed disposal operation plus proposed shipment details. The import Competent Authority has to verify the existence of a contract between the disposer and the exporter and to give written consent on the shipment. Once it is assessed all the requirements of the Convention have been met, the exporter's Competent Authority issues the movement document, containing details of consignment, and authorises the shipment to start. The third step is the transboundary movement itself. Finally, the disposer has to confirm to the exporter and the exporter's Competent Authority that the disposal has taken place pursuant to the contract¹¹².

Basel system has been criticised because it is more focused on the tracking of waste, rather than on their reduction¹¹³. Albeit in Art. 4 State parties commit to reduce at minimum the generation hazardous waste, there are no stronger obligation than that one. From a circular economy perspective, this is just a partial way to tackle the problem. Furthermore, the blurred notion of "environmentally sound management" permitted that, after the entry into force of the Convention, certain developing countries still received waste, albeit unable to manage them. That is why contracting parties tried to introduce an amendment to the Basel Convention providing for a total ban on waste transfer from developed to developing countries (or, better, from OECD countries to non-OECD countries). Nevertheless, the project failed, since the amendment never entered into force due to lack of ratifications¹¹⁴. Even from an enforcement perspective, the Convention does not foresee anything and the attempt to equip it with a Protocol on Liability and Compensation for Damages failed due to the lack of ratification¹¹⁵.

To address these important shortcomings, at regional level, certain contracting parties agreed on more stringent conditions on transfer of hazardous waste. Within the framework of the Organisation for African Unity (now African Union), the Bamako Convention forbade the import into Africa of hazardous, including radioactive, waste, limiting also inter-African States transfers¹¹⁶. At European level, Regulation (EC) No 1013/2006 on shipment of waste, as amended by Regulation (EU) No 660/2014 of 15 May 2014 that increased inspection powers, implemented Basel Convention provisions, including the Basel ban.

Nevertheless, non-compliance rates with the Regulation are esteemed to be 25%, depending also on the lack of common enforcement mechanisms, being the enforcement of the Regulation left to Member States¹¹⁷. Non-compliance with the Regulation, other than having consequences in terms of environmental protection, could also be negative on data protection, considering the amount of personal data that not adequately treated electronic hazardous waste may contain. Yet, even in the case of Waste shipment regulation, data protection considerations have been totally neglected. The regulation only implements Basel Convention provisions related to prior consent procedure, without considering the opportunity to include, for instance, an obligation on the exporter or on the disposer to ensure that hazardous electronic waste has been treated in a way to ensure the deletion of all personal information. Prior Consent procedure could have

¹¹² Basel Convention UNEP leaflet 'Controlling transboundary movements of hazardous wastes' (*basel.int*, 2009) <<http://www.basel.int/portals/4/basel%20convention/docs/pub/leaflets/leaflet-control-procedures-en.pdf>> accessed 20 March 2019

¹¹³ Nath Sanchayan, 'The Effectiveness of the Basel Convention' (*wordpress.com*, 26 October 2012) <<https://sanchayanwrites.wordpress.com/2012/10/26/the-effectiveness-of-the-basel-convention-2/>> accessed 20 March 2019

¹¹⁴ 'The Basel Convention Ban Amendment' (*basel.int*) <<http://www.basel.int/Implementation/LegalMatters/BanAmendment/Overview/tabid/1484/Default.aspx>> accessed 20 March 2019

¹¹⁵ 'Basel Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal Basel, 10 December 1999' (*basel.int*) <<http://www.basel.int/Countries/StatusofRatifications/TheProtocol/tabid/1345/Default.aspx>> accessed 20 March 2019

¹¹⁶ 'The Bamako convention' (*unenvironment.com*) <<https://www.unenvironment.org/explore-topics/environmental-rights-and-governance/what-we-do/meeting-international-environmental>> accessed 20 March 2019

¹¹⁷ 'Waste shipments' (*ec.europa.eu*, 13 November 2018) <<http://ec.europa.eu/environment/waste/shipments/index.htm>> accessed 20 March 2019

received a data protection connotation, whereas the “environmentally sound management measures” should have been coupled also with “data protection sound management measures”.

2.5. Summary and Conclusion

From the above analysis, it is possible to infer that, notwithstanding pursuant to the Treaty of Lisbon data protection considerations should be embedded in all the policies of the European Union, including the environmental ones, the reality is different.

Albeit data protection challenges arising from the management certain products are well known, as in case EEE, or easily perceivable considering the evolution of technology, as for ELVs, European Legislators failed to address them, even in the most recent legal frameworks adopted.

The fact that, at European level, data protection considerations have not been embedded in those environmental legal frameworks does not entail that, at national level, Member States have not taken measure at sector-related level to ensure data protection compliance (e.g. imposing on e-waste managers the application of certain safeguards, as encryption, de-magnetisation of memory supports, use of *ad hoc* software for effective data erasure)¹¹⁸.

Moreover, the new waste framework entered into force in July 2018 but, since it is about directives, Member States have two years to implement them and a great margin of appreciation¹¹⁹. This means that they could still consider data protection challenges in the implementation of the legislative framework, even if I must admit that, for the moment, I have no evidence that this is happening.

Moreover, even if data protection considerations have not been embedded in the updated legislative framework, Standardisation Organisation may contribute in filling this gap. For instance, the European Committee for Electrotechnical Standardization (CENELEC), one of the European Standardisation Organisation in charge of developing standards to support European legislation¹²⁰, in its draft standard EN50614 ‘Requirements for the preparing for re-use of waste electrical and electronic equipment’, that will be published on 29 July 2019¹²¹, apparently, will refer to the obligation to eradicate data from devices with a documented and recorded procedure¹²².

Considering that EN (European Standard) “carries with it the obligation to be implemented at national level by being given the status of a national standard and by withdrawal of any conflicting national standard”¹²³, this could be a very effective way to ensure compliance with data protection requirements.

Moreover, if such document would be presented to the EDPB to receive its avail, this could be used also to set GDPR compliance standards (Art. 42 GDPR).

However, until the report will be published, it will not be possible to assess if it will be effectively the case. Moreover, it is uncertain if the standard will refer also, for instance, to operations to be performed before the shipment of electronic equipment.

Furthermore, signs of understanding of data challenges raised by waste management come from private business: with a simple Google research, it is possible to find companies offering deletion of data services from electronic devices.

¹¹⁸ Italian Data Protection Authority Decision on Electrical and Electronic Waste and Data Protection [1583482] adopted on 13 October 2008

¹¹⁹ Davies, Lee and Braasch (n 94)

¹²⁰ ‘European Standards Organizations (ESOs)’ (*cenelec.eu*)
<<https://www.cenelec.eu/aboutcenelec/whoweare/europeanstandardsorganizations/index.html>> accessed 20 April 2019

¹²¹ ‘CLC/TC 111X Environment’ (*celenec.eu*)
<https://www.cenelec.eu/dyn/www/f?p=104:110:64829936439601:::FSP_ORG_ID,FSP_PROJECT,FSP_LANG_ID:1258637,58426,2> accessed 20 April 2019

¹²² Fulvio Ardente et al., ‘Resource efficiency, privacy and security by design: A first experience on enterprise servers and data storage products triggered by a policy process’ (2018)76 C&S 295, 297

¹²³ ‘European Standards (EN)’ (*celenec.eu*) <<https://www.cenelec.eu/standardsdevelopment/ourproducts/europeanstandards.html>> accessed 28 April 2019

However, for the moment, from an environmental point of view, there is no uniformity on the approach to be adopted towards data erasure in waste management, being the only instrument available the GDPR. Such a diversity in terms of data protection compliant waste management and recovery operations could severely jeopardise data protection in the European Union and undermine both the goals pursued by the GDPR and the circular economy strategy.

On the other way around, it must be said that the need to comply with the GDPR could incentive companies to adopt better waste management and recovery procedures: providing that one of the duties of data controllers and processors is demonstrating compliance, the recording of data processing (erasure in this case) operations could ensure more control on how waste management/recovery is performed.

But also the concept of extended producer responsibility may serve data protection goals.

Now, extended producer responsibility schemes, that are by coincidence mandatory precisely for those waste streams that present most risks for data protection, could be used to address also data protection challenges. To embed data protection considerations in the environmental legal framework, notwithstanding the lack of explicit reference to data protection, I propose a more comprehensive interpretation of the concept of extended producer responsibility, or, better, a data protection-oriented interpretation of extended producer responsibility, capable to merge environmental and data protection purposes.

Starting from the models of extended producer responsibility referred to by Thomas Lindhqvist in his doctoral thesis, the informative responsibility, pursuant to which producers shall supply information on the environmental properties of the manufactured products, could also be extended to data protection related information; the economic responsibility and physical responsibility could legitimise the obligation to perform on the waste treatments aimed at neutralising also the adverse effect of waste not only from an environmental perspective but also from a data protection one¹²⁴.

The element of extraterritorial applicability of extended producer responsibility, coupled with the extraterritorial scope on the GDPR, that I will mention in the following chapter, could also contribute to mainstreaming data protection at global level.

However, also the notion of hazardousness could receive a broader interpretation.

Up until now, the hazardousness of waste has always been referred to the chemical components of it, in relation to the risks posed on human health and environmental. But there is also another profile. Waste can be hazardous not only because it contains substances dangerous for human health and environment, but also because, if not properly managed, it could hamper another fundamental right: data protection.

That is why, in the future, European Legislators should revise their understanding of hazardousness, giving it a more encompassing nature.

For a better coordination of the environmental and data protection policy areas in the European Union, consistently with the new role that the Union has assumed in the field of fundamental rights thanks to the Treaty of Lisbon, both Member States in implementing the Directives and European legislators in the future should take these elements into account. Standardisation Organisation may help with technicalities, but I believe that, for a better protection of fundamental rights, European Institutions shall demonstrate more awareness of the potential inconsistencies between the data and environmental frameworks.

Setting aside these proposals for a broader interpretation of extended producer responsibility and the notion of hazardous waste, the most obvious way to ensure a GDPR compliant waste management is to apply the GDPR to waste management and recovery stakeholders. In effects, as in the case of the previous Data Protection Directive, the GDPR applies to them. However, as I will illustrate in the following chapter, the outcomes of the application of the GDPR to waste management actors are not always so straightforward, providing that the Regulation does not provide guidance in this sense and the indications coming from the

¹²⁴ Thomas Lindhqvist, 'Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems' (Dphil Thesis IIIIEE Lund University 2000) 38, 39

European Data Protection Supervisor and the European Data Protection Board/Working Party Article 29 (that are moreover not legally binding) are very limited.

Moreover, for a better coordination between the environmental and data protection legal frameworks, I believe that, in case of waste management and recovery operations, the GDPR should be interpreted in the light of Extended Producer Responsibility, which could lead to outcomes partially different than those one suggested by the European Data Protection Supervisors.

CHAPTER 3 THE DATA PROTECTION LEGAL FRAMEWORK APPLICABLE TO THE INTERNET OF THINGS

The 25th May 2018 represented a turning point for data protection law, because the General Data Protection Regulation (GDPR), the seminal legislation on data protection in Europe, entered into force, aimed at ensuring the protection of personal data and their free flow¹²⁵.

In this chapter, the other way around comparing with the previous one, I will assess to which extent environmental needs and circular economy considerations have been considered in this Regulation, outlining also how certain GDPR provisions drew inspiration from environmental law.

Relying on the definitions provided in Art. 4 GDPR, and further specified in GDPR Recitals and in the Guidelines and Opinions issued by the Working Party 29 (WP29)/European Data Protection Board (EDPB)¹²⁶ and the European Data Protection Supervisor (EDPS)¹²⁷, I will briefly present some key concept under GDPR to evaluate their applicability to waste management/recovery actors. To ensure a better coordination between the data protection and the environmental legal framework, I will propose an alternative interpretation of the data protection legal framework, in the light of extended producer responsibility.

3.1. Personal Data, Processing, Data controller and Data processor, Third Party

Having clear what personal data, processing, data controller, data processor and third-party mean is fundamental to understand the roles of waste management and recovery actors under the GDPR.

Under European data protection law, personal data is basically any information related to a data subject, which is an identified or identifiable living natural person. 'Information' needs to be interpreted in a broad sense, including also personal opinions along with objective elements¹²⁸. Identifiers encompass either names, identification numbers, location data, economic social and cultural identity and computerised files, cookies, IP addresses, web traffic... To assess if a person is identifiable, it is necessary to consider the reasonable means likely to be used for the identification¹²⁹. To give some examples sticking to smart devices, e.g. voice profiles collected and saved by a smart TV are personal data; mapping of walls and furniture performed by smart vacuum cleaners are personal data; bar codes of products collected by smart fridges enable to infer food preferences, that are personal data; geographical locations and addresses stored in the GPS of a vehicle are personal data¹³⁰ etc.

Processing is also a very broad notion under the GDPR, since it encompasses basically any operation performed on personal data: e.g. collection, recording, disclosure by transmission, erasure, storage, consultation etc. (Art. 4(2)).

¹²⁵ Christopher Kuner 'Introduction to the GDPR' (Lecture, Institute of European Studies, Brussels, 21 March 2019)

¹²⁶ The European Data Protection Board (EDPB), that succeeded the Working Party 29, is an independent European body composed by representatives of the Member States data protection authorities (DPAs), and of the European Data Protection Supervisor (EDPS), whose tasks are enhancing cooperation between European DPAs and contributing to the consistent application of data protection rules throughout the European Union. 'About EDPB' (*edpb.europa.eu*) <https://edpb.europa.eu/about-edpb/about-edpb_en> accessed 25 March 2019

¹²⁷ The European Data Protection Supervisor is the EU independent supervisory authority whose tasks consist in: monitoring EU institutions and bodies, to make sure their processing operation ensure data protection; advisory role to European Institutions and bodies on data protection matters; monitoring on new technologies; cooperation with national supervisory authorities. 'About EDPS' (*edps.europa.eu*) <https://edps.europa.eu/about-edps_en> accessed 25 March 2019

¹²⁸ FRA/ECTHR/EDPS (n 29) 81, 83, 86, 89

¹²⁹ *ibid*

¹³⁰ Aliya Ram, 'Vacuums that pick up data as well as dirt renew privacy concerns' *Financial Times* (London, 15 August 2017) <<https://www.ft.com/content/d8630420-776c-11e7-a3e8-60495fe6ca71>> accessed 25 March 2019; Maggie Astor, 'Your Roomba May Be Mapping Your Home, Collecting Data That Could Be Shared' *The New York Times* (New York, 25 July 2017) <<https://www.nytimes.com/2017/07/25/technology/roomba-irobot-data-privacy.html>> accessed 25 March 2019; Dan Saffer, 'The Wonderful Possibilities of Connecting Your Fridge to the Internet' *Wired* (29 October 2014) <<https://www.wired.com/2014/10/is-your-refrigerator-running/>> accessed 25 March 2019

Data controllers are the natural/legal persons, regardless if private or public, which, alone or jointly with others, determine purposes and means of the processing, whereas data processors are the natural/legal persons, regardless if private or public, which process data on behalf of the controller (Art. 4(7) and (8) GDPR).

The WP 29 has clarified that the notions of controllers and processors need to be interpreted in a functional sense rather than in a legalistic way: since they are intended to allocate responsibilities, they must stem from actual reality¹³¹. Providing that several scenarios are possible, different outcomes in terms of autonomy and responsibility may configurate.

Hence, whereas an entity has the capacity to determine means and purposes of data processing, regardless if this competence derives from a legal competence or factual circumstances, it will be deemed as data controller. Only those bodies which neither have legal nor factual influence to determine how personal data are to be processed cannot be considered data controllers¹³².

Residually, third parties are those subjects who have no specific legitimacy nor authorisation in processing personal data (e.g. those ones that accidentally access personal data). However, this does not mean that third parties are excluded from any responsibility. The WP29 deems that even third parties, when receiving personal data, regardless if lawfully or unlawfully, could be considered new data controllers, insofar as the other conditions above explained are fulfilled¹³³.

Comparing with the previous data protection directive, the obligations posed by the GDPR on data processors have increased¹³⁴. In a similar way as data controllers, processors must be able to demonstrate compliance, keeping record of processing activities (Art. 30(2)); ensure the security of processing, implementing technical and organisational measures (Art. 32); nominate a DPO when required under Art. 37 GDPR; notify data breaches to the controller (Art. 33 (2)). A written contract between the processor and the controller, or another legal act under Union or Member State law, detailing reciprocal obligations and rights, other than subject matter, nature, purpose, duration of the processing, types of personal data and category of data subjects, is mandatory (Art. 28(3) and (9)). Similarly, also in case of joint controllership, a specific agreement establishing reciprocal obligations for compliance (e.g. respective duties to provide information) is necessary, unless respective responsibilities of the controllers are determined by Union or Member State law (Art. 26)¹³⁵.

As regards waste management actors, intended as collectors, recyclers, disposers of WEEE or ELVs, neither GDPR provisions nor recitals provide guidance on how to consider them. Similarly, there is no guidance in the case of waste recovery actors, namely distributors and retailers dealing with repair and reuse tasks, and regarding actors involved of hazardous waste or EEE shipment¹³⁶.

Nevertheless, applying the functional definition of data controllers suggested by WP29, it is possible to argue that waste management and waste recovery actors are processing personal data within the meaning of the GDPR and therefore must be considered data controllers.

First, the mere storage and erasure of personal data constitute a processing under the GDPR.

Secondly, having those stakeholders the capability to influence waste management and recovery from an environmental perspective, and for this reason to be made liable, similarly, they have the capacity control those data that, perhaps unconsciously, the previous users Internet of Things made them available.

¹³¹ Article 29 Working Party, 'Opinion 1/2010 on the concepts of "controller" and "processor"' [WP169] Adopted on 16 February 2010

¹³² *ibid*

¹³³ *ibid*

¹³⁴ Detlev Gabel and Tim Hickman, 'Chapter 11: Obligations of processors – Unlocking the EU General Data Protection Regulation' in White&Case LLP (ed.), *Unlocking the EU General Data Protection Regulation: A practical handbook on the EU's new data protection law* (5 April 2019) <<https://www.whitecase.com/publications/article/chapter-11-obligations-processors-unlocking-eu-general-data-protection>> accessed 19 April 2019

¹³⁵ FRA/ECTHR/EDPS (n 29) 101, 102, 106 108, 109

¹³⁶ The categories of waste management and recovery actors have been extrapolated from Kiyon Vadoudi et al., 'E-waste management and resources recovery in France' (2015)33 WM&R 919, 922

Waste management and waste recovery operations, either aimed at the reuse or at the disposal of WEEE, ELVs or hazardous substances, or to their shipment, entail activities over electronic appliances that contain personal data. Depending on the measures put in place, the consequences in terms of data protection can change dramatically for data subjects, whose personal information risk to be disclosed.

This conclusion is directly supported by the EDPS opinion on the Proposal for WEEE Directive¹³⁷, but also, indirectly, by that one on Privacy by design¹³⁸.

In the former, still referred to Directive 95/46/EC, the EDPS clearly stated that disposal of EEE can involve data processing operations, namely erasure and destruction of data (para 14). The opinion proceeded further, affirming that “The EDPS intends to highlight the significant risks that may affect individuals and/or organisations acting as “data controllers” where the WEEE, particularly IT and telecommunications equipment, contain personal data relating to the users of those devices and/or third parties at the time of disposal” (para 15).

In the latter, focused on Art. 25 GDPR, the EDPS stressed the importance of embedding privacy friendly technologies and data security in the whole life-cycle of a product, therefore also in the recovery and disposal ones. It is evident the parallel with the life-cycle thinking elaborated within the framework of environmental matters¹³⁹.

However, to ensure more consistency between data protection and environmental protection, I believe it is necessary to consider also extended producer responsibility to better establish the relations between data processors and data controllers. That is why I propose an interpretation of the notion of controller and processor in the light of extended producer responsibility. Such interpretation could lead to a partially different outcome comparing with the solution proposed in the EDPS Opinions.

Providing that the organisational/financial/administrative burden of waste management shall be borne by producers, and that the erasure of personal data is one aspect of waste management, applying the functional definition provided for by WP29, producers within the meaning of WEEE and ELVs may be deemed data controllers, whereas the organisations acting on behalf of the producers may be considered data processors, in charge of implementing the recommended erasure techniques. Alternatively, producers may be considered joint controllers together with waste management and recovery actors.

Producers are indeed in the best position to influence the means of processing, that in case of waste management are the best techniques to ensure that data are removed from the devices (e.g. wiping programs or shredders, etc.).

The distinction between (joint) controllers and processors is important because it may determine different outcomes in terms of liability.

One of the most interesting novelties of the GDPR is indeed the introduction of administrative fines and penalties, that can be imposed on (joint) data controllers and processors for infringements of the GDPR by national Data Protection Authorities.

The GDPR provides for different administrative fines but keeps open for Member States the possibility to determine other penalties, even criminal ones, for infringements not subjects to administrative fines (Art. 84)¹⁴⁰. For example, violations of Art. 25 (Data protection by design and default) may lead to administrative sanctions up to 10 million Euro or up to 2% worldwide annual turnover of the previous financial year of an undertaking. Violations related to the basic principles of processing, including transparency (Art. 5, 6, 7, 9) may lead to administrative fines up to 20 million Euro or 4% total turnover of the preceding financial year (Art. 83 (5)).

Whereas the *ratio* behind the GDPR sanction system is to ensure a wide protection of data subjects, and that is why either the GDPR (Art. 79) and the WP29 Guidelines on the application and setting of

¹³⁷ EDPS Opinion on the Proposal for a Directive of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE) adopted on 14 April 2010

¹³⁸ EDPS Preliminary Opinion on Privacy by design [5/2018] adopted on 31 May 2018

¹³⁹ Petarčić (n 82)

¹⁴⁰ FRA/ECTHR/EDPS (n 29) 247

administrative fines for the purposes of the Regulation 2016/679¹⁴¹ make clear that data subjects can complain for violations of the GDPR perpetrated by both controllers and processors, Art. 82 establishes that “A processor shall be liable for the damage caused by processing only where it has not complied with obligations of this Regulation specifically directed to processors or where it has acted outside or contrary to lawful instructions of the controller”.

Therefore, notwithstanding the increased responsibility of processors, the GDPR still follows the approach of the former data protection directive, assuming the controller is the strongest party between the two, and almost omni competent¹⁴². This statement is confirmed by Art. 28 (10), pursuant to which whereas a processor infringes the GDPR by determining purposes and means of processing, s/he shall be considered data controller in respect of that processing.

To distribute liability between joint controllers or between controllers and processors, the GDPR requires written agreements between them, or Union or Member States acts. However, having a contract and putting producers in condition of exercise control over processors may be very difficult at practical level. That is why a Union or Member State act would be the best option for clarifying the respective obligations in this case. For example, in the laws transposing new waste directives. Also European standards as CELENEC ones could specify how to distribute liability. This last solution would be preferable because it would ensure more uniformity.

Consistently with the above considerations, I believe that, in case of shipment of hazardous waste, when electric appliances are involved, applying the functional definition of controller, exporters should be considered data controllers and provisions on transfers of data to third countries, whereas the disposer is outside the EU, shall apply. Similarly, when there is a shipment of EEE, the seller should be considered data controller and even in this case provisions on data transfer should be applicable.

3.2. Transparency

Transparency is one of the cornerstones of the GDPR and it was conceived as a tool to empower data subjects to give them control over their personal information¹⁴³. Indeed, in the GDPR, transparency assumes a twofold connotation: as principle governing data processing (Art. 5) and as duty of data controllers, which are required to convey information in a simple way and in a language tailored to the data subjects they are addressing to¹⁴⁴, to both let them understand what happens with their data and to enable them to effectively exercise their rights (Art. 12, 13, 14). That is why transparency can be also considered somehow a right of the data subject, mirroring this obligation on controllers. Furthermore, transparency is also a mean to favour monitoring of compliance of data controller¹⁴⁵.

Although transparency is not expressly defined, the WP29 clarified that it needs to be interpreted in a user-centred manner: information given to data subjects on the processing and on their rights needs to be easily accessible, easy to understand and clear and plain language must to be used¹⁴⁶. Briefly, to comply with transparency principle, the data controller must make sure that the data subjects understand what happens with their data and are aware of the rights deriving from their status¹⁴⁷.

Transparency, in the sense of duty to inform, is however important also for the environmental framework analysed above: in case of WEEE, producers have to provide information to consumers and

¹⁴¹ Article 29 Working Party Guidelines on the application and setting of administrative fines for the purposes of the Regulation 2016/679 [WP254] adopted on 3 October 2017

¹⁴² Jenna Lindqvist, ‘New challenges to personal data processing agreements: is the GDPR fit to deal with contract, accountability and liability in a world of the Internet of Things?’ (2017)26 IJLIT 45, 54

¹⁴³ Boyana Bellamy and Markus Heyder ‘Empowering Individuals Beyond Consent’ (*iapp.org*, 2 July 2015) <<https://iapp.org/news/a/empowering-individuals-beyond-consent/>> accessed 5 April 2019

¹⁴⁴ Gloria González Fuster, ‘Transparency as translation in data protection’ in Emre Bayamlioglu, Irina Baraliuc, Liisa Janssens, Mireille Hildebrandt (eds.), *Being profiled: cogitas ergo sum* (Amsterdam University Press 2018)

¹⁴⁵ Raphaël Gellert, ‘Understanding Data Protection as Risk Regulation’ (2015)18 IJL 3, 10

¹⁴⁶ Article 29 Working Party, ‘Guidelines on transparency under Regulation 2016/679’ [WP260rev.01] Adopted on 29 November 2017

¹⁴⁷ *ibid* 29

Member States concerning the disposal; in case of ELVs, producers must issue a certificate of destruction of the vehicle to the former owner; exporters of hazardous waste have the duty to inform the Competent Authority to trigger the procedure of prior informed consent.

Paralleling data protection and environmental protection legal frameworks, the fact that producers and exporters have this obligation of transparency can be an argument in favour of considering them as data controllers or joint controllers with other waste management and recovery actors as I proposed.

3.3. Geographical Scope and Transfer to Third Countries

A particularity of the GDPR is that it has an extraterritorial geographical scope, providing that also entities not established in EU, when they target or monitor behaviour of people in the European Union, need to abide by it (Art. 3 (2)). Albeit there may be clashes with actual enforceability of this provision, equipping the GDPR with this characteristic, in effect, influenced Internet Service Providers all over the World, that rushed to change their privacy policies to avoid sanctions¹⁴⁸.

The GDPR has an international dimension also in another sense: it limits the data transfers towards third countries or international organisations. Data transfer is allowed only: insofar as the Commission has issued an adequacy decision, where it is stated that the data protection legal framework of that third Country is essentially the same as European one; in the absence of an Adequacy Decision, when data controllers and processors provide appropriate safeguards (e.g. binding corporate rules, codes of conducts, certification mechanisms...) and on condition that enforceable rights and effective legal remedies are available for individuals; in absence of either Adequacy Decision and appropriate safeguards, in exceptional circumstances (e.g. the data subject has been informed of the risks, wants to enter into a contractual relation where the transfer abroad is necessary...) ¹⁴⁹. Also in this case, exceptions need to be interpreted in a restricted way and cannot legitimate massive or repetitive data transfers¹⁵⁰.

Extraterritoriality is another element that the data protection framework has in common with the environmental one: above, I illustrated how also extended producer responsibility has an extraterritorial ambition, to make sure that even producers of third countries bear the administrative/organizational/financials costs of waste disposal.

As I said before, restrictions on shipment of hazardous and electronic waste and equipment may serve data protection purposes, encouraging the disposal or re-use of these products within the boundaries of the European Union. However, also GDPR could serve also environmental objectives. Whereas data are not adequately removed from the appliances before the shipment, this could be considered a data transfer, eventually to third countries and therefore sanctionable in absence of appropriate safeguards.

That is would be an incentive for exporters to more thoroughly investigate the reliability of their counterparts.

In this case, appropriate safeguards may be, for instance, the requirement of a certificate of erasure of personal data prior the shipment takes place, or the conclusion of a contract with the disposer/receiver, specifying the duty to erase all personal data contained in the appliance.

3.4. The Risk-Based Approach and Data Protection by Design

The elements where the legacy of environmental law manifests more in the GDPR are given by the risk-based and “by design” approaches.

It is the parallel between environmental injuries and privacy/data protection ones that have justified similar solutions. Both types of damages are indeed characterised by negative externalities, providing that,

¹⁴⁸ Christopher Kuner ‘Introduction to the GDPR’ (Lecture, Institute of European Studies, Brussels, 21 March 2019)

¹⁴⁹ FRA/ECTHR/EDPS, *Handbook on European data protection law* (Publications Office of the European Union, 2018) 257-264

¹⁵⁰ Article 29 Working Part, ‘Working document on a common interpretation of Article 26 (1) of Directive 95/46/EC of 24 October 1995’ [WP114] Adopted on 25 November 2005

unless there is a rule providing for something different, the negative outcomes of e.g. pollution and data breaches are not borne by companies, but by individuals; and by the so called tragedy of commons, whereas the over-exploitation of a common resource may lead to its destruction (e.g. in case of maritime resources, overfishing determines a loss, whereas bulk collection of personal data may destroy the trust of consumers, that will refrain from sharing their personal information to anybody¹⁵¹). The risk-based approach witnesses also how data protection has evolved from being considered a mere individual right towards a right having a societal dimension (e.g. datafication¹⁵² simplifies mass surveillance threatening democratic societies)¹⁵³.

The risk-based approach in data protection builds upon the idea that data protection principles, as consent, purpose limitation or data minimisation, may not be adequate to a transforming and more and more complex processing reality (e.g. widespread of algorithms and AI, difficulties in understanding privacy notices...). Hence, performing a risk analysis exercise and managing risks become more valid alternatives¹⁵⁴. However, the approach of the GDPR is not entirely a risk-based one. Risk-based approach is indeed used in relation with compliance obligation set in Chapter 4, like the obligation to perform a data protection risk assessment (DPIA), but only for certain types of operations¹⁵⁵. For the rest, there is still a right-based one, founded on data protection principles, as data minimisation, purpose limitation etc¹⁵⁶. Such a solution responds to the need to burden data controllers in a scalable manner (e.g. the riskiest the processing operation, the greatest the burden), ensuring at the same time a sufficient level of data protection to all data subjects¹⁵⁷.

The risk-based approach of the GDPR was inherited from the former data protection directive¹⁵⁸ but it has been further refined and it is embodied in provisions like Art. 24 (responsibility of the controller), Art. 25 (data protection by design and default), Art. 35 (DPIA)¹⁵⁹etc.

The feature of the risk-based approach I will focus on is data protection by design (DPbD), that is that one which may appear more problematic for the interpretation in the light of EPR.

Art. 25 is about data protection by design (and by default), that derives from the concept of privacy by design (PbD). DPbD is a new construction for European law: it was not included in the '95 Directive. Conversely, it derives from North American data protection tradition, since it was elaborated in mid 90s by Ann Cavoukian, the Information and Privacy Commissioner of Ontario¹⁶⁰. As extended producer

¹⁵¹ Dennis Hirsch, 'Is privacy regulation the environmental law of the information age?' in Katherine Strandburg and Daniela Stan Raicu (eds.), *Privacy and technologies of identity: a cross-disciplinary conversation* (Springer 2005) 239-253; Dennis Hirsch, 'Protecting the inner environment: what privacy regulation can learn from environmental law' (2006)41 GLR 1 Parts III and IV

¹⁵² Meaning "the process through which data is accumulated and rendered useful in the quantities that characterise big data", the "transformation of social action into online quantified data, thus allowing for real-time tracking and predictive analysis". Kenneth Cukier and Viktor Mayer-Schonberger, 'Big Data, A Revolution that Will Transform How We Live, Work and Think' (*europaeaninstitute.org*, April 2013) <<https://www.europaeaninstitute.org/index.php/173-european-affairs/ea-april-2013/1708-big-data-a-revolution-that-will-transform-how-we-live-work-and-think-by-kenneth-cukier-and-viktor-mayer-schonberger>> accessed 22 April 2014; Amelia Matteson, 'The Concept of Datafication; Definition & Examples' (*datasciencecentral.com*, 6 February 2018) <<https://www.datasciencecentral.com/profiles/blogs/the-concept-of-datafication-definition-amp-examples>> accessed 22 April 2019

¹⁵³ Rohen (n 67) 604

¹⁵⁴ Raphaël Gellert, 'We Have Always Managed Risks in Data Protection Law: Understanding the Similarities and Differences Between the Rights-Based and the Risk-Based Approaches to Data Protection' (2016)2 EDPL 481, 482, 483, 484

¹⁵⁵ *ibid* 481, 486.

¹⁵⁶ *ibid* EDPL 481, 486.

¹⁵⁷ Article 29 Working Party 'Statement of the Working Party on current discussions regarding the data protection reform package' adopted on 27 February 2013

¹⁵⁸ Lina Jasmontaite et al., 'Data protection by design and by default: framing guiding principles into legal obligations in the GDPR' (2018)2 EDPL 169, 177

¹⁵⁹ *ibid* 169, 173

¹⁶⁰ Lecture from Joris Van Hoboken 'Organising Compliance' (18 March 2019) Institute of European Studies, Brussels

responsibility, PbD started as a policy goal¹⁶¹, as an approach, a methodology to proactively embed privacy into information technology, business practices, and networked infrastructures¹⁶².

Therefore, DPbD is a transposition in data protection terms of what is an important environmental approach: the eco-design one, based on the embedding of environmental consideration in the design and production of a product, paying attention to its entire life-cycle (e.g. limitations in the use of hazardous substances, durability and recyclability, energy efficiency...)¹⁶³. Albeit the GDPR does not explicitly mention this relation, the EDPS has paralleled eco-design and privacy by design, two principles that make possible for producers to shape technology in a way suitable to promote societal values¹⁶⁴.

In the GDPR, DPbD is an obligation posed on data controllers (and not on processors, notwithstanding the attempts of the European Parliament to extend this obligation also to them¹⁶⁵), that consists of implementing appropriate technical and organisational measures designed to implement data protection principles in an effective manner and to integrate the necessary safeguards in the processing. The goal is to meet the requirements of the GDPR and to protect the rights of data subjects. Those technical and organisational measures need to be implemented both at the time of determination of the means of processing and at the time of processing itself. However, the obligation appears mitigated by the wording “taking into account the state of the art, the cost of implementation and the nature, scope, context and purposes of processing as well as the risks of varying likelihood and severity for rights and freedoms of natural persons posed by the processing”¹⁶⁶. Moreover, the wording of the article is very generic and there is no definition of “technical and organisational measures” and “state of the art”. All these factors determine that, at practical level, it is very difficult to prove that a data controller has violated Art. 25 GDPR¹⁶⁷.

Art. 25 does not impose obligations on designers and producers, which is an important limit for the effectiveness of the principle, considering that producers and designers have more possibilities of influencing the design of products than controllers¹⁶⁸. The European Parliament had indeed proposed to introduce the category of “producers” under the GDPR and to extend the obligation to respect DPbD also on them¹⁶⁹, but it did not succeed.

¹⁶¹ Lina Jasmontaite et al., ‘Data protection by design and by default: framing guiding principles into legal obligations in the GDPR’ (2018)2 EDPL 169, 172

¹⁶² Privacy by Design is based on seven foundational principles. First, Proactive not Reactive, Preventative not Remedial, meaning that privacy invasive events should be anticipated, identified and prevented before they occur. Second, Privacy as Default Setting for any system or business practice, to not to undermine privacy even of those users who chose not to do anything. Third, Privacy Embedded into Design, as a constitutive element and not an optional. Fourth, Full Functionality —Positive-Sum, not Zero-Sum, in the sense that there must not be a trade-off for opting for privacy: a person needs to enjoy full functionality of a service, without renouncing to privacy. Five, End-to-End Security —Full Lifecycle Protection, as to say that strong security measures must involve the complete lifecycle of data. Six, Visibility and Transparency —Keep it Open, because privacy standards should be open, transparent and subject to independent verification. Seven, Respect for User Privacy —Keep it User-Centric, for user’s empowerment (Information and Privacy Commissioner of Ontario ‘Privacy by Design’ (*ipc.on.ca*, January 2018) <<https://www.ipc.on.ca/wp-content/uploads/2018/01/pbd.pdf>> accessed 25 March 2019)

¹⁶³ For a series of definitions of “eco-design”: Sharon Prendeville ‘ENEC Technical Report Envisioning Ecodesign Definitions, Case Studies and Best Practice’ adopted on April 2014

¹⁶⁴ EDPS Preliminary Opinion on Privacy by design [5/2018] adopted on 31 May 2018 para 9; EDPS Opinion on the Proposal for a Directive of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE) adopted on 14 April 2010 para 32

¹⁶⁵ Lina Jasmontaite et al., ‘Data protection by design and by default: framing guiding principles into legal obligations in the GDPR’ (2018)2 EDPL 169, 171

¹⁶⁶ Art. 25 GDPR

¹⁶⁷ Ira Rubinstein ‘The Trouble with Art. 25 (and how to fix it)’ (Workshop, Vrije Universiteit Brussels, Brussels, 25 February 2019); Lee Bygrave ‘Data Protection by Design and by Default: Deciphering the EU’s Legislative Requirements’ (2017)4 OLR 105, 117

¹⁶⁸ EDPS Preliminary Opinion on Privacy by design [5/2018] adopted on 31 May 2018

¹⁶⁹ Gregory Voss, ‘One Year and Loads of Data Later, Where Are We? An Update on the Proposed European Union General Data Protection Regulation’ (2013)18 JoIL 14, 19, 20; Committee on Civil Liberties, Justice and Home Affairs Draft Report on the proposal for a regulation of the European Parliament and of the Council on the protection of individual with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation) (COM(2012)0011 – C7-0025/2012 – 2012/0011(COD))

However, producers, designers and manufacturers are “encouraged to take into account the right to data protection when developing and designing such products, services and applications and, with due regard to the state of the art, to make sure that controllers and processors are able to fulfil their data protection obligations” (Recital 78).

The fact that the GDPR does not pose obligations directly on producers seems proving a diversity of approaches than EPR schemes. However, this does not represent an obstacle to the interpretation of the notion of data controller in the light of extended producer responsibility, as it may appear to be. Indeed, to the extent that a producer could be deemed a data controller, even for just certain types of processing operations and in certain situations, as in case of waste management, the GDPR shall apply also to him/her.

The interpretation of the GDPR in the light of EPR that I have proposed is aimed at ensuring more consistency between environmental and data protection policies, and it regards only a specific type of processing (data deletion), in relation with their waste management: it is not a general one. That is why I believe it does not circumvent the intention of the legislators set in Art. 25.

3.5. Summary and conclusions

Therefore, even in the case of data protection legal framework, environmental considerations seem having been neglected by European legislators. Nor the actual text of the GDPR neither the Recitals refer to the need not to jeopardise the goals of circular economy. In the explanatory memorandum of the GDPR, perhaps superficially, the Commission looked at the issue in simple terms, saying that “environmental impacts were not observed”¹⁷⁰.

Conversely, I proved how the lack of coordination and uncertainty in terms of liability between the two legal frameworks may lead to inconsistencies. On the one hand, the Regulation could foster environmental protection objectives (e.g. to incentive the management of hazardous electronic waste within the boundaries of EU or the choice of more reliable disposer abroad). On the other hand, the GDPR could have adverse effects on the re-use of electronic equipment.

Yet, the legacy of environmental law in the GDPR is significant. I have dealt with the extraterritorial ambition, the importance of transparency, the “by design”/risk-based approaches¹⁷¹, that come from environmental law¹⁷² and witness an evolution of data protection from an individual right to a right having a collective dimension¹⁷³.

In a certain sense, the GDPR brought those elements further, being able to include them in a Regulation and to render them legally binding with a certain homogeneity in all Europe, whereas the environmental legal framework still sticks mainly to Directives. In the future, I suggest that environmental law may take back inspiration from the GDPR risk-based approach, assessing its strength and weaknesses with the ultimate goal to transpose the lessons learnt in more homogeneous environmental rules for Member States.

For the time being, the EDPB and the EDPS have not issued specific guidance concerning the positions of the stakeholders in waste management/recovery sectors from a data protection perspective, except from the (old) opinion on the recast of WEEE Directive, where it was specified that individuals and organisations

¹⁷⁰ Proposal for a Regulation of the European Parliament and of the Council on the protection of individuals with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation) (COM(2012) 11 final; 2012/0011 (COD)) 4

¹⁷¹ Rob Van Straten, ‘Risk-Based Approach to GDPR | GDPR Risk Assessment Template’ (*saiglobal.com*, 26 April 2018) <<https://www.saiglobal.com/hub/blog/risk-based-approach-to-gdpr-gdpr-risk-assessment-template>> accessed 5 April 2019

¹⁷² EEA Publication ‘Chapter 2: The use of risk assessment in environmental management’ in ‘Environmental Risk Assessment - Approaches, Experiences and Information Sources’ (*eea.europa.eu*, May 2016) <<https://www.eea.europa.eu/publications/GH-07-97-595-EN-C2/chapter2h.html>> accessed 5 April 2019

¹⁷³ Rohen (n 67) 604

dealing with IT and Communications, in quality of data controllers, have to face several risks. However, the opinion was very generic and rendered on the basis of a pre-existing data and environmental legal frameworks. That is why I proposed an interpretation of GDPR provisions to be applied to waste management and recovery actors on the basis of extended producer responsibility.

Providing that the organisational/financial/administrative burden of waste management shall be borne by producers in case of WEEE and ELVs, and that the erasure of personal data is one fundamental aspect of waste management for these types of waste, applying the functional definition provided for by WP29, producers may be deemed data controllers, or at least joint controllers with other actors, with their reciprocal obligations regulated by Union or Member States acts.

More defined roles for data processors and controllers in waste management and recovery field could also be an important incentive to push those States, which have looser obligations from an environmental perspective, to improve their waste management and recovery, to avoid being sanctioned under the GDPR.

CONCLUSIONS

At the end of this analysis, it is possible to conclude that data protection and circular economy are deeply interrelated. Environmental and data protection present common features. I have outlined how GDPR provisions may serve environmental purposes and, vice-versa, environmental rules can support data protection purposes. Nevertheless, conflicts are also possible and, not existing a hierarchy between data protection and environmental protection, their conciliation may be challenging, especially considering that the legislative frameworks examined seems ignoring the existence of potential conflicts between them.

To ensure more coordination and reduce conflicts, several possibilities are open. When the legal frameworks will be updated in the future, first of all, recitals be formulated in a way to acknowledge the reciprocal interaction and challenges of data protection and circular economy. Then, it could be possible for instance to amend Art. 4 WFD, to include the possibility to derogate waste hierarchy, in exceptional situations particularly risky for data protection. To include, in the proper treatment *ex* Annex VII WEEE Directive, data erasure. To broaden the duties of information of producers towards consumers *ex* Art. 14 WEEE, to warn them on the importance of data deletion, and towards Member States *ex* Art. 15 WEEE, making it specify how data erasure is dealt with in respect of each type of new EEE placed for the first time on the Union market. Annex VI on shipment of EEE should include in the minimal requirements for shipments e.g. a certificate attesting data erasure. European legislators should clarify which rules are applicable to ELVs electronic and software components, either reconducting them to WEEE Directive or introducing *ad hoc* provisions in ELVs one. A broader understanding of “hazardousness”, encompassing the data protection risks other than the environmental and health related ones could help. In case of e-waste shipment, “environmentally sound management measures” should be coupled also with “data protection sound management measures”. Member States should be made aware of the opportunity of considering data protection needs while implementing the 2018 novelties. Also making the CENELEC working together with the EDPB could be foster the adoption of both higher environmental and data protection standards.

BIBLIOGRAPHY

CASE LAW

- Case C29/69 *Erich Stauder v City of Ulm- Sozialamt* [1969] ECR 419
- Case 11/70 *Internationale Handelsgesellschaft mbH v Einfuhr- und Vorratsstelle für Getreide und Futtermittel* [1970] ECR 1125
- Case 4/73 *J. Nold, Kohlen- und Baustoffgroßhandlung v Commission of the European Communities* [1974] ECR 491
- Case 92/79 *Commission v Italy* [1980] ECR 1115
- AG Capotorti Jointed Opinion on Cases 68/81 to 73/81 *Commission v Belgium* [1982] ECR 153
- Case 240/83 *Procureur de la République v Association de défense des brûleurs d'huiles usages (ADBHU)* [1985] ECR 531
- Case C -293/97 *Standley* [1999] ECR 215
- C-284/95 *Safety Hi Tech* [1998] ECR 352
- C-237/07 *Janecek* [2008] ECR 447
- C-240/09 *LZ I* [2011] ECR 125
- C-72/95 *Kraaijeveld* [1998] ECR 404
- Apanasewicz v Poland* App No 6854/07 (ECHR, 3 May 2011)
- Guerra and others v Italy* App No 14967/89 (ECHR, 19 February 1998)
- Hatton and others v UK* App No 36022/97 (ECHR, 8 July 2003)
- Klass and others v Germany* App No 5029/71 (ECHR, 6 September 1978)
- Malone v UK* App No 8691/79 (ECHR, 2 August 1984)

LEGISLATION

- Treaty Establishing the European Economic Community (EEC Treaty, Treaty of Rome) [1957]
- Single European Act [1987] OJ L 169/1
- Treaty on European Union (Treaty of Maastricht) [1993] OJ C 191/1
- Treaty of Amsterdam amending the Treaty on European Union, the Treaty Establishing the European Communities and Certain related acts [1999] OJ C 340/3
- Treaty of Nice amending the Treaty on European Union, the Treaty Establishing the European Communities and Certain related acts [2001] OJ C 80/3
- Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union (TFEU) [2016] OJ C202/1
- European Parliament and Council Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) [2016] OJ L 119/1
- European Parliament and Council Directive (EU) 2016/680 on the protection of natural persons with regard to the processing of personal data by competent authorities for the purposes of the prevention, investigation,

detection or prosecution of criminal offences or the execution of criminal penalties, and on the free movement of such data, and repealing Council Framework Decision 2008/977/JHA [2016] OJ L 119/89

European Parliament and Council Regulation (EU) 2018/1725 on the protection of natural persons with regard to the processing of personal data by the Union institutions, bodies, offices and agencies and on the free movement of such data, and repealing Regulation (EC) No 45/2001 and Decision No 1247/2002/EC [2018] OJ L 295/39

European Parliament and Council Directive 2008/98/EC on waste and repealing certain Directives [2008] OJ L 312/3

European Parliament and Council Directive 2000/53/EC on End-of-Life Vehicles [2000] OJ L 269/34

European Parliament and Council Directive 2012/19/EU on waste electrical and electronic equipment [2012] OJ L 197/38

European Parliament and Council Regulation (EC) No 1013/2006 on shipment of waste [2006] OJ L 190/1

European Parliament and Council Directive (EU) 2018/849 amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment [2018] OJ L 150/93

European Parliament and Council Directive (EU) 2018/851 amending Directive 2008/98/EC on waste [2018] OJ L 150/109

Convention for the Protection of Human Rights and Fundamental Freedoms (European Convention on Human Rights, as amended) (ECHR) [1950]

Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data 1981, ETS 108

Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (adopted 22 March 1989, entered into force 5 May 1992) 1673 UNTS 126 (Basel Convention)

ACTS

Article 29 Working Party, 'Guidelines on transparency under Regulation 2016/679' [WP260rev.01] Adopted on 29 November 2017

Article 29 Working Party, 'Opinion 1/2010 on the concepts of "controller" and "processor"' [WP169] Adopted on 16 February 2010

Article 29 Working Party 'Statement of the Working Party on current discussions regarding the data protection reform package' adopted on 27 February 2013

Article 29 Working Party, 'Opinion 8/2014 on the Recent Developments on the Internet of Things' [WP223] adopted on 16 September 2014

Article 29 Working Party, 'Working document on a common interpretation of Article 26 (1) of Directive 95/46/EC of 24 October 1995' [WP114] Adopted on 25 November 2005

Article 29 Working Party Guidelines on the application and setting of administrative fines for the purposes of the Regulation 2016/679 [WP254] adopted on 3 October 2017

Commission Proposal for a Parliament and Council Directive amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment

Commission Proposal for a Regulation of the European Parliament and of the Council on the protection of individuals with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation) COM(2012) 11 final 2012/0011 (COD)

Commission Communication C(2017) 2616 final Commission Notice on Access to Justice in Environmental Matters

Commission Staff Working Document SWD(2019) 90 final Accompanying the document Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Implementation of the Circular Economy Action Plan COM(2019) 190 Final

Proposal for a European Parliament and Council Regulation on the protection of individuals with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation) COM(2012) 11 final

Commission Proposal for a European Parliament and Council Regulation concerning the respect for private life and the protection of personal data in electronic communications and repealing Directive 2002/58/EC (Regulation on Privacy and Electronic Communications) COM(2017) 10 final

Commission Proposal for a European Parliament and Council Directive on the protection of individuals with regard to the processing of personal data by competent authorities for the purposes of prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, and the free movement of such data COM(2012) 10 final

EDPS Preliminary Opinion on Privacy by design [5/2018] adopted on 31 May 2018

EDPS Opinion on the Proposal for a Directive of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE) adopted on 14 April 2010

Committee on Civil Liberties, Justice and Home Affairs Draft Report on the proposal for a regulation of the European Parliament and of the Council on the protection of individual with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation) (COM(2012)0011 – C7-0025/2012 – 2012/0011(COD))

Commission Guidelines on the interpretation of key provisions of Directive 2008/98/EC on waste

Italian Data Protection Authority Decision on Electrical and Electronic Waste and Data Protection [1583482] adopted on 13 October 2008

BOOKS

-- FRA/ECTHR/EDPS, *Handbook on European data protection law* (Publications Office of the European Union, 2018)

Cremona M., 'The two (or three) Treaty solution: the new Treaty structure of the EU' in Biondi A., Eeckhout P. and Ripley S. (eds.), *EU Law After Lisbon* (Oxford University Press 2012)

Gabel D. and Hickman T., 'Chapter 11: Obligations of processors – Unlocking the EU General Data Protection Regulation' in White&Case LLP (ed.), *Unlocking the EU General Data Protection Regulation: A practical handbook on the EU's new data protection law* (5 April 2019) <<https://www.whitecase.com/publications/article/chapter-11-obligations-processors-unlocking-eu-general-data-protection>> accessed on 19 April 2019

González Fuster G., *The Emergence of Personal Data Protection as a Fundamental Right of the EU* (Springer, 2014)

-- 'Transparency as translation in data protection' in Bayamlioglu E., Baraliuc I., Janssens L. and Hildebrandt M. (eds.), *Being profiled: cogitas ergo sum* (Amsterdam University Press 2018)

Hey C., 'EU Environmental Policies: A short history of the policy strategies' in Scheuer S. (ed.), *EU Environmental Policy Handbook - A Critical Analysis of EU Environmental Legislation* (European Environmental Bureau 2005)

Hirsch D., 'Is privacy regulation the environmental law of the information age?' in Strandburg K. and Stan Raicu D. (eds.), *Privacy and technologies of identity: a cross-disciplinary conversation* (Springer 2005)

Hielke Hijmans, 'The mandate of the EU under Article 16 TFEU and the perspectives of legitimacy and effectiveness' in *The European Union as Guardian of Internet Privacy - The Story of Art 16 TFEU* (Springer 2016)

Kasper A. C. et al., 'Electronic Waste Recycling' in Veit H. M. and Bernardes A. M. (eds.), *Electronic Waste – Recycling techniques* (Springer 2015)

Oladele O. et al., 'Global Management of Electronic Waste-Challenges Facing Developing and Economy-in-Transition Countries' in Reed M. (ed.), *Metal Sustainability* (Wiley 2016)

Peers S. et al. (eds.), *The EU Charter of Fundamental Rights - A Commentary* (Hart Publishing 2014)

Roman E., 'WEEE management in Europe: Learning from Best Practice' in Goodship V. and Stevels A. (eds.), *Waste Electrical and Electronic Equipment Handbook* (Woodhead Publishing 2012)

Tischner U., 'Sustainable Electronic Product Design' in Goodship V. and Stevels A. (eds.), *Waste Electrical and Electronic Equipment Handbook* (Woodhead Publishing 2012)

Veit H. and Bernardes A., 'Electronic Waste: Generation and Management' in Veit H. M. and Bernardes A. M. (eds.), *Electronic Waste – Recycling techniques* (Springer 2015)

PUBLICATIONS

-- BIO Intelligence Service, 'Review of the scope of the Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), Final report prepared for European Commission –DG Environment' (ec.europa.eu, 2013) <http://ec.europa.eu/environment/waste/weee/pdf/approved_%20WEEE%20scope%20review.pdf> accessed 23 March 2019

-- EEA Publication 'Chapter 2: The use of risk assessment in environmental management' in 'Environmental Risk Assessment - Approaches, Experiences and Information Sources' (eea.europa.eu, May 2016) <<https://www.eea.europa.eu/publications/GH-07-97-595-EN-C2/chapter2h.html>> accessed 5 April 2019

-- Press Unit of the European Court of Human Rights, 'Environment and the European Convention on Human Rights' [2019]

Anderson D. and Murphy C., 'The Charter of Fundamental Rights: History and Prospects in Post-Lisbon Europe' [2011] EUI Working Papers 2,3

Ardente F. et al., 'Resource efficiency, privacy and security by design: A first experience on enterprise servers and data storage products triggered by a policy process' (2018)76 C&S 295

Barrington E., 'European Environmental Law: Before and After Maastricht' (2015)2 UMICLR 79

Bellamy B. and Heyder M. 'Empowering Individuals Beyond Consent' (iapp.org, 2 July 2015) <<https://iapp.org/news/a/empowering-individuals-beyond-consent/>> accessed 5 April 2019

Bourguignon D., 'European Parliament Research Service Briefing 'Understanding waste streams-Treatment of specific waste' (europarl.europa.eu, July 2015) <<http://www.europarl.europa.eu/EPRS/EPRS-Briefing-564398-Understanding-waste-streams-FINAL.pdf>> accessed 23 March 2019

Bygrave L., 'Data Protection by Design and by Default: Deciphering the EU's Legislative Requirements' (2017)4 OLR 105

Cucchiella F. et al, 'Scrap Automotive Electronics: A Mini-Review of Current Management Practices' (2016)34 WM&R 3

De Búrca G., 'The road not taken: the European Union as a global human rights actor American Journal of international law' (2011)105 AJIL 649

Geissdoerfer M. et al., 'The Circular Economy – a new sustainability paradigm?' (2017)143 JCP 757

Gellert R., 'Understanding Data Protection as Risk Regulation' (2015)18 IJL 3

-- 'We Have Always Managed Risks in Data Protection Law: Understanding the Similarities and Differences Between the Rights-Based and the Risk-Based Approaches to Data Protection' (2016)2 EDPL 481

González Fuster G., 'Fundamental Rights and the European Union' (Lecture, Institute of European Studies, Brussels, 22 November 2018)

Gu F. et al., 'Internet of things and Big Data as potential solutions to the problems in waste electrical and electronic equipment management: An exploratory study' (2017)68 WM 434

Guthwirth S., 'Generations of Rights' (Lecture, Institute of European Studies, Brussels, 13 and 14 November 2011)

Hilson C., 'Rights and Principles in EU Law: A Distinction without Foundation?' (2008)15 MJE&CL 193

Hirsch D., 'Protecting the inner environment: what privacy regulation can learn from environmental law' (2006)41 GLR 1

Lee D. et al., 'Monitour: Tracking Global Routes of Electronic Waste' (2018)72 WM 362

Lina Jasmontaite et al., 'Data protection by design and by default: framing guiding principles into legal obligations in the GDPR' (2018)2 EDPL 169

Kedia P., 'Big data analytics for efficient waste management' (2016)5 IJRET 208

Kirchherr J., Reike D. and Hekkert M., 'Conceptualizing the circular economy: An analysis of 114 definitions' (2017)127 RC&R 221

Kumar A. et al., 'E-Waste: an Overview on Generation, Collection, Legislation and Recycling Practices' (2017)122 RCR 32

Kuner C., 'Introduction to the GDPR' (Lecture, Institute of European Studies, Brussels, 21 March 2019)

Lee D. et al., 'Monitour: Tracking Global Routes of Electronic Waste' (2018)72 WM 362

Lindhqvist T., 'Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems' (IIIEE, Lund University, 2000)

Lindhqvist J., 'New challenges to personal data processing agreements: is the GDPR fit to deal with contract, accountability and liability in a world of the Internet of Things?' (2017)26 IJLIT 45

Maple C., 'Security and privacy in the internet of things' (2017)2 JCP 155

Mantelero A., 'Personal data for decisional purposes in the age of analytics: From an individual to a collective dimension of data protection' (2016)32 CL&SR 238

Orlando E., 'The Evolution of EU Policy and Law in the Environmental Field: Achievements and Current Challenges' (April 2013) Transworld working paper 21

Reidenberg J., 'Resolving Conflicting International Data Privacy Rules in Cyberspace' (1999)52 SLR 1315

-- 'E-Commerce and Trans-Atlantic Privacy' (2001)38 HLR 717

-- and Paul M. Schwartz, 'Data protection law and online services: regulatory responses' [1998]

Rohen M., 'Rear view mirror, crystal ball: Prediction for the future of data protection law based on the history of environmental protection law' (2017)33 CLSR 603

Rubinstein I., 'The Trouble with Art. 25 (and how to fix it)' (Workshop, Vrije Universiteit Brussels, Brussels, 25 February 2019)

Selin H. and VanDeveer S., 'EU Environmental Policy Making and Implementation: Changing Processes and Mixed Outcomes' [2015] Conference Proceedings

Vadoudi et al., 'E-waste management and resources recovery in France' (2015)33 WM&R 919

Van Hoboken J., 'Organising Compliance' (Lecture, Institute of European Studies, Brussels, 18 March 2019)

Voss G., 'One Year and Loads of Data Later, Where Are We? An Update on the Proposed European Union General Data Protection Regulation' (2013) JoIL 14

Weber R., 'Internet of Things: Privacy Issues Revisited' (2015)31 CL&SR 618

WEBSITES

-- 'About EDPB' (*edpb.europa.eu*) <https://edpb.europa.eu/about-edpb/about-edpb_en> accessed 25 March 2019

-- 'About EDPS' (*edps.europa.eu*) <https://edps.europa.eu/about-edps_en> accessed 25 March 2019

-- 'Basel Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal Basel, 10 December 1999' (*basel.int*) <<http://www.basel.int/Countries/StatusofRatifications/TheProtocol/tabid/1345/Default.aspx>> accessed 20 March 2019

-- 'Circular Economy' (*ec.europa.eu*, 2018) <https://ec.europa.eu/growth/industry/sustainability/circular-economy_en> accessed 15 December 2018

-- 'Circular Economy-Implementation of the Circular Economy Action Plan' (*ec.europa.eu*) <http://ec.europa.eu/environment/circular-economy/index_en.htm> accessed 8 December 2018

-- 'CLC/TC 111X Environment' (*cenelec.eu*) <https://www.cenelec.eu/dyn/www/f?p=104:110:64829936439601:::FSP_ORG_ID,FSP_PROJECT,FSP_LAN_G_ID:1258637,58426,25> accessed 20 April 2019

-- 'Development of guidance on Extended Producer Responsibility (EPR)' (*ec.europa.eu*, January 2014) <http://ec.europa.eu/environment/archives/waste/eu_guidance/introduction.html> accessed 30 March 2019

-- 'Electronic waste' (*who.int*) <<https://www.who.int/ceh/risks/ewaste/en/>> accessed 21 March 2019

-- 'Extended producer responsibility' (*oecd.org*) <<http://www.oecd.org/env/tools-evaluation/extendedproducerresponsibility.htm>> accessed 30 March 2019

-- 'European Standards Organizations (ESOs)' (*cenelec.eu*) <<https://www.cenelec.eu/aboutcenelec/whoweare/europeanstandardsorganizations/index.html>> accessed 20 April 2019

-- 'European Standards (EN)' (*cenelec.eu*) <<https://www.cenelec.eu/standardsdevelopment/ourproducts/europeanstandards.html>> accessed 28 April 2019

-- 'History of the negotiations of the Basel Convention' (*basel.int*) <<http://www.basel.int/TheConvention/Overview/History/Overview/tabid/3405/Default.aspx>> accessed 18 March 2019

-- 'Production and international trade in high-tech products' (*ec.europa.eu*, 2017) <https://ec.europa.eu/eurostat/statistics-explained/index.php/Production_and_international_trade_in_high-tech_products#EU_imports_of_trade_in_high-tech_products> accessed 24 March 2019

- 'RoHS 2 FAQ' (*ec.europa.eu*, 12 December 2012) <http://ec.europa.eu/environment/waste/rohs_eee/pdf/faq.pdf> accessed 15 April 2019
- 'Smarter Information Systems' (*europarl.europa.eu*, 2018) <<http://www.europarl.europa.eu/legislative-train/theme-towards-a-new-policy-on-migration/file-smarter-information-systems>> accessed 15 December 2018
- 'The Bamako convention' (*unenvironment.com*) <<https://www.unenvironment.org/explore-topics/environmental-rights-and-governance/what-we-do/meeting-international-environmental>> accessed 20 March 2019
- 'The Basel Convention Ban Amendment' (*basel.int*) <<http://www.basel.int/Implementation/LegalMatters/BanAmendment/Overview/tabid/1484/Default.asp>> accessed 20 March 2019
- 'The Internet of Things' (*ec.europa.eu*) <<https://ec.europa.eu/digital-single-market/en/policies/internet-things>> accessed 9 December 2018
- 'The RoHS Directive' (*ec.europa.eu*) <http://ec.europa.eu/environment/waste/rohs_eee/index_en.htm> accessed 15 April 2019
- 'Waste shipments' (*ec.europa.eu*, 13 November 2018) <<http://ec.europa.eu/environment/waste/shipments/index.htm>> accessed 20 March 2019
- Basel Convention UNEP leaflet 'Controlling transboundary movements of hazardous wastes' (*basel.int*, 2009) <<http://www.basel.int/portals/4/basel%20convention/docs/pub/leaflets/leaflet-control-procedures-en.pdf>> accessed 20 March 2019
- DEFRA (Department for Environment, Food and Rural Affairs) Guidance on applying the Waste Hierarchy (*defra.gov.uk*, June 2011) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69403/pb13530-waste-hierarchy-guidance.pdf> accessed 30 March 2019
- E-Waste' (*basel.int*) <<http://www.basel.int/Implementation/Ewaste/Overview/tabid/4063/Default.aspx>> accessed 20 March 2019
- EXPRA 'Extended Producer Responsibility at a glance' (*expa.eu*, 2016) <http://www.expri.eu/uploads/downloads/EXPRA%20EPR%20Paper_March_2016.pdf> accessed 21 March 2019
- Astor M., 'Your Roomba May Be Mapping Your Home, Collecting Data That Could Be Shared' *The New York Times* (New York, 25 July 2017) <<https://www.nytimes.com/2017/07/25/technology/roomba-irobot-data-privacy.html>> accessed 25 March 2019
- Burkacky O. et al., 'Rethinking car software and electronics architecture' (*McKinsey.com*, 2018) <<https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/rethinking-car-software-and-electronics-architecture>> accessed 21 March 2019
- Davies A., Lee E. K. and Braasch P., 'The EU Adopts Four Directives to Solidify Europe's Leading Position in Waste Management' (*Latham & Watkins LLP*, 6 July 2018) <<https://www.globalelr.com/2018/07/the-eu-adopts-four-directives-to-solidify-europes-leading-position-in-waste-management/>> accessed 10 March 2019
- Information and Privacy Commissioner of Ontario 'Privacy by Design' (*ipc.on.ca*, January 2018) <<https://www.ipc.on.ca/wp-content/uploads/2018/01/pbd.pdf>> accessed 25 March 2019
- Kam R., 'Connected cars: security and privacy risks on wheels' (*iapp.org*, 22 February 2016) <<https://iapp.org/news/a/connected-cars-security-and-privacy-risks-on-wheels/>> accessed 31 March 2019
- Kekäläinen F., 'IoT& Big Data solving problems for the waste & recycling industry' (Presentation to ITRE Committee, 13 June 2016) <http://www.europarl.europa.eu/cmsdata/103427/4_enevo.pdf> accessed 25 April 2019

Cukier K. and Mayer-Schonberger V., 'Big Data, A Revolution that Will Transform How We Live, Work and Think' (*europeaninstitute.org*, April 2013) < <https://www.europeaninstitute.org/index.php/173-european-affairs/ea-april-2013/1708-big-data-a-revolution-that-will-transform-how-we-live-work-and-think-by-kenneth-cukier-and-viktor-mayer-schonberger>> accessed 22 April 2014

Matteson A., 'The Concept of Datafication; Definition & Examples' (*datasciencecentral.com*, 6 February 2018) <<https://www.datasciencecentral.com/profiles/blogs/the-concept-of-datafication-definition-amp-examples>> accessed 22 April 2019

Ohliger T., 'Environment Policy: General Principles and Basic Framework' Fact Sheets on the European Union – 2019 (*europarl.europa.eu*, 2018) <<http://www.europarl.europa.eu/factsheets/en/sheet/71/environment-policy-general-principles-and-basic-framework>> accessed 26 February 2019

Petarčić I., 'Life cycle thinking in sustainable waste management' (*Hi4CSR.com*, 2016) <<http://www.hi4csr.com/en/blog/life-cycle-thinking-in-sustainable-waste-management/>> accessed 31 March 2019

Ram A., 'Vacuums that pick up data as well as dirt renew privacy concerns' *Financial Times* (London, 15 August 2017) <<https://www.ft.com/content/d8630420-776c-11e7-a3e8-60495fe6ca71>> accessed 25 March 2019

Saffer D., 'The Wonderful Possibilities of Connecting Your Fridge to the Internet' *Wired* (29 October 2014) <<https://www.wired.com/2014/10/is-your-refrigerator-running/>> accessed 25 March 2019

Sanchayan N., 'The Effectiveness of the Basel Convention' (*wordpress.com*, 26 October 2012) <<https://sanchayanwrites.wordpress.com/2012/10/26/the-effectiveness-of-the-basel-convention-2/>> accessed 20 March 2019

Van Straten R., 'Risk-Based Approach to GDPR | GDPR Risk Assessment Template' (*saiglobal.com*, 26 April 2018) <<https://www.saiglobal.com/hub/blog/risk-based-approach-to-gdpr-gdpr-risk-assessment-template>> accessed 5 April 2019

Wals C., 'Software in cars' (*embedded.com*, 20 July 2016) < <https://www.embedded.com/design/operating-systems/4442406/Software-in-cars> > accessed 22 March 2019

Workman D., 'Electronic Circuit Component Exports by Country' (*worldtopexports.com*, 13 February 2019) <<http://www.worldtopexports.com/electronic-circuit-component-exports-country/>> accessed 24 March 2019