

GUIDANCE ON POLICY AND LEGISLATION FOR INTEGRATED WASTE MANAGEMENT DURING A PANDEMIC



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Executive Summary



The **overarching objective** of this guidance is to support countries in their efforts to **develop or revise their legislation and policies to foster better preparedness and responses**, in the event of future pandemics, to address health and environment risks associated with waste management.

To this end, the guidance draws upon **existing waste management guidelines issued by international organizations** on key principles of, and approaches to, integrated waste management. The guidance seeks to complement the existing UNEP 2016 *Guidelines for Framework Legislation for Integrated Waste Management*. It also gathers together and analyses **national experience of measures adopted for COVID-19 waste management**, using a combination of in-depth case studies and results from an online survey distributed to the National Focal Points of the Montevideo Programme V (Montevideo National Focal Points). This experience illustrates the **different legislative and policy approaches** countries have taken to deal with increased quantities of waste and other waste management challenges during the COVID-19 pandemic, as well as **overall trends** in the kinds of measures adopted and areas where **challenges** arose.

A key finding from the analysis of national measures is the **absence of examples of a comprehensive approach** to the management of COVID-19 waste in line with best-practice concepts and integrated waste management principles. In particular, approaches to COVID-19 waste management have **focused on health-care wastes and infection risks**, with limited consideration of broader environmental and social impacts (including gender dimensions) of the increased quantities of waste produced during the pandemic. There is therefore an opportunity for countries to transition from initial emergency responses to longer-term planning for pandemic waste management by implementing elements of a best-practice and integrated waste management legislative response into their relevant frameworks.

The final chapter of the guidance outlines the **elements of framework measures** that could be adopted by countries (or used as a basis for revision of existing structures) to enhance preparedness to deal with waste management challenges in future pandemic scenarios. Rather than recommending a one-size-fits all approach, the guidance offers a checklist with a menu of options for countries to consider for inclusion in pandemic waste legislation and policy guidelines, recognizing the varying context for application in different countries. Options are provided in relation to each of the following elements of potential framework measures:

- statements of legislative purpose and objectives framed around integrated waste management;
- definitions of waste;
- allocation of major responsibilities for waste management;
- provisions pertaining to waste sector regulation;
- specific integrated waste management principles for application in pandemic scenarios related to the whole life cycle for waste management, from minimization to disposal, reuse and recycling;
- particular measures applicable to specific waste streams produced in increased quantities during a pandemic, such as plastic wastes and health-care wastes associated with use and disposal of personal protective equipment (PPE);
- provisions pertaining to the environmental and social impacts of pandemic wastes;
- provisions regarding public participation and access to information;
- compliance and enforcement measures, including penalties;
- technology, research and development aspects.

Chapter 1:

Introduction, purpose and scope



Introduction and purpose

COVID-19 and its impacts on waste management

1. As the United Nations Environment Programme (UNEP) articulated, “[a]dverse impacts on human and planetary health will come from many sources as the world deals with COVID-19.” These include “a spike in hazardous waste, such as personal protective equipment, electronics and pharmaceuticals” (UNEP 2020a, p. 2), as well as increased quantities of health-care and other infectious wastes, and single-use plastic waste (Silva *et al.* 2021, p. 3). In addition, the COVID-19 pandemic has disrupted waste management chains and undermined environmental protection standards (Sommer and Pointon 2020; Rowell 2020). Disruptions in waste management chains in country have also disrupted transboundary movements of waste, placing still further pressure on in-country capacity to manage waste on the basis of integrated waste management (European Commission 2020a).
2. Negative environmental consequences of the pandemic have been related to increased use of certain types of single-use plastics in particular (including those found in personal protective equipment [PPE] such as masks, gloves, face shields and gowns, and associated with packaging and consumption of food and drink) and shifting priorities for waste management that are contrary to environmental sustainability goals (including the green and circular economies; Silva *et al.* 2021, p. 2-3).
3. The massive increase in health-care waste associated with the COVID-19 pandemic has overwhelmed systems, especially in health facilities where appropriate technologies for safe storage, treatment and disposal are already lacking (Economic Research Institute for ASEAN [Association of Southeast Asian Nations] and East Asia 2020). This has placed extra pressure on waste management systems, leading to inappropriate management strategies and improper disposal (Adyel 2020).
4. PPE distributed by health-care services as part of COVID-19 risk management has had a large environmental impact through its carbon footprint, impact on ecosystems and impact on resource depletion (Rizan, Reed and Bhutta 2021). Increased use of plastic-based PPE during the pandemic has also driven increased plastic pollution (Adyel 2020).
5. In addition to increased quantities of health-care wastes, household waste generation has been affected during the pandemic as many countries have adopted “stay at home” policies in response to COVID-19. This has resulted in increases in the use of food and other goods delivery services, and resulting increases in plastic packaging waste such as takeaway containers and plastic bags (Silva *et al.* 2021).
6. The pandemic has also heavily impacted the collection, separation and recycling of waste. For example, in some countries as much as 80 per cent of the recycling industry did not operate during the height of the pandemic (Olley 2020). Some countries stopped recycling programmes as authorities were concerned about the risk of COVID-19 spreading in recycling facilities (Silva *et al.* 2021, p. 3). Overall, recycling has been made more challenging during the pandemic, facilities have been closed, and there have been reductions in the price of recyclable waste (Economic Research Institute for ASEAN and East Asia 2020; Silva *et al.* 2021). A drop in the prices of virgin plastics (due to both the pandemic and the temporary drop in oil prices relative to recycled plastics) also decreased the demand for plastic waste for recycling (Economic Research Institute for ASEAN and East Asia 2020, p. 2).

7. The COVID-19 pandemic has sparked concerns for the health and safety of all workers, including their ability to access appropriate PPE (International Finance Corporation 2020). It has also had an impact on the informal sector in circumstances where pay and working conditions are not regulated, especially in developing countries where livelihoods have been disrupted (Economic Research Institute for ASEAN and East Asia 2020).
8. As noted in UNEP COVID-19 Waste Management Factsheet 1, “Introduction to COVID-19 waste management”, “[w]hen not managed soundly, infected medical waste could be subject to uncontrolled dumping, leading to public health risks, and to open burning or uncontrolled incineration, leading to the release of toxins in the environment and to secondary transmission of diseases to humans. Other wastes can reach water sources and add to riverine and marine pollution” (2020b).
9. The COVID-19 pandemic and its impact on waste production and management illustrates the need for more prepared and pro-active policy and legal frameworks to deal with future pandemics (Rowell 2020). Such frameworks should be better adapted to deal with the changes in production–consumption patterns that have emerged during the COVID-19 pandemic. In line with international best-practice approaches, they should also ensure that capacity for integrated waste management is sufficient to minimize adverse health and environmental impacts (see Box 1).

Integrated waste management is a strategic approach to sustainable management of wastes covering all sources, stakeholders and aspects (including generation, segregation, storage, collection, transfer, sorting, recycling, treatment, recovery and disposal) in an integrated manner that effectively protects human health and the environment, while also incorporating political, institutional, social, economic, financial and technical dimensions (adapted from UNEP 2015, pp. 29-30).

Box 1: What is integrated waste management?

Objective of the guidance

10. The objective of this guidance is to support countries in their efforts to develop or revise policies and legislation in order to foster better preparedness and responses in the event of future pandemics, and address the health and environmental risks associated with waste management.
11. The guidance is intended to complement the UNEP 2016 *Guidelines for Framework Legislation for Integrated Waste Management*. It also seeks to complement other existing relevant materials that deal with waste management, such as other UNEP guidelines, and guidelines produced by the World Health Organization (WHO), other UN agencies and secretariats of waste-related multilateral environmental agreements (MEAs), such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention). Furthermore, the guidance builds on the findings of the 2020 UNEP/Institute for Global Environmental Strategies (IGES) report on *Waste Management during the COVID-19 Pandemic: From Response to Recovery*, which surveyed existing COVID-19 waste management practices, and identified key challenges and local solutions in the provision of proper management of waste generated by health-care facilities, households and quarantine locations with confirmed or suspected COVID-19 cases. All documents cited or used in this guidance can be found in the Reference List.

12. A key aim of this guidance is to outline the framework legislation that could be adopted by countries (or used as a basis for revision of existing structures) to enhance preparedness for waste management challenges in future pandemic scenarios (see chapter 5). This is important in a context of increasing pandemic risk associated with climate change and biodiversity loss, which create the conditions for closer human–animal contact and subsequent transmission of infectious diseases (Gibb *et al.* 2020; Thomas 2020). As UNEP’s *COVID-19 Waste Management Factsheet 4, “Policy and legislation linked to COVID-19 and pandemics”* writes, “[g]uidance on policy and legislation will help countries to have a stable legal and institutional basis to better respond to future waste emergencies such as the COVID-19, and to clarify measures to be taken” (2020e).

Scope and methodology

Scope and approach

13. To achieve its objective, this guidance draws on existing waste management guidelines issued by international organizations (see chapter 2), and examples from policy and legislative measures adopted by different countries and regions over the course of the COVID-19 pandemic (see chapter 3).
14. Analysis of this experience allows the identification of global trends, instances of good practice, challenges and gaps (see chapter 4). This assessment then informs the guidance’s recommendations for how countries might seek to adopt new policy or legislative measures for integrated waste management in a pandemic scenario, or revise or repurpose existing frameworks to better manage changes in waste production and management during a pandemic (see chapter 5). This approach is outlined in Figure 1.

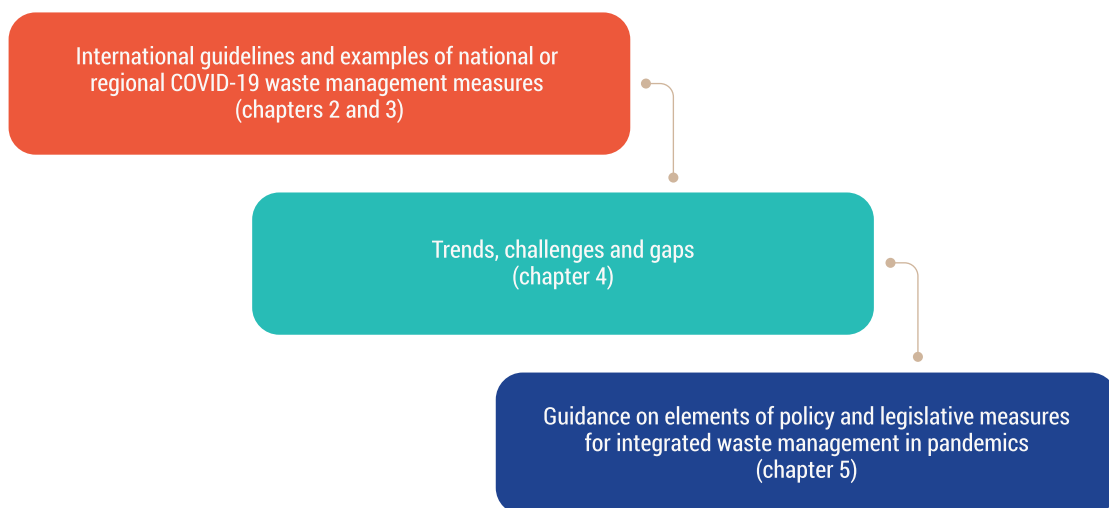


Figure 1: Outline of the guidance

15. By demonstrating how countries have dealt with waste management, particularly the increased quantities of many types of waste during the COVID-19 pandemic, the guidance intends to assist countries in their deliberation on the adoption and implementation of measures most appropriate to manage health and environmental risks in future pandemics, taking into account their own situations, including their technical capacities and legal traditions.
16. To this end, chapter 5 identifies different legislative elements that countries may include in national measures to allow for a more holistic or integrated waste management response in future pandemics. Rather than recommending a one-size-fits all approach, the guidance offers a menu of different options for how these elements might be introduced or implemented in policy or legislation, recognizing the varying contexts for application in different countries.
17. Countries might differ in the approach they use to introduce pandemic-ready integrated waste management measures (e.g. enacting new legislation, relying on or modifying existing frameworks, or issuing policy, guidance or regulations) as well as the kinds of measures or regulatory model they use for this purpose. Options in this regard may include comprehensive waste management laws (e.g. environmental or specific waste laws); laws or policies targeted to particular sectors such as health-care waste; laws specifically dealing with emergency situations like pandemics or with disaster management more generally; or targeted and/or time-limited response measures (see Figure 2).

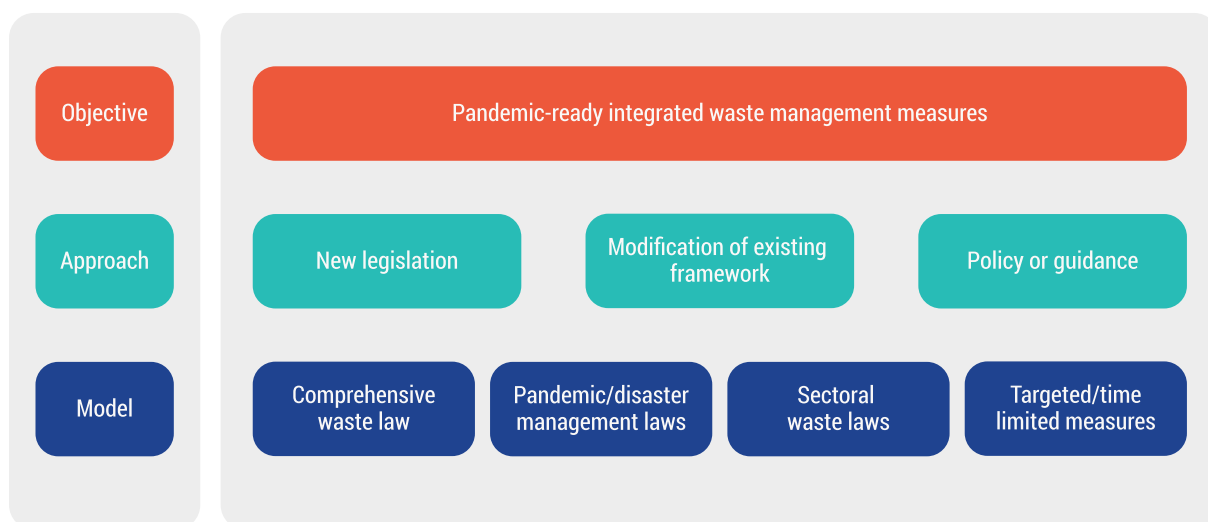


Figure 2: Options for implementation of guidance

Methodology

18. This guidance draws on existing guidelines and experience to shape its recommendations for integrated waste management measures that might be adopted by countries to prepare for future pandemics.

19. Existing guidelines on waste management issued by international organizations, such as UNEP, WHO and secretariats of multilateral environmental agreements (MEAs) were identified and analysed using desktop research methods and publicly available online resources. This analysis has informed the discussion of key terms, definitions and principles of integrated waste management included in chapter 2.
20. To assemble data on the experience of countries and regions in managing waste during the COVID-19 pandemic, an exercise of mapping and analysis of selected national policy and legislative response measures was undertaken. Examples were drawn from two main sources:
 - a. a geographically diverse sample of 13 in-depth country/regional **case studies**;
 - b. a broader online **survey** of countries regarding their waste management policy and legislative responses during the pandemic.
21. Case studies (discussed further in chapter 3) were selected to capture a range of pandemic responses across different regions and countries with a variety of legal and institutional frameworks. Countries included in the case study sample include those with different legal traditions, differing levels of exposure to COVID-19 risk, differing levels of existing waste management infrastructure and capacity, greater or lesser amounts of legislative activity on waste management during the pandemic, and differing coverage of types of wastes in their COVID-19 waste management measures. Where official English translations of legislation are not available, this report includes unofficial translations of such legislation. Table 1 summarizes the selected case studies and the matrix of criteria by which they were selected.
22. To supplement the case study analysis, an online survey was distributed via UNEP to designated Montevideo National Focal Points in 131 countries for the purpose of identifying other relevant national measures for COVID-19 waste management.

Case study	Geographic region	Legal tradition			COVID-19 exposure			Pre-COVID-19 waste infrastructure			COVID-19 legislative activity			Wastes covered by COVID measures		
		Civil law	Common law	Mixed	Low	Med	High	Low	Med	High	Low	Med	High	Haz/medical	Solid/Household	Plastics
Kenya	Africa															
South Africa	Africa															
Zambia	Africa															
China	Asia & the Pacific															
India	Asia & the Pacific															
PNG	Asia & the Pacific															
Argentina	Latin America & Caribbean															
Peru	Latin America & Caribbean															
Jordan	Central & West Asia															
Canada	W Europe & N America															
European Union	W Europe & N America															
France	W Europe & N America															
Italy	W Europe & N America															

Table 1: Case studies and selection matrix

23. Forty-one survey responses were received from 37 countries, a response rate of 28 per cent.¹ These were Australia, Benin, Burkina Faso, Canada, Cameroon, Comoros, Congo (2 responses), Estonia, Eswatini, Finland, Germany, Ghana (2 responses), Guatemala, Guinea, Hungary, Jamaica, Kenya, Malawi, Mexico (2 responses), North Macedonia, Nigeria, Pakistan (2 responses), Panama, Qatar, Saint Lucia, Sri Lanka, Sierra Leone, Singapore, Somalia, Suriname, Syria, Trinidad and Tobago, Uganda, United Arab Emirates, Zambia, and Zimbabwe, with one country “unknown” as the respondent did not provide details.
24. Figure 3 shows the regional distribution of responding countries. Analysis of the survey data, along with the results of the case studies, is included in chapter 4.
25. Additional information on waste management practices during the COVID-19 pandemic in developing countries was drawn from the UNEP/IGES 2020 report on *Waste Management during the COVID-19 Pandemic: From Response to Recovery*. Information was also drawn from four regional webinar consultations with stakeholders (Africa, Europe and Central Asia, Americas [Latin America and the Caribbean, and North America], Asia and the Pacific, and West Asia), and from individual communication with countries providing direct feedback.
26. The case studies and examples discussed in the guidance do not purport to provide a comprehensive survey of policy and legislative measures adopted for COVID-19 waste management around the globe. While the case studies are drawn from different geographic regions, data on COVID-19 waste management measures were not as readily available or accessible for some countries and regions (particularly in Central and Eastern Europe, and Central and West Asia) as for others. Disaggregated data on the differential gender impacts of different COVID-19 waste measures were also not available, although some general conclusions can be drawn about the likely impacts on women and children of particular waste management practices emerging during the pandemic (e.g. greater exposure of informal waste pickers to hazardous wastes due to improper disposal of discarded PPE and the need for gender mainstreaming across waste management) (Carenbauer 2021; Urban Waste 2019).

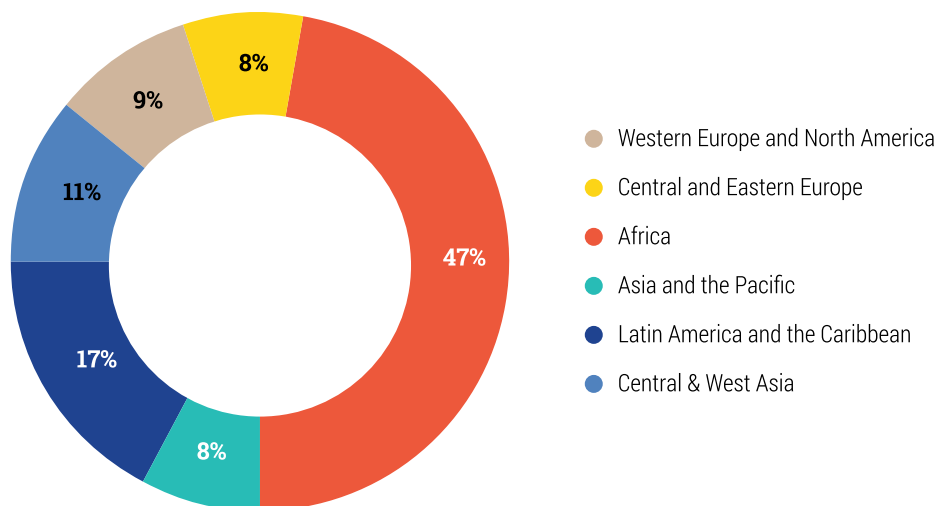


Figure 3: Survey responses by region

¹ Some survey respondents did not answer every question.

27. In addition, the COVID-19 pandemic generated an uneven legislative and policy response across countries. Some countries adopted no significant new waste management laws during the pandemic (in some cases because they already had a robust framework in place), whereas others adopted a significant number of new laws and policies.
28. A key finding from the analysis of case studies and other national measures (also supported by the findings of the UNEP/IGES 2020 report) is the absence of examples of a comprehensive approach to the management of COVID-19 waste in line with best practice concepts and principles of integrated waste management. In particular, most countries that were examined in the case studies and responded to the survey adopted an approach to COVID-19 waste management focused on health-care wastes and infection risks, with limited consideration of broader environmental and social impacts (including gender dimensions) of the increased quantities of waste produced during the pandemic.
29. In light of this finding, the guidance focuses on ways that countries can bridge this gap through legislative and policy measures that take a more holistic or integrated waste management approach, also taking into account the general imperative of the Sustainable Development Goals (SDGs) to “achiev[e] sustainable development in its three dimensions – economic, social and environmental – in a balanced and integrated manner” (United Nations, General Assembly [UNGA] 2015, para. 2).

Chapter 2:

Key Terms, Definitions and Principles of Integrated Waste Management during a Pandemic



Overview

1. This chapter presents key terms, definitions and principles that underpin environmentally sound guidelines on integrated waste management frameworks during a pandemic. These terms, definitions and principles have been developed drawing on existing international resources and guidelines for integrated waste management. These include relevant instruments and guidance produced by international institutions such as WHO, and UNEP, including in its capacity as secretariat for MEAs.
2. In addition, many organizations at both the international and regional levels developed resources and guidelines during the COVID-19 pandemic that offer guidance on aspects of pandemic-related waste management, with a particular focus on the management of hazardous or infectious health-care wastes.

Key terms and definitions

3. This section of the chapter draws on existing international instruments and guidelines to define key concepts relevant to the guidance's objective. It includes explanations of terms such as "environmentally sound", "emergency situations" and "pandemics", as well as the central notion of "integrated waste management".
4. Also discussed are different categories of waste, such as health-care, household and plastic wastes, certain types of which have been produced in increased quantities during the COVID-19 pandemic (see chapter 1, under "COVID-19 and its impacts on waste management"). The chapter explores how these wastes have been defined in international guidelines.

Integrated waste management

5. The concept of "integrated waste management" has been addressed in previous UNEP guidance, particularly the *Guidelines for Framework Legislation for Integrated Waste Management* (UNEP 2016). These guidelines aim to provide countries with clear advice on how to introduce or enhance their waste management legislation, but do not specifically define the term "integrated waste management". The 2016 guidelines note that while "there is no single hierarchy," a general waste management hierarchy of "prevention, reduction, recycling, recovery and disposal is a suitable default one" (UNEP 2016, p. 4; see discussion of the "3Rs" or "5Rs" later on in the chapter). The Basel Convention's strategic framework breaks it down as follows: "prevention, minimization, reuse, recycling, other recovery including energy recovery, and final disposal" (Secretariat of the Basel Convention 2011).

6. The term “integrated sustainable waste management” is defined in UNEP’s 2015 report, *Global Waste Management Outlook*, as follows:

Integrated sustainable waste management brings together three dimensions, namely: (1) “[a]ll the *physical elements* (infrastructure) of the system, from waste generation through storage, collection, transport, transfer, recycling, recovery, treatment and disposal”; (2) “[a]ll the *stakeholders* (actors) involved, including municipalities; regional and national governments; waste generators/service users (including industry, business, institutions and households); producers (those who put products on the market which become waste at the end of their life, including manufacturers, brand owners, importers and others in the supply chain); service providers (whether public or private sector, formal or informal, large or small); civil society and non-governmental organizations (NGOs) (which play a variety of roles, including facilitating the participation of other parties); international agencies; etc.” and (3) “[a]ll the *strategic aspects*, including the political, health, institutional, social, economic, financial, environmental and technical facets” (UNEP 2015, p. 29).

Box 2: Integrated sustainable waste management

7. The *Global Waste Management Outlook* report definition (UNEP 2015) emphasizes the need for a comprehensive, integrated approach to waste management. The United States Environmental Protection Agency (US EPA)’s sustainable materials management (SMM) approach emphasizes the use and reuse of materials in the most productive and sustainable way across their entire life cycle in order to meet the material needs of the future, by providing methods to decrease environmental impacts of materials use while increasing economic competitiveness.
8. The need for a comprehensive approach to waste management coheres with notions of the waste management hierarchy, such as that outlined in WHO’s *Safe management of wastes from health-care activities* (2014). This provides:

“The most preferable approach, if locally achievable, is to avoid producing waste as far as possible and thus minimize the quantity entering the waste stream. Where practicable, recovering waste items for secondary use is the next most preferable method. Waste that cannot be recovered must then be dealt with by the least preferable options, such as treatment or land disposal, to reduce its health and environmental impacts” (WHO 2014, p. 68).

Box 3: Comprehensive waste hierarchy

9. Other definitions of integrated waste management, or similar concepts, make reference to the need for a “sustainable” approach. In the UN 2030 Agenda for Sustainable Development, a sustainable approach is understood to incorporate three dimensions – economic, social and environmental – addressed “in a balanced and integrated manner” (UNGA 2015, para. 2). In addition, several of the SDGs apply specifically to waste management (see Table 2).

SDG target	Description
3.9	By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
6.3	By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
6.a	By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies
8.4	Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead
11.6	By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
12.4	By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment
12.5	By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse
14.1	By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

Table 2: SDGs relevant to waste management

- 10.** Drawing on these sources, in this report “integrated waste management” is defined as a strategic approach to sustainable management of wastes covering all sources, stakeholders and aspects (including generation, segregation, storage, collection, transfer, sorting, recycling, treatment, recovery and disposal) in an integrated manner that most effectively protects human health and the environment, while also incorporating political, institutional, social, economic, financial and technical dimensions (see Box 1).
- 11.** This definition combines requirements for a comprehensive approach to waste management (considering all sources, stakeholders and aspects in the waste hierarchy) with recognition of the need to not only strive for sustainable outcomes that protect human health and the environment but also balance these with other social, economic and technical aspects.

Emergency situations and pandemics

12. This report has been shaped by the experience of waste management during the COVID-19 pandemic and a desire to ensure more holistic, better integrated waste management in the event of future pandemics.
13. An “emergency” or “emergency situation” linked to “disasters” can encompass health crises such as pandemics, but it can also cover a range of other situations and events. The WHO *Strategic Framework for Emergency Preparedness* (2017) defines an “emergency” as follows:

An event or threat that produces or has the potential to produce a range of consequences that require urgent, coordinated action. [...] An emergency may have limited consequences in a circumscribed area, or catastrophic consequences on a global scale. The impact of an emergency may exceed the capacity of a community or a state to cope using its own resources, and external assistance may be required. This type of emergency is often termed a disaster (WHO 2017, p. 14).

Box 4: WHO definition of an emergency

14. The WHO framework recognizes that emergencies may arise due to natural hazards (e.g. biological, geophysical or hydrometeorological hazards) or human-induced hazards (e.g. technological disasters, violence or social conflict, financial crises). “Pandemics” are listed in the WHO framework as a particular type of emergency deriving from natural biological hazards such as viruses or other pathogens.
15. A pandemic signifies “an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people” (Bonneux 2010 in Kelly 2011). As WHO’s *Strategic Framework for Emergency Preparedness* outlines, two prominent features of pandemics that need to be considered when undertaking preparedness planning include:
 - a. the likelihood that societal functions will be seriously compromised;
 - b. lack of assurance of the availability of external assistance for countries whose capacities are surpassed given that, by definition, all countries will be affected and will have to deal with their own domestic emergencies (2017, p. 13).
16. As the COVID-19 pandemic has demonstrated, a pandemic response often extends beyond the initial emergency response to longer-term efforts to safeguard communities (e.g. through vaccinations) and to manage economic recovery following the acute impacts of response measures such as lockdowns. These longer-term effects also need to be considered in waste management measures, and often give rise to new risks. These may include waste generation associated with vaccine production and delivery, or efforts to delay or roll back waste reduction or prevention measures given their potential economic impacts during the recovery phase.

Environmentally sound management

17. Initial international responses to the COVID-19 pandemic were largely characterized by an emphasis on human health and infection prevention, with more limited attention paid to environmental aspects (UNEP and IGES 2020). However, in international instruments dealing with waste management and pollution, a more integrated approach is endorsed, focusing on the concept of environmentally sound management.
18. Environmentally sound management is a cornerstone of the Basel Convention's controls on the transboundary movement of hazardous wastes and other wastes. The importance of protecting both human health and the environment was also addressed in the European Union (EU) guidance on *Shipments of waste in the EU in the context of the Coronavirus crisis* (2020). The conferences of the Parties to the Basel, Rotterdam and Stockholm conventions adopted decisions on gender mainstreaming within its activities, projects and programmes, and women and men's equal involvement in informing and participating in decision-making on gender-responsive approaches to hazardous chemicals and waste policies (Secretariat of the Basel, Rotterdam and Stockholm conventions [BRS Secretariat] 2021).
19. Article 2.8 of the Basel Convention defines "environmentally sound management" as:

"[T]aking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes".

Box 5: Basel Convention definition of environmentally sound management

20. This coheres with the definition of integrated waste management, which also emphasizes the need for effective protection of human health and the environment as part of waste management strategies.
21. Guidelines developed by the Secretariat of the Basel Convention provide further guidance on technical aspects of environmentally sound management of particular wastes. These include the *Technical guidelines for the identification and environmentally sound management of plastic wastes and for their disposal* (2002, under revision as at March 2021) and the *Technical Guidelines on the Environmentally Sound Management of Biomedical and Healthcare Wastes* (2003). The latter aim to reduce hazardous and problematic waste streams to a minimum by means of deployment of highly qualified staff, strict definition and classification of the waste stream, and segregation at the source of the waste. An *Overall Guidance Document on the Environmentally Sound Management of Household Waste* is also being developed as at June 2021 (BRS Secretariat 2020b). Under the Basel Convention, the Expert Working Group on ESM has developed materials on environmentally sound management, including factsheets and manuals on promoting environmentally sound management of wastes (Secretariat of the Basel Convention n.d.).
22. Requirements for environmentally sound management and disposal of hazardous wastes and chemicals are also found in other MEAs, such as the Stockholm Convention on Persistent Organic Pollutants (Stockholm Convention), which entered into force in 2004. The objective of the Stockholm Convention is to protect human health and the environment from persistent organic pollutants (POPs) (art. 1). The Stockholm Convention requires Parties to prohibit, eliminate or

restrict the production, use, import and export of listed intentionally produced POPs. It also requires Parties to reduce or eliminate releases from unintentionally produced POPs and has provisions on the environmentally sound management of stockpiles and wastes consisting of, containing, or contaminated with POPs. Emerging research linking exposure to pollutants such as POPs to increasing impacts of pathogens such as COVID-19 (see Espejo *et al.* 2020, p. 2) further underlines the importance of the environmentally sound management of these wastes.

- 23.** The Stockholm Convention also calls for priority consideration of “best available techniques” of management and disposal which limit or reduce the release of POPs, such as dioxins and furans, and their impact on the environment as a whole (Annex C, art. 5). Waste incinerators (including those for hazardous or health-care waste disposal which are likely to be used more heavily during a pandemic) are recognized in the Stockholm Convention as having the potential for comparatively high formation and release of dioxins and furans to the environment (Annex C). The Convention calls for measures to reduce the releases of these chemicals (e.g. in new facilities, releases may not be high).
- 24.** MEAs targeting marine pollution are also relevant to environmentally sound waste management during pandemics given the increasing quantities of health-care and other wastes, especially certain types of plastics, likely to be generated in these situations. As outlined in chapter 1, the COVID-19 pandemic has resulted in a significant increase in health-care waste, used PPE and used single-use plastics (e.g. for food packaging and consumption), which significantly contributes to both marine pollution and terrestrial and atmospheric pollution (Silva *et al.* 2021).
- 25.** Relevant obligations under marine pollution MEAs include the following:
 - a.** The 1982 United Nations Convention on the Law of the Sea (UNCLOS) places a general obligation on States to protect and preserve the marine environment (art. 192). It calls on States to individually and collectively take measures to prevent, reduce and control marine pollution, using best practicable means and in accordance with their capabilities (art. 194), including from land-based sources (art. 207) and pollution at sea (arts. 208-211).
 - b.** The 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention) calls on Parties to “take all practicable steps to prevent the pollution of the sea by the dumping of waste and other matter that is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea” (art. 1). The London Convention would cover any wastes illegally dumped at sea during a pandemic.
 - c.** The 1996 Protocol to the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Protocol) calls on Parties “to prevent, reduce and where practicable eliminate pollution caused by dumping or incineration at sea of wastes or other matter” (art. 2). The Convention adopts a precautionary approach to environmental protection and embeds the principle of polluter pays in its provisions (art. 3). As for the London Convention, the London Protocol would cover any wastes illegally dumped at sea during a pandemic.
 - d.** The International Convention for the Prevention of Pollution from Ships (MARPOL) 1973/78 regulates ship-based pollution, including the disposal of garbage from ships (Annex V). The MARPOL Convention would cover waste disposal during a pandemic from cruise ships and other vessels.

26. These instruments affirm the need for an integrated approach to waste management that considers all aspects, including disposal and associated environmental impacts such as marine pollution.

Definitions of wastes

27. Definitions underpin binding laws and regulations as well as non-binding policies and guidelines. They need to be clear, relevant and implementable. Definitions vary between different laws and policies, between different countries and organizations, and within countries themselves, depending on the needs of legislators and policymakers. “Wastes” is one such term defined by countries and international bodies in different ways, as is appropriate for the context.
28. An extensive discussion on waste and other related definitions can be found in Part 2 of the UNEP 2016 guidelines. To provide for integrated waste management during a pandemic, existing definitions should be adaptable to accommodate associated waste streams and specific pandemic response measures.

Health-care waste

29. During pandemics, the amount of health-care waste will generally increase (WHO 2014). While it is appropriate for the objectives of medical waste management to be congruent with the principles of integrated waste management and sound waste management practices, the highly specialized elements of pandemic waste management that directly respond to health imperatives need to be recognized. The integration of WHO best practice protocols into domestic legislation and practices is important to ensure that both waste and health outcomes are achieved. Waste from the health-care sector, mostly made of plastic, increased during the COVID-19 pandemic (Silva *et al.* 2021, p. 3). Where vaccines become available, the quantity of sharps waste and empty vials will also increase (WHO 2014). Measures to deal with increased quantities of health-care wastes and their environmentally sound disposal are thus likely to be an important part of countries’ policy and legislative response during a pandemic. In particular, increased capacity to handle and treat these wastes may be required (WHO and UNICEF 2020).
30. The term “health-care waste” is generally understood to include all waste generated from health-care facilities, research facilities and laboratories, as well as some waste from homes and communities, such as where patients are self-quarantining at home, or are residing in care homes or hotel quarantine (WHO and UNICEF 2020).
31. WHO (2014) defines several categories of health-care waste, which may be “hazardous” or “non-hazardous” in nature (p. 4; also referenced elsewhere such as WHO and UNICEF 2020 and Secretariat of the Basel, Rotterdam and Stockholm Conventions 2020a). Hazardous health-care wastes likely to be produced in increased quantities during a pandemic include:
 - a. used or unused *sharps* (e.g. needles, syringes, scalpels, pipettes, knives, blades and broken glass);
 - b. *infectious waste* (e.g. PPE used to treat COVID-19 patients including boots, aprons, long-sleeved gowns, thick gloves, masks and goggles or face shields; any waste contaminated with blood and other body fluids; laboratory cultures and microbiological stocks; waste including excreta and other materials that have been in contact with patients with highly infectious diseases in isolation wards).

32. Health-care waste may also include non-hazardous or general waste which does not pose any infectious, pathological, chemical, biological or physical hazard, such as packing, food waste and disposable hand-drying towels.

Household waste and commercial waste

33. Household and commercial wastes may also increase during a pandemic. Definitions of “household waste” and “commercial waste” can be found in Part 2 of the UNEP 2016 guidelines. As noted earlier, guidance on household waste is also under development in respect of transboundary waste movements (BRS Secretariat 2020b).
34. Pandemic-related increases in household and commercial wastes may be due to the impact of “stay at home” policies, a requirement or preference for takeaway food with associated packaging and single-use plastics, and/or use of PPE including plastic-containing face masks and shields. As stated in UNEP COVID-19 Waste Management Factsheet 5, “Links to circularity – Non-healthcare waste”, “COVID-19 will lead to a greater production and consumption of household and personal health related products. These products can include: personal protection equipment and products (gloves, masks), electronic equipment (thermometers), sanitization and cleaning products (cleaning clothes [sic] and wipes, detergents, sanitizers etc.). Most of these products are single-use and contain valuable resources like plastics, textiles, metals, electronics” (2020f).
35. Pandemics may also cause disruptions to regular waste management services as a result of lockdowns, physical distancing requirements for waste collection staff, increased disposal at landfills, and the temporary closure of recycling facilities (United Nations Human Settlement Programme [UN Habitat] 2020; International Finance Corporation 2020; Asian Development Bank 2020).
36. Increases in single-use items, such as disposable masks and PPE, may have environmental and human health impacts. There is therefore a need to consider investments in waste management for these items (WHO and UNICEF 2020).

Plastic waste

37. Certain types of plastic wastes may increase during a pandemic as a result of infection control protocols or consumer and/or industry pressures (Silva *et al.* 2021). This includes non-hazardous waste or general health-care waste such as food plastic packaging, single-use plastics, plastic bags or plastics used in household product storage. In 2019, Parties to the Basel Convention agreed on amendments to bring certain types of plastic waste within the scope of controls on transboundary movements of waste (Conference of the Parties [COP] decision BC-14/12).
38. Definitions of plastic waste used in policy or legislative measures will depend on the areas of plastics regulation being adopted (e.g. regulating single-use plastic products, microplastics in personal care products, marine plastics, container deposit schemes).

Principles addressing environmental and other impacts

39. Integrated waste management principles applicable outside emergency situations such as pandemics have been well articulated in previous international instruments and guidelines. In addition to general sustainable development principles such as the precautionary principle, the polluter pays principle, the principle of sustainable use, the participation principle and the principles

of intragenerational and intergenerational equity (Sands *et al.* 2018), a number of principles have been developed with specific application to waste management.

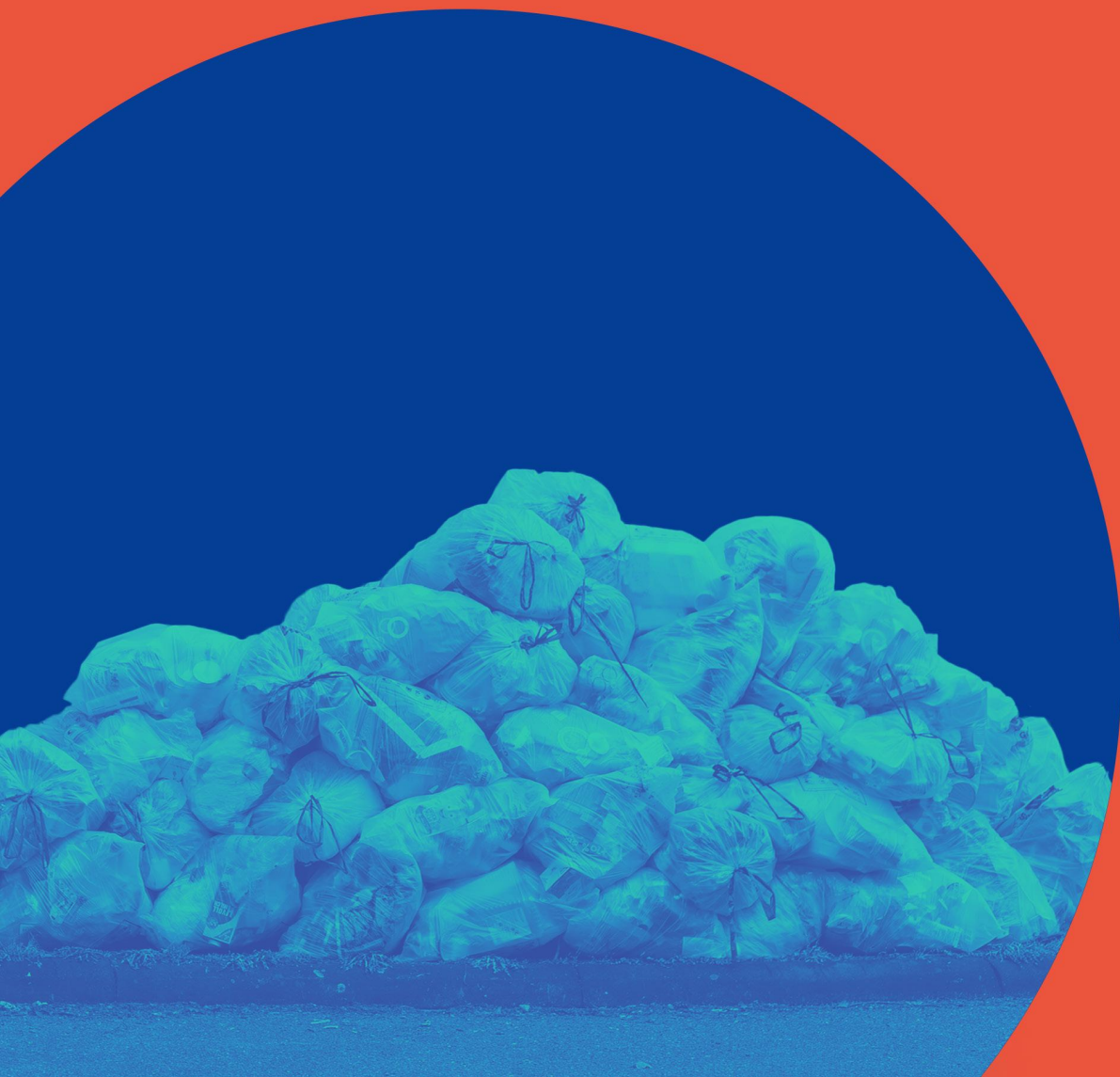
40. A key tenet of these integrated management principles is the waste hierarchy. This hierarchy is frequently referred to as the “3Rs” of waste management: reduce, reuse and recycle. This is sometimes further refined as the “5Rs”, namely refuse, reduce, reuse, repurpose and recycle. The waste hierarchy approach seeks waste minimization or prevention as its primary objective, with reuse, repurposing or recycling as a second-tier option and disposal as the last resort, recognizing that resources and tools should be allocated in accordance with this hierarchy as far as possible in light of capabilities and constraints (Basel Convention COP 2013; see also Secretariat of the Basel Convention 2011).
41. Concepts such as the “circular economy” further supplement the waste hierarchy approach. A circular economy is one that is designed to be regenerative, in contrast to take-make-dispose approaches, by promoting better design, production, use, reuse, and recycling (Ellen MacArthur Foundation 2017; Kirchherr, Reike and Hekkert 2017). In a waste management context, a circular economy emphasizes waste minimization, reuse and recycling options. The Basel Convention strategic framework uses the term “life-cycle thinking” (Secretariat of the Basel Convention 2011).
42. With the increased quantities of waste expected during a pandemic (and experienced during the COVID-19 pandemic), and the disruptions to ordinary waste management operations that accompany such events, the assumptions underlying the general integrated waste management principles might not match emerging conditions (Rowell 2020). As a result, these principles need to be applied more flexibly in the context of a pandemic, while still striving for the most effective possible protection of human health and the environment.
43. Guidelines developed by international organizations and bodies on waste management during the COVID-19 pandemic offer guidance on the kinds of approaches needed. UNEP works in collaboration with governments, WHO, UNDP, the Global Environment Facility (GEF) and NGOs to “mitigate the adverse impacts on global environment [sic] from the increase of waste produced in response to the crisis, through controlling releases of harmful chemicals in the atmosphere, land and water” (UNEP 2020b). In the short term, UNEP suggests that governments assess their national waste management capacity, work with UNEP to study the environmental impacts, and to apply the “3S” methodology (sorting, segregation and storage) to COVID-19 waste at the point of generation to assess volumes and enable the development of an appropriate response/stop-gap solution. UNEP’s longer-term response includes developing guidance on policy and legislation to better respond to future pandemics, develop robust systems and strategies for managing household and medical waste, assist selection of the best technologies for disposal, use recovery to improve air quality, and maximize the circular economy (UNEP 2020b).
44. Another useful example is the 10 point strategy for solid waste management operations during the COVID-19 pandemic, developed by UN Habitat (2020). It suggests principles and measures such as:
 - a. separation of infectious waste in households;
 - b. maintenance and expansion of waste collection services;
 - c. guarantee of safe treatment and disposal;
 - d. protection of waste workers, both formal and informal;
 - e. regular communication with citizens and engagement with stakeholders;

health-care workers. A number of standards bodies have since supported gender-responsive waste management services by providing open access to many PPE-related standards (UN Women 2020).

51. Moreover, “gender equality and a rights-based approach are key to ensuring progress towards environmental sustainability” (UNEA 2021, para. 17). Bodies such as ISWA also recognize the importance of women’s voices in waste management. Through collaboration with the Women of Waste (WOW!) Taskforce, ISWA is incorporating gender in its work. WOW! advisory members help raise awareness of women’s strong contribution to waste management and provide technical input towards addressing a range of barriers to women’s full participation, “from a lack of well-fitting safety equipment to persistent bias in legislation, culture, and gender roles, to sexual harassment and physical assault at dumpsites” (ISWA 2021). These are crucial to foster improved understanding of the linkages between gender and waste management.

Chapter 3:

National waste management
measures during the
COVID-19 pandemic



Overview

1. This chapter examines national and regional approaches to COVID-19 waste management, providing examples of legislative measures and guidelines adopted over the course of the pandemic to respond to the particular waste challenges that arose. Examples are drawn from the 13 in-depth country and regional case studies, supplemented by results from the online survey distributed to 131 countries (see “Methodology”, chapter 1).
2. Initial COVID-19 measures in many countries were put in place through executive power under a declared state of emergency or public health emergency, or via existing legislation. These emergency powers provided a framework for invoking broad COVID-19 measures not limited to waste management (e.g. public lockdowns, quarantine measures).²
3. In dealing with COVID-19 wastes, some countries were able to rely upon, or modify, their pre-existing legislative frameworks, which provided sufficient scope for a pandemic waste management response. In other cases, countries responded by issuing pandemic-related policy or technical health and occupational guidelines, or by enacting new legislation. A diversity of approaches also characterized the regulatory models through which COVID-19 waste management measures were implemented (see Figure 2 in chapter 1). Some countries implemented these measures as part of comprehensive environmental or waste laws. Others used or introduced pandemic or disaster management laws which included measures for managing associated wastes, or relied on sectoral waste laws (e.g. pertaining to health-care waste). In addition, some countries used targeted or time-limited measures as part of their emergency response to the pandemic.
4. By assessing the COVID-19 waste management measures taken during the pandemic, the aim is to identify examples of good practice that could serve as a model for countries considering the adoption of new legislation or revisions to existing frameworks to ensure better preparedness and responses for integrated waste management in future pandemics. Trends emerging from this analysis, as well as gaps and challenges, are discussed further in chapter 4, with chapter 5 identifying elements that might be included by countries in new or revised legislation to foster environmentally sound and integrated waste management frameworks.
5. The following sections highlight examples of countries’ policy and legislative responses to the COVID-19 pandemic which demonstrate aspects such as:
 - a. inclusion of integrated waste management objectives and waste definitions in legislation and policy guidelines;
 - b. how countries allocated major responsibilities for waste management;
 - c. approaches for waste sector regulation, including the designation of waste services as essential and provisions for protection of waste-sector workers;
 - d. measures addressing stages in the waste management life cycle and waste hierarchy from minimization to disposal, reuse or recycling;

² As an example of an emergency powers framework, s 27 of South Africa’s Disaster Management Act 57 of 2002 provides for the declaration of a national state of disaster and gives the relevant minister the power to make regulations and issue directions for a three-month period, which can be extended.

- e. particular measures adopted for specific pandemic wastes such as plastics and PPE;
- f. management of the environmental or social aspects of COVID-19 wastes;
- g. measures for public participation and access to information;
- h. measures promoting new technologies, research and development.

Legislative purpose and definitions

Integrated waste management objectives

6. Pre-existing legislation for waste management provided some countries with a framework that could be readily adapted to COVID-19 waste management during the pandemic. This was facilitated by legislative frameworks, such as environmental protection laws, which included purposes and objectives reflecting integrated waste management. Clearly articulated legislative purposes targeting integrated waste management objectives are also likely to assist in strengthening environmental outcomes in future pandemics.
7. A wide range of environmental legislation and regulations in the case study countries adopted integrated waste management objectives.³ For example, integrated waste management purposes are expressly stated in France's Environmental Code and Italy's Code on the Environment,⁴ both of which transpose relevant provisions of the EU Waste Framework Directive (see Box 6). Both France and Italy's laws emphasize the importance of managing waste without harming human health and the environment, and reference principles to guide integrated waste management, including precaution, prevention, sustainability, proximity, participation and circular economy.

³ Other examples include: Zambia's Environmental Management Act, 2011, which promotes waste reduction, reuse, recycling and recovery, and provides that the producer of waste has a responsibility to promote and/or ensure the reuse, recycle and recovery of reusable, recyclable and recoverable waste, in line with the core elements of a "waste hierarchy" approach; the Environmental Protection and Enhancement Act from the province of Alberta, Canada, which has legislative purposes that recognize the interplay between the objectives of environmental protection and promotion of human health.

⁴ Article 177(4) of Italy's Code on the Environment specifies the objective that "Waste is managed without endangering human health and without using procedures or methods that could be prejudicial to the environment."

Article 1 – “This Directive lays down measures to protect the environment and human health by preventing or reducing the generation of waste, the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use and improving the efficiency of such use, which are crucial for the transition to a circular economy and for guaranteeing the Union’s long-term competitiveness.”

Article 4: Waste hierarchy – “1. The following waste hierarchy shall apply as a priority order in waste prevention and management legislation and policy: (a) prevention; (b) preparing for re-use; (c) recycling; (d) other recovery, e.g. energy recovery; and (e) disposal. 2. When applying the waste hierarchy referred to in paragraph 1, Member States shall take measures to encourage the options that deliver the best overall environmental outcome. This may require specific waste streams departing from the hierarchy where this is justified by life-cycle thinking on the overall impacts of the generation and management of such waste.”

Article 13: Protection of human health and the environment – “Member States shall take the necessary measures to ensure that waste management is carried out without endangering human health, without harming the environment and, in particular: (a) without risk to water, air, soil, plants or animals; (b) without causing a nuisance through noise or odours; and (c) without adversely affecting the countryside or places of special interest.”

Box 6: EU’s Waste Framework Directive 2008/98/EC

8. Pre-pandemic waste legislation and regulations in other case study countries, such as Argentina, China, Kenya, Peru and South Africa, also incorporated purposes and objectives reflective of integrated waste management. For example, Peru’s Law on the Integral Management of Solid Waste identifies integrated waste management as a legislative purpose (comprising a waste hierarchy from most to least desirable management options) (see Box 7) and sets out key principles and definitions to guide waste management (e.g. circular economy, recovery of waste, extended producer responsibility [EPR], shared responsibility, and protection of the environment and public health).⁵

Article 2: “The integral management of solid waste in the country has as its primary purpose the prevention or minimization of the generation of solid waste at source, compared to any other alternative. Second, with respect to the waste generated, the recovery and material and energy recovery of the waste is preferred, including reuse, recycling, composting, co-processing, among other alternatives, provided that health protection is guaranteed and the environment. The final disposal of solid waste in the respective infrastructure constitutes the last alternative for management and must be carried out in environmentally appropriate conditions, which will be defined in the regulations of this Legislative Decree issued by the Ministry of the Environment.”

Box 7: Peru’s Law on the Integral Management of Solid Waste

⁵ Costa Rica’s Law on Integrated Management of Waste is another example, which sets out a waste hierarchy in Article 4 and includes objectives in Article 2(a)-(ñ) such as guaranteeing everyone the right to enjoy a healthy and ecologically balanced environment, and protecting public health.

9. In some nations, integrated waste management was not set as an overarching legislative purpose but instead presented as a general duty. For example, Kenya's Environmental Management and Co-ordination Act, 1999 states: "[e]very person whose activities generate wastes shall employ measures essential to minimize wastes through treatment, reclamation and recycling" (section 87). Specific duties (as opposed to general duties) are also included in regulations made under the same Act. Specific waste reduction legislative purposes can also be found at a subnational and city level (see Buenos Aires' 2006 Zero Waste Law).
10. High-level integrated waste management objectives may alternatively be found in sectoral waste laws, such as pre-existing health-care legislation and regulations for health-care or biomedical waste. This approach is evident in India's Bio-Medical Waste (Management and Handling) Rules 2016, which define "management" as: "all steps required to ensure that bio- medical waste is managed in such a manner as to protect health and environment against any adverse effects due to handling of such waste [sic]." China's 2003 Regulations on the Administration of Medical Wastes include similar objectives recognizing the importance of protecting human health and the environment through comprehensive waste management (art. 1).
11. In addition to integrated waste management objectives in pre-existing legislative frameworks, some countries incorporated integrated waste management considerations into time-sensitive, designated COVID-19 technical guidelines, typically issued under emergency powers. For example, Mexico issued its Emerging State Environmental Technical Standard (see Box 8), which applied to COVID-19 waste. The standard emphasized the importance of segregating waste, measures to protect workers and measures to ensure the safe collection of these wastes.⁶ In Kenya, the emergency powers were exercised at the onset of COVID-19 pandemic but specific guidelines on the management of COVID-19 waste were subsequently formulated.

⁶ Another case study country using a technical standard that included integrated waste management elements was Kenya, with its COVID-19 Emergency Response Project (P173820): Environmental and Social Commitment Plan (23 March 2020).

Preamble: “That in order to guarantee the exercise and respect of the fundamental rights of Mexicans, considering the environmental, economic and strategic importance of proper comprehensive management of urban solid waste and special handling waste, which will allow the care of health and environment, it is necessary to issue an Emerging Environmental State Technical Standard that establishes technical criteria for the separation, collection, treatment and final disposal of the urban solid waste and special handling waste generated as a result of the use of materials, products and by-products used by the population, in the care of the health [due to] COVID-19, in accordance with applicable legal provisions.”

Pt 5.2 General aspects: “For protection purposes and to avoid possible contagion through Urban Solid Waste, Special Handling Waste, and COVID-19 Waste will be segregated from the sources to be delivered to the collection and transport service.” The document issued by Mexico dictates practices that state and municipal governments, the collection and separation service providers, as well as the general population, must ensure. Preventive practices are established aimed at dedicated personnel including: (a) Protocol for the review of basic health conditions; (b) Health care that they must maintain during their activities; (c) Provide collection workers (formal and informal) with PPE. In addition to these points, this guideline is divided by:

- Waste management at homes
- Waste management during collection service
- Waste management at transfer station
- And final disposal

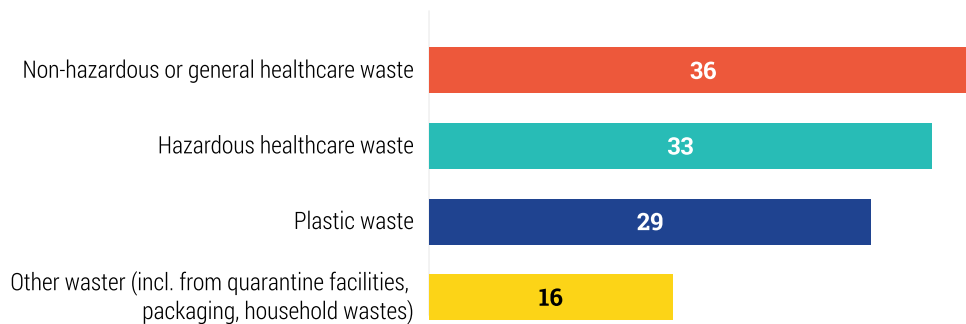
Each point is detailed with particular activities that must be done in order to protect the personnel involved in the cleaning service and consequently all the population.

“The municipalities must make the measures established in the present guide known to the population through the means of communication they have...Hazardous Waste and Hazardous Biological-Infectious Waste...must be managed in accordance with applicable federal legal provisions. The measures referred to in this Standard are essential for the safety of the personnel who will manage Health Waste as well as prevent the spread of the SARS Cov-2 virus (COVID-19).”

Box 8: Mexico’s Emerging State Environmental Technical Standard NTEAE-002-SeMAGEM-RS-2020 (July 2020)

Waste definitions

12. Waste streams that increased during COVID-19 included health-care wastes, plastic wastes, and household and commercial wastes (see chapter 1). Survey results indicated that the main types of in-country COVID-19 wastes were health-care wastes (hazardous and non-hazardous), followed closely by plastic waste (see Figure 4).



Note: Results are based on the analysis of free-text survey responses.

Figure 4: Survey results on institutional responsibilities during COVID-19

13. As set out in chapter 2, definitions of waste and related matters were contained within international guidances predating the COVID-19 pandemic, including definitions of health-care waste in WHO (2014), and definitions of waste, household waste and commercial waste in the UNEP 2016 guidelines. Plastic waste definitions typically depend on the particular regulatory context.
14. Wastes and related definitions were a prominent feature in many case study countries' pre-pandemic legislative frameworks. Such definitions were relied upon in instruments and guidelines developed during the COVID-19 pandemic. Stand-alone waste legislation, or environmental or health-care laws encompassing waste, incorporate varying definitions of wastes, often tailored to the country or region's circumstances and contexts (e.g. hospitals or health-care facilities, homes, commercial establishments and other urban spaces).
15. Given the complexity and variability of waste definitions, the case study examples highlighted offer selective, rather than comprehensive, coverage of possible waste definitions pertinent to integrated waste management (see Box 9).⁷

⁷ A further example is provided by South Africa's National Public Hygiene Strategy and Implementation Plan (June 2020), which contains South Africa's operational guidelines for waste management during the COVID-19 pandemic. It operates in conjunction with general health-care and waste management legislation, policies and legislative standards and provides definitions of general waste, health-care waste, health care risk waste and infectious waste.

EU's Waste Framework Directive 2008/98/EC

Article 3 defines “waste” as “any substance or object which the holder discards or intends or is required to discard”.

France's Public Health Code

R1335-1 defines waste from health-care activities as waste resulting from diagnostic, monitoring and preventive, curative or palliative treatment activities in the fields of human and veterinary medicine. The definition of health-care waste further distinguishes between infectious and non-infectious waste.

Jordan's Environmental Protection Law of 2017

Article 2 defines “hazardous waste” as “[w]astes of various activities and processes or their ashes that retain the properties of hazardous substances and that have no subsequent original or alternative uses unless they are treated according to scientific and technical conditions.” Note also Jordan's Regulation No. 68 of 2020 on Hazardous Materials and Waste Management System.

Kenya's Environmental Management and Co-ordination (Waste Management) Regulations, 2006

Defines “biomedical waste” as including “any waste which is generated during the diagnosis, treatment or immunization of human beings”. These regulations were supplemented by pandemic guidelines developed on COVID-19 waste management.

Box 9: Examples of waste definitions

Major responsibilities for waste management

16. During the COVID-19 pandemic, waste standards were generally set, and oversight provided for, at the national level. Varying degrees of decentralization were observed in the implementation of the pandemic waste measures across the case studies. This included emergency responses to the pandemic at the national level, especially at the outset of the pandemic, and subsequent reliance on pre-existing structures, with or without amendment, for implementing waste management.
17. This model of implementation requires well-established, decentralized governance structures and a clear understanding of responsibilities at each level, as well as the capacity to implement these responsibilities in the management of COVID-19 wastes. Canada, for example, had pre-existing health and environmental waste laws that already distributed responsibilities between national and provincial governments. Provincial governments are largely responsible for effective municipal waste management laws, with a degree of autonomy accorded to municipalities or local governments (e.g. through by-law powers). Nationally, Health Canada's role during the COVID-19 pandemic was to develop policy and practice guidance for provincial governments.
18. Decentralized waste management infrastructure is characterized by adequate coordination and coverage, not only between varying levels of government, but also across different waste streams, departments and settings. For example, in Hungary, the Ministry of Human Capacities had responsibility for regulation of health-care waste during the COVID-19 pandemic, while selective collection of medical waste was the responsibility of health-care institutions and transport to authorized disposal sites was undertaken by licensed companies (according to the general

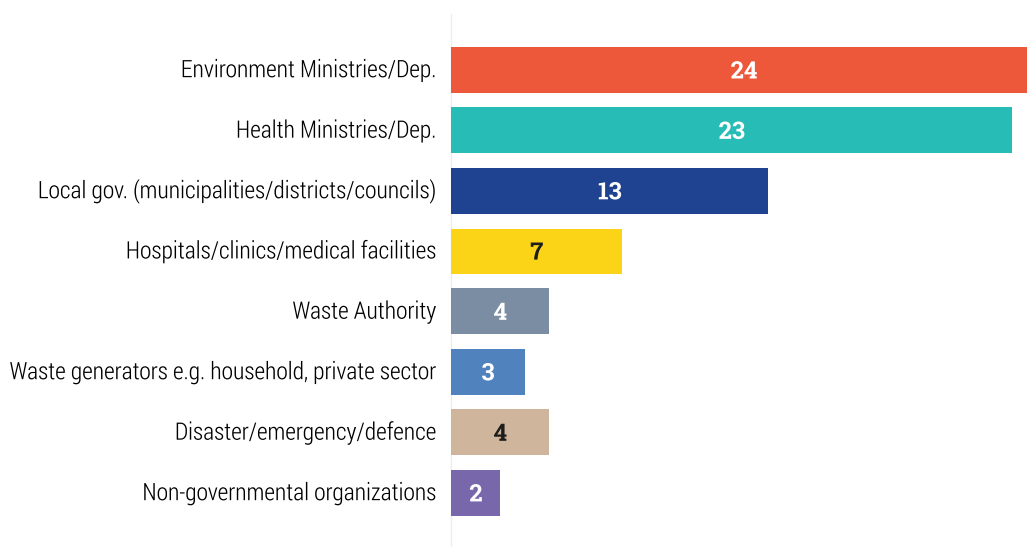
rules). The control of activities related to medical wastes was performed by the public health and environmental departments. Additionally, due to the increased amounts of waste in households, the National Coordination of Waste Management and Asset Management Zrt. (NHKV; a national coordinating body established in 2016; see Box 10) issued recommendations to public waste management service providers and facilities.

Article 32a: “(4e) The Coordinating Body shall: (a) provide inter-municipal and regional coordination for the recovery of recyclable waste collected separately from public service waste and for the disposal of non-recoverable waste; (b) establishes whether the development of the public service waste management system complies with the National Waste Management Public Service Plan; (c) establish a system for the optimal use of infrastructure resources in order to meet the goals and development of directions of waste management at the national level; (d) manages the assets entrusted to it voluntarily by local governments and associations of local governments in the field of asset management; (e) collect the public service fee and pay to the public service providers the service fee determined in accordance with the decree of the Minister responsible for setting the public service and service fee for waste management; (f) manage public service receivables.” The health-care waste issue is regulated in detail in Decree No. 11/2017 (VI.12) of the Minister of Human Capacities on the waste management activities related to pharmaceutical waste generated in the course of supplying patients and consumers with medicinal products.

Box 10: Hungary’s Act CLXXXV of 2012 on waste

19. Countries such as China used their previous experience of disease outbreaks to inform their legislative response in terms of allocating responsibilities. After the severe acute respiratory syndrome (SARS) epidemic, China introduced significant reforms to its framework for handling disease outbreaks, including reforms to the Law of the People’s Republic of China on Prevention and Treatment of Infectious Diseases (Infectious Diseases Law), the Emergency Response Law of the People’s Republic of China and the direct reporting system. These reforms aimed to unify China’s ecological and environmental departments, together with the hygiene and health departments, to coordinate a response which takes “municipalities with administrative districts as units to coordinate the resources of emergency disposal facilities” (Guo and Chen 2020, p. 8). In addition to relying on these existing pandemic and disaster management frameworks, an amendment was made to China’s Law of the People’s Republic of China on Prevention and Control of Environmental Pollution by Solid Waste (Solid Waste Law) in 2020 during the COVID-19 pandemic which emphasized the importance of cooperation between the competent departments of health, ecology and environment, environmental health and transportation (art. 91).
20. Processes for consultation between different government bodies were also a feature of some of the COVID-19 responses observed in case studies. Papua New Guinea’s National Pandemic Act 2020, for example, anticipates the creation of ad hoc Technical Advisory Councils for relevant declared periods (section 13). The Technical Advisory Council must comprise senior members of government bodies responsible for health, border protection and other matters pertinent to the national response (section 13(2)). Government bodies responsible for the environment or waste management are not expressly mentioned but could be included among the members.

21. Statutory bodies responsible for developing technical guidance for waste management were also important in the COVID-19 response. For example, a French statutory body, the *Haut Conseil de la santé publique* [High Council for Public Health], provided technical guidance on the management of COVID-19-related health-care waste, and a network of local governments, together with the Association of Cities and Regions for Sustainable Resource Management, provided guidance to municipalities on COVID-19-related waste managed at the local level. In Zambia, at the national executive level, a new National Epidemic Preparedness, Prevention, Control and Management Committee was introduced to respond to the COVID-19 pandemic. The Zambia National Public Health Institute Act, 2020 was enacted in December 2020 to augment the existing Zambia National Public Health Institute's role and extends its functions to better respond to pandemics.
22. The survey results showed that specific responsibilities for waste management and their allocation among different authorities depend on a country's circumstances and regulatory frameworks. Survey respondents were asked which institutions or agencies in their country have responsibilities for managing COVID-19 related wastes (see Figure 5).



Note: Results are based on the analysis of free-text survey responses.

Figure 5: Survey results on institutional responsibilities during COVID-19

23. The majority of survey respondents (30) indicated that these responsibilities had not changed during the pandemic (with six indicating some change and one unsure).

Waste sector regulation

24. During the COVID-19 pandemic, some case study countries designated waste collection as an essential service or identified waste-related services as having a special status, which exempted them from strict lockdown restrictions and ensured the continuity of waste services.

25. Such measures were often put in place through targeted or time-limited measures, such as emergency decrees or laws. For example, under measures implementing Italy's Decree-Law 19/2020 on Urgent measures to deal with the epidemiological emergency from COVID-19 (25 March 2020, Decree of the President of the Council of Ministers 10 April 2020), Article 2(1) suspended all industrial and commercial activities throughout Italy, unless exempted. Collection, treatment and waste disposal and the recovery of waste materials was exempted (Annex 3(38)) as were waste management services (Annex 3(39)). In France, the preamble to an order relaxing laws governing road freight listed "la gestion des déchets" (waste management) among several "activités cruciales" (crucial activities) that must be facilitated during the COVID-19 pandemic (Order of 20 March 2020 made by the environment minister).
26. In some cases, continuity of waste services during the COVID-19 pandemic was also achieved by modifying existing legislation or issuing policy or guidelines. For example, Peru amended its Law on the Integral Management of Solid Waste to provide that it is local governments' duty to ensure the continuity of waste management in emergency situations as a "basic, essential and priority service". The EU also issued guidance early in the COVID-19 pandemic recognizing the importance of minimizing interruption to municipal waste collection (including recycling services) (see Box 11).

"...the overall continuity of proper municipal waste management services, including separate collection and recycling, is to be safeguarded in line with EU law. Preventing disruptions of separate waste collection is important for ensuring that the infrastructure for residual waste collection and treatment is not overburdened, potentially creating additional health risks, that the effort sharing in waste collection is respected and the taxpayers do not bear disproportionate share [sic] of the costs of waste management, and that citizens can keep their environmentally friendly habits. Separate collection is also essential for safeguarding the trajectory towards a more circular economy and the jobs and businesses that depend on secondary raw materials supply."

Source: European Commission (2020b, p. 2).

Box 11: Example of waste sector regulation under EU law

27. In addition to essential worker designations, several case study countries included stipulations for provision of PPE and/or training to waste workers, especially in COVID-19 guidance documents or under pre-existing occupational health and safety legislation. For example, regulations made under the French *Code du travail* [Labour Code] prior to the COVID-19 pandemic govern the provision of appropriate PPE to all workers (R4323-91 to R4323-98). The regulations are tailored to the workplace, with R4323-97 providing that "[t]he employer determines, after consulting the Social and Economic Committee, the conditions under which personal protective equipment is made available and used, in particular those conditions concerning the duration of its wearing. Those conditions take into account the seriousness of the risk, the frequency of exposure to the risk, the characteristics of the workstation of each worker, and the performance of the personal protective equipment in question."
28. Beyond the provision of PPE, some countries introduced further measures to protect waste workers during the COVID-19 pandemic (see Box 12). For example, in emergency decrees, Argentina introduced tax exemptions for income earned by essential service workers who were required to work mandatory shifts, overtime and other work necessitated by the pandemic, and pensions for

families of workers who passed away due to COVID-19 (Law 27549 – Special Benefits for Health-care Workers, Armed Forces, Security Staff and Others during the COVID-19 Pandemic).⁸

A prominent feature of Canada’s response to COVID-19 wastes has been to regulate waste services under its hybrid system of public and private waste services as “essential”. Nationally, its basis was the *Guidance on Essential Services and Functions in Canada During the COVID-19 Pandemic*. At a provincial level, much regulatory activity for COVID-19 waste management has also been directed towards managing wastes services, including designating waste services or waste workers “essential”. In Quebec an exemption was allowed under the Public Health Act for “waste collection and residual materials management”. In tandem with the national Labour Code, all three provinces included in the case study analysis (Alberta, Ontario and Quebec) have also instituted regulations under relevant occupation health and safety legislation for ensuring health and safety in employment settings, including in residential care and health facilities. These regulations range from ensuring adequate ventilation, to worker training, to the provision of PPE (e.g. Alberta’s Occupational Health and Safety Act and accompanying Occupational Health and Safety Code; regulations under Ontario’s Occupational Health and Safety Act).

Box 12: Examples of waste sector regulation under Canadian national and provincial laws

Measures addressing the waste management life cycle

Waste minimization

29. Waste minimization encompasses the first two rungs of the waste hierarchy (discussed in chapter 1): prevention and reduction as part of an integrated waste management response. As defined in Article 3(12) of the EU Waste Framework Directive, prevention “means measures taken before a substance, material or product has become waste, that reduce: (a) the quantity of waste, including through the re-use of products or the extension of the life span of products; (b) the adverse impacts of the generated waste on the environment and human health; or (c) the content of hazardous substances in materials and products.”

⁸ Other examples include the following: Peru introduced broad protections through policy and guidelines, including mandatory PPE, training and monitoring of health conditions for solid waste workers, the recycling sector, and the informal sector (Ministerial Resolution No. 099-2020-MI-NAM; Ministerial Resolution No. 112-2020-MINAM; Ministerial Resolution No. 972-2020-MINSA); India issued protocols applying to sanitation workers and garbage pickers, waste segregators, biomedical waste handlers and other cleaners, and also recently amended occupational health and safety legislation to protect a range of workers (India, National Disaster Management Authority 2020; the Occupational Safety, Health and Working Conditions Code, 2020). In Singapore, tripartite advisories have been issued to advise service buyers and providers to adopt measures to ensure the sustainability of the cleaning and waste management sectors during the COVID-19 pandemic. Recommended measures include ensuring adequate remuneration of workers, maintaining a baseline level of cleaning and waste management services, paying service providers appropriately, and seizing the opportunity to upskill workers by tapping into government funding support (National Environment Agency *et al.* 2020). Such measures support the establishment and retention of a trained pandemic workforce which is vital to implementing joint health- and environment-related measures.

30. Prior to the COVID-19 pandemic, a high-level, strategic aspect of waste minimization involved putting in place plans or strategies. For example, Peru specifically addressed the minimization of solid waste in health-care facilities in a 2018 Technical Standard, with key components being a solid waste minimization and management programme and planning (see Box 13).

Peru's Ministerial Resolution No. 1295-2018-MINSA Technical Health Standard – Integrated Solid Waste Management in Health Establishments, Medical Support Services and Research Centres

“This Technical Health Standard is technically justified insofar as it is necessary to achieve the following objectives: a) establish the guidelines and procedures for the management and handling of solid waste generated by [health-care facilities] in an integrated, sanitary and environmentally sound manner; b) standardize safety conditions for patients, health personnel, cleaning staff and visitors exposed to hazardous solid waste they generate; c) provide alternatives to minimize the generation of hazardous solid waste...and reduce the negative impact that these cause the environment and people's health”.

4.1.25 Minimization is defined as the “[ac]tion of reducing to the minimum possible the generation of solid waste, through any preventive strategy, procedure, method or technique used in the generating activity”.

4.1.27 A solid waste minimization and management programme is defined as: a “planning [d]ocument that describes the actions of minimization and management of the solid waste from [health-care facilities].”

4.1.43 Solid waste is defined as “waste generated in the processes and activities for care and research medical facilities such as: hospitals, clinics, health centres and posts, laboratories, and clinics. Some of these wastes are characterized by being contaminated with infectious agents or...that are of potential danger, such as: hypodermic needles, gauze, cottons, cultures, pathological substances, food scraps, papers, packaging, laboratory equipment, medicines or pharmaceutical products.”

Box 13: Waste minimization principles in Peru's waste management measures

31. Waste minimization has been challenging during the COVID-19 pandemic, with many countries seeing increasing volumes of waste having prioritized infection prevention and control in their regulatory responses to protect populations. Nevertheless, countries' COVID-19 measures sometimes distinguished between steps taken to prevent and reduce waste from households, and health-care facilities (see Box 14).⁹

⁹ See also India's *Guidelines for Handling, Treatment and Disposal of Waste Generated during Treatment/Diagnosis/Quarantine of COVID-19 Patients* issued by the Central Pollution Control Board (2020). These include reference to minimization of general solid waste: “In order to minimize waste generation, as far as possible, non-disposable items must be used for serving food, which are to be handled with appropriate precautions and cleaned and disinfected as per hospital guidelines. If use of disposable items is inevitable, use bio-degradable cutlery” (2020, p. 3).

Argentinian Ministry of Health's COVID-19 waste management procedure recommendations for patients in quarantine

This document sets out the COVID-19 waste management procedure in home quarantine, with stages contemplated as follows: generation of household waste due to confirmed cases, storage inside the house, collection and transport, and final disposal. On the generation of waste in home isolation, it notes: "isolation waste cannot be recycled" but recommends measures "to minimize the generation of waste, avoiding the use of disposable materials as long as this does not compromise compliance with biosecurity safety measures. The use of utensils and dishes for the exclusive use of the patient is ideally recommended...and sanitized separately from the rest of the cohabitants."

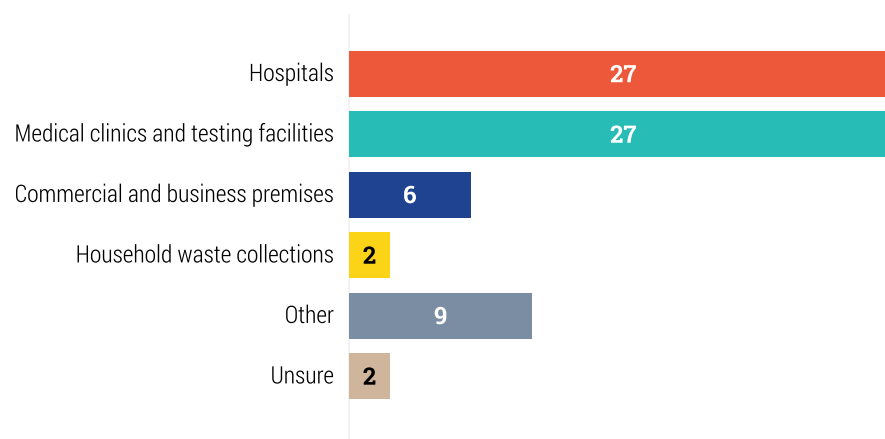
Argentinian Ministry of Health's recommendations for waste management procedures in health facilities in the context of COVID-19

These recommendations set out the procedure for COVID-19 waste management in health-care settings with stages contemplated being: Generation of waste at the isolation site, removal of waste from the isolation site, internal transport, external transport, treatment and final disposition. The document does not describe waste minimization, with all waste from isolation areas to be considered bio-pathogenic waste.

Box 14: Examples of differentiated waste minimization principles in Argentinian measures

Segregation

32. Prior to the COVID-19 pandemic, some countries reinforced the importance of segregation and separate collection of wastes as part of an integrated waste management approach, with general prohibitions on mixing hazardous waste and/or duties to segregate waste in health-care facilities and medical, commercial or business and household settings. For example, the EU requires that "Member States shall take the necessary measures to ensure that hazardous waste is not mixed, either with other categories of hazardous waste or with other waste, substances or materials. Mixing shall include the dilution of hazardous substances" (Waste Framework Directive, art. 18, transposed into France and Italy's laws).
33. As survey results indicated, many countries separated COVID-19 wastes from other wastes during the pandemic (27 respondents selected "yes", 10 respondents selected "no", and four respondents selected "unsure"). Those who selected "yes" were asked in which setting(s) the separation of these wastes occurred. Results indicated that the majority of COVID-19 wastes are separated in medical settings (see Figure 6).



Note: The numbers relate to the number of survey responses received for each option. Respondents were asked to select all applicable options.

Figure 6: Survey results on separation of COVID-19 wastes

34. Reinforcing this finding, mandatory streaming in health-care or medical facilities was a key feature of case study countries' pre-existing legislative and regulatory approaches. For example, India's Biomedical Waste (Management and Handling) Rules 2016 include simplified categories (colour coded) for the segregation, packaging, transportation, treatment and disposal of different biomedical wastes, with Rule 8 stating: "(2) The bio-medical waste shall be segregated into containers or bags at the point of generation in accordance with Schedule I prior to its storage, transportation, treatment and disposal."¹⁰
35. Policy and guidelines issued by countries during the COVID-19 pandemic reiterated the importance of segregating COVID-19 wastes in health-care and medical facilities (see Box 15).

¹⁰ As a further example, in Canada, general waste streaming classifications are set in provincial legislation (e.g. Ontario Regulation 102/94: Waste Audits and Waste Reduction Work Plans). Certain waste generators, including hospitals, are required to prepare waste audits around such waste segregation (e.g. for hazardous waste, acute hazardous waste and pathological waste).

Argentinian Ministry of Health's recommendations for waste management procedures in health facilities in the context of COVID-19

These recommendations specify certain containers for different waste streams in health facilities during the pandemic (e.g. sharps, solid waste, liquid waste), and bagging procedures.

Chinese Ministry of Ecology and Environment's Management and Technical Guidelines for Emergency Disposal of Medical Waste Infected by the Novel Coronavirus Pneumonia Epidemic (Trial) (29 January 2020)

"The infectious medical waste and other medical waste generated during the prevention and control of [COVID-19] will be classified and managed separately... Designated hospitals that treat patients with [COVID-19] should strengthen the classification, packaging and management of medical waste." Requirements are included for packaging and labelling.

India's Guidelines for Handling, Treatment and Disposal of Waste Generated During Treatment/ Diagnosis/ Quarantine of COVID-19 Patients (July 2020)

These guidelines apply in addition to existing rules (including the Biomedical Waste (Management and Handling) Rules 2016 and Solid Waste Management Rules 2016) and outline different procedures for handling/treatment/disposal of COVID-19 wastes depending on the place (i.e. isolation wards, sample collection centres/laboratories, quarantine centres/home quarantine and common biomedical waste treatment facilities).

UK's "Coronavirus (COVID-19): disposing of waste" guidance

The UK issued guidance on how to dispose of waste, including face coverings, PPE and rapid lateral flow tests. The guidance covers reusing and safely disposing of face coverings and PPE, disposing of face coverings or PPE if you or a family member are self-isolating, disposing of rapid lateral flow home test kits, disposing of waste in the workplace, disposing of rapid lateral flow test kits at businesses and schools, disposing of waste at registered health-care facilities and mass-testing locations, waste management businesses, and litter-picking during COVID-19. The guidance does not apply to hospitals, primary care providers, care homes or home care.

Box 15: Examples of waste segregation under national measures

36. Guidance issued during the pandemic also emphasized the importance of segregating wastes from confirmed or suspected COVID-19 patients isolating at home or in other settings, from other wastes (see Box 16).

Argentinian Ministry of Health's COVID-19 waste management procedure recommendations for patients in quarantine

These recommendations specify wastes to be segregated during home isolation of probable or confirmed COVID-19 cases, including disposable tissues, diapers, other contaminated dressings, disposable items for baths, PPE for health-care staff (gloves and masks), respiratory protectors (masks) worn by the patient, food containers and packaging that have been in contact with the patient, remnants of food consumed by the patient, and waste generated from cleaning the isolation room. This waste “must be stored in a basket, sheathed by a black plastic bag inside...separated from the rest of the household waste”.

EU's Waste management in the context of the coronavirus crisis (April 2020)

For municipal waste, this guidance highlights the importance of preventing disruptions to separate collection services, including recycling. It also emphasizes the need for separate measures to segregate waste from suspected or confirmed cases isolating at home.

Peru's Ministerial Resolution No. 099-2020-MINAM

This guidance includes recommendations to separate waste in homes, isolation centres, supply centres, warehouses, administrative offices, and public and private headquarters.

Box 16: Examples of segregation measures for management of wastes from home isolation

Storage, handling and transport

37. Pre-existing legislation, regulations and guidance in case study countries outlined various requirements for the handling, storage and transportation of wastes, including in light of the physical, biological, chemical and hazardous characteristics of these wastes.
38. More stringent requirements, especially relating to tracking and tracing, were apparent in some countries' pre-existing regulations for hazardous wastes such as health-care or infectious wastes. China, for example, requires units that collect, store, use or dispose of hazardous wastes to hold a permit (China's Solid Waste Law). In addition, Chinese law requires medical or health institutions and centralized medical waste disposal units to register medical waste and keep records for specified times. Other requirements specified relate to maximum temporary storage times, special transport vehicles, and tracking or procedures to be followed (China's Regulations on the Administration of Medical Wastes).¹¹
39. The storage of waste was an issue during the COVID-19 pandemic. Some case-study countries recognized that disruptions arising due to the pandemic might increase the time for which wastes had to be stored. For example, the *Decreto Cura Italia* [Cure Italy Decree] increased the maximum quantities and time allowed for the temporary storage of waste (art. 113-bis, subsequently repealed by the *Decreto Rilancio* [Relaunch Decree], art. 228-bis).

¹¹ Other examples include Canada, which issued guidelines on the specific packaging and transportation requirements for the movement of clinical, (bio)medical or regulated medical waste (broadly defined) and Kenya's Occupational Safety and Health Act, 2007 which provides that occupiers (“occupiers” includes employers) have a duty to make “arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances” (section 6(2)(b)).

40. Prior planning to ensure the timely collection of wastes and prevent the risks of longer storage times was also considered (see Box 17). Case-study countries also emphasized in policy or guidelines that waste from health-care facilities, or from patients self-isolating at home, should be safely stored including through appropriate bagging, labelling, disinfection and separate storage.

1. Municipal waste: “Member States should ensure proper planning of temporary storage capacities for waste collected for recovery in anticipation of any disruptions in sorting and other treatment processes.” (p. 3)

2. Health-care facilities: “Member States should ensure proper planning of capacities for treatment and, where necessary, storage of medical waste. In case of treatment disruptions due to lack of dedicated disposal or incineration capacity for medical waste, it is paramount that waste is safely stored temporarily until the capacity issue is solved. Storage should consider the use of sealed containers in secured areas where access is limited only to authorised personnel. The inner and outer surfaces of the containers should be treated with a suitable disinfectant. The containers should be stored locally. Additional capacity for the treatment of medical waste to deal with its infectious properties may be required.” (p. 4)

Source: European Commission (2020b).

Box 17: Storage measures under EU waste management laws for the COVID-19 crisis

41. In relation to waste handling, as already noted, some case-study countries included stipulations for waste workers to be provided with PPE and/or training. These requirements were mostly found in COVID-19 policy or guidance documents, as well as in pre-existing occupational health and safety legislation.
42. Regarding transport of wastes, some case-study countries published procedures in relation to tracking, traceability and record-keeping of COVID-19 waste in policy or guidelines.¹² This tracking and tracing of COVID-19 waste plays a role in monitoring the volume of waste (see Box 18).

¹² For example, China; see the *Management and Technical Guidelines for Emergency Disposal of Medical Waste Infected by the Novel Coronavirus Pneumonia Epidemic (Trial)*: “[t]he infectious medical waste generated during the prevention and control of [COVID-19] shall be transported using special medical waste transport vehicles...During the medical waste transfer process, an electronic transfer coupon or a paper coupon can be run according to the actual local conditions. Before trans-shipment, the trans-shipment route and handover requirements should be determined. The transportation route should avoid densely populated areas as much as possible, and the transportation time should avoid rush hour. Medical waste should be transferred to the disposal facility within 48 hours. Each time the transport vehicle is unloaded, it should be disinfected in accordance with the method and frequency required by the health authority...The transfer form should be filled out separately from other medical wastes and a ledger should be established”.

Argentina's Resolution 99/2020 (March 2020)

This required that all provincial authorities record all operators of pathological or pathogenic waste within 10 days. All provincial authorities and the Autonomous City of Buenos Aires were required to provide monthly updates, with the Ministry of the Environment and Sustainable Development recording the information received and making it available to the health and environmental authorities.

Argentina's Resolution 120/2020 (April 2020)

This recognized that with health authorities repurposing certain places (e.g. hotels) to cope with the foreseen significant increase in the number of COVID-19 patients, it was necessary to establish the traceability of pathological waste from these facilities which were not currently registered. The resolution establishes a procedure for authorizing the management of hazardous/pathological waste from these facilities.

Canada's Transportation of Dangerous Goods Act, 1992; Transportation of dangerous goods regulations

A COVID-19 amendment included coronavirus as Item 3(3) in Appendix 3, classifying the virus as an "infectious substance." This broad definition could include used diagnostic tests, soiled PPE or general waste. Transport Canada issued guidelines on the transportation of infectious substances under the Regulations in 2020 which include requirements for safe transportation of infectious substances (Class 6.2), and on specific packaging and transportation requirements for the movement of clinical, (bio)medical or regulated medical waste.

India's Supreme Court (*M.C. Mehta v Union of India & Others*, Case No. 13029/1985, 21 July 2020)

The Court made it mandatory for urban local bodies and state pollution control boards to use mobile applications for tracking biomedical waste daily to ensure that waste is collected, transported and sent to registered common biomedical waste treatment facilities. The Central Pollution Control Board also publishes information about the common biomedical waste treatment facilities involved in the management of biomedical waste, including the volumes of waste collected.

Box 18: Examples of transport measures for COVID-19 wastes**Collection, treatment and disposal**

43. Prior to the COVID-19 pandemic, many case-study countries had legislative provisions relating to the collection, treatment and disposal of waste. Permitting or licencing of facilities involved in waste collection, treatment and disposal was a feature of these legislative schemes. Under Italian law, access to waste collection services is also considered part of a person's fundamental right to a healthy and protected environment (see *Di Sarno and Others v Italy*, Case No. 30765/08, 10 January 2012).
44. There is a relationship between the effective segregation of waste and the safe collection, treatment and disposal of these wastes. For example, as one survey respondent noted, one of the key successes in their country was "separating hazardous medical waste (including wastes related to COVID-19) because it is transferred to the medical waste treatment center, sterilized, and then buried. In this way, prevention and safety were secured for everyone."

45. During COVID-19, relevant waste collection regulations related to the collection of wastes from health-care facilities (for example, by designated hazardous waste collectors), and to the collection of wastes from homes and other settings (including both hazardous and non-hazardous wastes). Not all case-study countries had comprehensive formal waste-collection services. Some, such as South Africa, were working towards reducing disparities in waste collection between urban and rural areas, while also dealing with extensive informal waste-picker sectors which complicate the adoption of integrated waste management principles for waste collection.
46. Countries such as India set out responsibilities or duties for these different settings.¹³ They also emphasized the importance of ensuring the continuity of comprehensive collection services (i.e. recycling services), as was the case in the EU. Where waste collection practices were altered, the EU advised Member States to only make changes that were “necessary and proportionate to protect human health in particular by limiting them to areas and time periods strictly necessary” (European Commission 2020b, p. 2).
47. Waste treatment includes, as per the definition provided by Peru’s Law on the Integral Management of Solid Waste, “the processes, methods or techniques that enable the modification of the physical, chemical or biological characteristics of the solid waste, to reduce or eliminate its potential danger of causing damage to health or the environment and aimed at enhancing or facilitating final disposal” (art. 40).
48. The specific processes, methods or techniques available for waste treatment depend on a country’s capacities and constraints but are to be guided by human health and environmental protection considerations.¹⁴ The EU, for example, has the power to set out technical minimum standards for treatment activities, including sorting and recycling of waste, which should: “(a) be directed to the main environmental impacts of the waste treatment activity; (b) ensure that the waste is treated in accordance with Article 13 [protection of human health and the environment]; (c) take into account best available techniques; and (d) as appropriate, include elements regarding the quality of treatment and the process requirements” (EU Waste Framework Directive, art. 27).
49. Incineration is a common treatment method recommended for hazardous wastes, including medical waste generated during the COVID-19 pandemic. During this time, in recognition of the exponential increase in the volumes of hazardous health-care wastes, some countries authorized certain operators to carry out the exceptional incineration of hazardous wastes.¹⁵ Argentina sought to mitigate any environmental impacts of this by providing, at the national level, that registered hazardous waste operators were only authorized if they had a current Annual

13 India’s *Guidelines for Handling, Treatment and Disposal of Waste Generated during Treatment/Diagnosis/Quarantine of COVID-19 Patients* applied in addition to the existing Biomedical Waste (Management and Handling) Rules 2016 and Solid Waste Management Rules 2016. They set out relevant waste collection, disposal and treatment duties/responsibilities of various authorities, including: (a) duties of common biomedical waste treatment facilities to collect COVID-19 waste, including record-keeping/reporting, using a tracking app, sterilization and care of workers; (b) duties of state pollution control boards/pollution control centres, including maintaining records, ensuring proper segregation, collection and disposal of biomedical waste as per the relevant rules/guidance, and coordinating with common biomedical waste treatment facilities and urban local bodies in establishing adequate facilities for COVID-19 waste collection and disposal; and (c) duties of urban local bodies, including ensuring collection of biomedical waste (by common biomedical waste treatment facilities) and solid waste from quarantine camps/homes, ensuring that general solid waste/biomedical waste is not mixed.

14 UNEP (2020d) sets out preferred technologies to treat COVID-19 waste (autoclave, sterilisation), secondary preferred technologies (twin chamber incineration), temporary stop-gap solutions (brick-built De Montfort incinerators, barrel incinerators with air induction) and emergency solutions (onsite pit burial).

15 China authorized emergency incineration facilities under the *Management and Technical Guidelines for Emergency Disposal of Medical Waste Infected by the Novel Coronavirus Pneumonia Epidemic (Trial)*. Peru required emergency solid waste infrastructure projects approved without environmental assessment processes to include technical modifications to minimize environmental impacts, to report regularly, and to obtain an environmental assessment/permit once the emergency was over (Legislative Decree No. 1501).

Environmental Certificate and complied with relevant regulations (Resolution 144/2020). EU measures also emphasize environmental considerations where exceptional treatment processes are authorized (see Box 19).

Medical waste: “If Member States decide to exceptionally authorise alternative treatment processes of medical waste in line with EU law and applicable national rules, including in state of emergency conditions, they should ensure that where such processes have less beneficial overall environmental outcome than the normal practice, their use is limited in time and strictly necessary to address identified storage and treatment capacity shortages. The appropriate precaution as regards health and safety measures at the workplace should be applied.”

Source: European Commission (2020b, p. 4).

Box 19: Treatment measures under EU coronavirus waste management law

50. Disposal is the last stage in the waste hierarchy.¹⁶ For example, Peru’s Law on the Integral Management of Solid Waste, adopted prior to the COVID-19 pandemic, provided that “[w]aste that cannot be [recovered] must be isolated and/or confined in duly authorized infrastructures, according to the physical, chemical and biological characteristics of the waste, in order to eliminate the potential danger of causing damage to health or the environment” (art. 41).
51. Difficulties in final disposal during the pandemic arose where treatment facilities for hazardous waste were lacking, as well as regarding the safe disposal of ashes from incineration of hazardous waste, and the mixing of municipal and hazardous wastes from homes. In seeking to deal with these challenges, under Argentina’s *COVID-19 waste management procedure recommendations for patients in quarantine*, the Ministry of Health recommended that practical consideration be given to disposal at a designated spot in sanitary landfills or, where unavailable, open air dumps, avoiding the exposure of waste workers and the informal sector as much as possible.

Reuse, recycling and the circular economy

52. Prior to the COVID-19 pandemic, many of the case-study countries had legislative measures in place relating to reuse or recycling, including provisions on producer responsibility and the circular economy. This approach is particularly evident in environmental legislation and regulations providing for circular economy approaches to waste management and provisions encouraging recycling and reuse, and EPR schemes (including for plastics and other recyclables), such as are found under Zambia’s Environmental Management Act, 2011 (sections 58 and 63). It is also particularly evident in Statutory Instrument No. 65 of 2018 which specifically focuses on EPR.

¹⁶ The European Union has a pre-existing Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste (Landfill Directive). The aim of the Directive is to prevent, or reduce as much as possible, any negative impact from landfill on surface water, groundwater, soil, air or human health, and it does so by introducing stringent operational and technical requirements.

53. Health legislation might also include measures placing responsibilities on producers for disposal. However, pre-COVID-19 legislative provisions regarding reuse were often not appropriate due to human safety concerns (e.g. they did not prevent the dangerous reuse of PPE).
54. Recycling can be defined as “any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations” (EU Waste Framework Directive, art. 3(17)).
55. During the COVID-19 pandemic, some countries experienced disruption to recycling activities, especially at the outset. Case-study countries showed steps towards the continuation, and/or safe resumption of, such services (see Box 20).

Argentina’s Recommendations for the management of recyclable waste in the context of COVID-19

While the COVID-19 pandemic has resulted in disruption to the recycling sector, it is advisable to gradually resume collection, transportation, separation and management of recyclable waste. As such, this guidance sets out a series of recommendations for the management of recyclable waste in the context of COVID-19.

Peru’s Ministerial Resolution No. 199-2020-MINAM

This resolution includes a framework to restore the waste management and recycling network in Peru, including measures for the management of wastes in future emergencies, such as requiring district and provincial authorities to implement pre-emptive plans (covering actions to be taken in emergency situations related to at least scoping of collection routes, provision of PPE/disinfection kits, identification of operators/drivers, procedures for de-contamination), as well as creating information tools and mechanisms to facilitate environmental management measures, and maintaining sanitary conditions in emergency situations.

Box 20: Examples of national reuse and recycling measures

56. EPR measures ensure that producers have responsibilities for wastes and may include return of products or financial responsibility for waste activities. The EU’s Waste Framework Directive, for example, provides that Member States may adopt measures to encourage “the development, production and marketing of products and components of products that are suitable for multiple use, that contain recycled materials, that are technically durable and easily repairable and that are, after having become waste, suitable for preparing for re-use and recycling in order to facilitate proper implementation of the waste hierarchy. The measures shall take into account the impact of products throughout their life cycle, the waste hierarchy and, where appropriate, the potential for multiple recycling” (art. 8).
57. Prior to the COVID-19 pandemic, many small island states with limited capacity or space for final disposal had started initiatives for the export of recyclable wastes. For example, the RePLAST-OECS Plastic Recycling Project is a two-year initiative, piloted in Saint Lucia, with replication to follow in Organisation of Eastern Caribbean States (OECS) countries, aimed at setting up an incentivized plastic waste-collection and recycling scheme. Plastic collected is transferred to local recyclers for processing and preparation for export to a recycling facility in the Caribbean. The Moana Taka

partnership between the Secretariat of the Pacific Regional Environment Programme (SPREP) and the China Navigation Company in the Pacific is another example. The partnership enables use of empty shipping containers to transport non-commercial recyclable waste from Pacific Island countries and territories to countries with appropriate waste disposal facilities.

58. Another example is South Africa's EPR scheme, adopted under regulations issued in November 2020, which applies to paper, packaging and some single-use products to promote recycling and reuse for post-consumer paper and plastic items. More clarification is needed, however, on how these regulations operate in the context of COVID-19.

Measures targeting specific pandemic wastes

Plastics

59. Pre-COVID-19, many countries had measures in place to address plastic wastes. These include, for example, France and Italy's broad provisions on plastics which implement EU law (including single-use plastics, recycling, EPR and microplastics). Argentina, Buenos Aires, India, Jordan, Kenya and Papua New Guinea have regulations relating to single-use plastic bags. Laws passed in China and Peru establish frameworks for single-use plastics, other non-reusable plastics and containers for food and beverages.
60. Legislation regulating plastics in some countries was suspended or delayed during the COVID-19 pandemic. Italy, for example, delayed the introduction of its single-use plastic tax because of the economic effects of the COVID-19 pandemic (Relaunch Decree, art. 139). Other countries continued with plastic bans that were in the pipeline. The Bahamas, for example, passed an Environmental Protection (Control of Plastic Pollution) Act in 2019 eliminating single-use plastic in the country (single-use plastic bags, single-use plastic foodware) which entered into force in January 2020, and was fully implemented by July 2020. With some exceptions, such as South Africa, no new plastic waste laws have been introduced as a result of the COVID-19 pandemic.

Personal protective equipment (PPE)

61. Occupational health and safety requirements to provide workers with PPE were in place in some case-study countries' legislation prior to the COVID-19 pandemic, such as in France and in Italy. During the COVID-19 pandemic, all case-study countries emphasized the importance of providing PPE to workers and ensuring that PPE was safely used and disposed of to mitigate infection risks (including disposal as hazardous waste). These measures evidenced a clear human health priority.
62. However, PPE is not protecting everyone equally: female health-care workers make up roughly 70 per cent of the workforce and are bearing the brunt of ensuring our collective well-being (United Nations Entity for Gender Equality and the Empowerment of Women [UN Women] 2020). Female health-care workers report that even the smallest sizes of PPE are too big for them (Kleinman 2020). PPE equipment must be designed for both women and men to prevent unnecessary exposure and ensure the safety for all health-care workers. A number of standards bodies such as the International Electrotechnical Commission, International Organization for Standardization (ISO), ASTM International, the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC) have supported the response by providing open access to many standards including PPE-related standards (UN Women 2020).

63. There are significant opportunities to redress PPE as a waste stream. Most single-use PPE is regarded as non-hazardous waste with disposal in municipal solid waste landfills. Some countries, recognizing the increasing quantities of waste going to landfill, have therefore introduced recycling initiatives to manage PPE as a specific waste stream (see Box 21).

France's Emergency Law and Labour Code

Laws in France have identified specific types of waste, and relevant workplaces, for targeted regulation, implemented under Emergency Law No. 2020-290 of 23 March 2020 to deal with the COVID-19 epidemic and existing laws such as the Labour Code. From mid-March 2020, a series of measures in the form of decrees and orders covered technical aspects of health-care wastes. For example, the Order of 16 October 2020 creates an annex to Article 26 of the Order of 10 July 2020, requiring a disposal system for waste from health-care activities that might be infectious in accordance with various provisions of the Public Health Code. The annex requires PPE to be worn by health-care workers carrying out testing. PPE is described as "masks, gowns, gloves, headgear and eye protection such as protective glasses or a visor". It may be inferred that PPE would constitute waste from health-care activities that is subject to the disposal system. Articles 1 and 6 of the Order 2 of November 2020 relate to the transport of possibly infectious health-care waste.

Italy's Cure Italy Decree and Relaunch Decree

Italy's laws responding to the COVID-pandemic provided for minimum environmental criteria relating to masks and PPE in order to promote environmental sustainability and reduce pollution caused by the spread of single-use PPE (Cure Italy Decree, art. 15(4-bis)). They included measures designed to meet the increase in waste generated by the widespread use of disposable masks and gloves (Relaunch Decree, art. 229-bis). For example, they allow for the issuance of minimum environmental criteria relating to masks, PPE and medical devices.

India's Guidelines for Handling, Treatment and Disposal of Waste Generated during Treatment/Diagnosis/ Quarantine of COVID-19 Patients

"Waste masks and gloves in general households should be kept in paper bag for a minimum of 72 hours prior to disposal of the same as dry general solid waste after cutting the same to prevent reuse. Discarded PPEs from general public at commercial establishments, shopping malls, institutions, offices, etc. should be stored in separate bin for 3 days, thereafter disposed of as dry general solid waste after cutting/shredding. At Material Recovery Facilities (MRFs), discarded PPEs containing plastic should be shredded and sent to SPCB [state pollution control board] authorised plastic waste recyclers, or may be converted into refuse derived fuel (RDF) for co-processing or energy recovery (in Waste to Energy Plants) or for road making. Shredded PPEs may be disposed at landfill only in case the requisite infrastructure as required under SWM [Solid Waste Management] Rules is not available in the State. PPEs doffed by health-care workers accompanying diseased body of COVID-19 patient to crematorium / graveyards should be treated as biomedical waste and disposed as per provisions under SWM Rules, 2016 and BMW [Biomedical Waste] Management Rules, 2016 [sic]." (pp. 10-11)

Box 21: Examples of plastic and PPE reuse and recycling measures

Management of environmental and social impacts

64. Legislation relating to waste management in place prior to COVID-19 recognized the environmental and social impacts of waste (e.g. on workers, women, children). For example, according to Peru's Law on the Integral Management of Solid Waste: "Comprehensive waste management includes the necessary measures to protect people's individual and collective health, in harmony with the full exercise of the fundamental right to live in a balanced and adequate environment for the development of life" (art. 5). The EU includes a general provision that Member States should adopt measures to ensure that waste management does not harm human health or the environment (EU Waste Framework Directive, art. 13).
65. During the COVID-19 pandemic, there was some recognition that any derogation from environmental protection considerations in light of public health concerns should be necessary and proportionate (see, for example, art. 13 of the EU's Waste Framework Directive, and European Commission 2020b). It was also recognized as essential for integrated waste management that disruptions be prevented or limited. This includes steps to prevent and reduce possible obstacles to transboundary movements of waste and to facilitate implementation of guidelines or rules on waste shipments e.g. timely communication/action, clear procedures, close/effective cooperation (European Commission 2020a).
66. In terms of future pandemic preparedness projects, Kenya requires that these be implemented in accordance with environmental and social commitment plans (see Kenya's Environmental and Social Commitment Plan).
67. In some cases, environmental and social protection was broadly defined to also reflect considerations for the protection of groups at greater risk from COVID-19 such as pregnant women, the elderly and those in the informal sector. For example, Argentina's Resolution 207/2020 creates a temporary exemption for at-risk groups from the "duty of assistance in the workplace" under the terms specified. Exempt groups include workers over 60 years (except workers in the health sector who are considered "essential personnel"), pregnant workers, and male and female workers in identified high-risk groups.
68. Measures in France reflected a different approach with the country's Emergency Law No. 2020-290 relaxing certain environmental laws in response to the COVID-19 pandemic. In the case of Italy, under its Cure Italy Decree, certain payments relevant to waste management services were temporarily suspended (art. 72-bis) and the deadline for certain reporting measures related to quantities and types of waste was extended (art. 113).
69. The EU has strong policies and strategies in place to promote gender equality.¹⁷ For example, the EU funded the Urban Strategies for Waste Management in Tourist Cities project which included a specific study on *Gender mainstreaming in waste planning* (Urban Waste 2019). The study found that waste management is highly masculinized, with gender issues in waste management poorly understood and neglected. There are also gendered attitudes and behaviours towards waste (e.g. in the home, with women responsible for unpaid waste disposal and associated decisions), and gender mainstreaming is only scantily embedded in practice across the EU (Urban Waste 2019).

¹⁷ See https://ec.europa.eu/info/policies/justice-and-fundamental-rights/gender-equality_en.

Public participation and information

- 70.** Public access to information and consultation procedures are often a feature of environmental legislation, including those applicable to waste management. For example, Italy's Code on the Environment provides that waste management shall be carried out "in compliance with the rules in force regarding participation and access to environmental information" (art. 178(1)). Both Italy and France transpose the provisions of EU law into their national frameworks, with the EU Waste Framework Directive relevantly providing that "Member States shall ensure that relevant stakeholders and authorities and the general public have the opportunity to participate in the elaboration of the waste management plans and waste prevention programmes, and have access to them once elaborated" (art. 31).
- 71.** Prior to the COVID-19 pandemic, Italy was also a partner in the Partnership for Principle 10, a network "to improve national public participation systems to ensure access to information, public participation, and justice in decision-making that affects the environment" (United Nations 2012). Government websites also publish yearly data on wastes.
- 72.** While there are emerging practices and protocols around public participation (see Box 22) and provision of information in managing pandemic waste,¹⁸ as well some waste reporting systems, there are few mandatory requirements. This might be a particular focus for reform to introduce more environmentally sound and integrated waste management approaches for future pandemics (discussed further in chapter 5).

Papua New Guinea's response to COVID-19

Stakeholder engagement and transparency of information have been highlighted as an important part of Papua New Guinea's response to COVID-19 in general (as distinct from waste management in particular). Part III of the National Pandemic Act 2020 on "Stakeholder Engagement" speaks very generally of engagement with governmental bodies, the defence force, international partners, the private sector and NGOs. The government also sought to educate the "public on how to protect themselves and address rumors and fake news" (Papua New Guinea, Department of Health 2019, p. 3) and the Minister for Communication & Information Technology created the Official Information Center for COVID-19 in Papua New Guinea.

Box 22: Examples of public participation and information in Papua New Guinea's COVID-19 response

- 73.** More generally, some countries emphasized the importance of public awareness-raising and intergovernmental engagement during the COVID-19 pandemic in their policy or guidelines. For

¹⁸ The Government of Canada is taking action to reduce litter, promote reusable alternatives, and increase the recovery and recycling of PPE. Federal departments and agencies are supporting innovative product and technology solutions through research and development grants; engaging and informing the public on reusable masks and appropriate disposal of PPE via social media campaigns; and taking leadership by reducing PPE waste in federal government operations. Targeted PPE waste working groups with federal, provincial, and territorial representation have been convened to share best practices and lessons learned, promote effective end-of-life management, identify gaps and opportunities, and develop a shared vision for sustainable PPE management in Canada.

example, one survey respondent noted: “[the Environment and Health Departments’] joint social media campaign on proper disposal of non-medical PPE was the most successful in the two departments’ history.”

74. Meanwhile, India placed a duty on urban local bodies to “create awareness among citizens regarding segregation of municipal solid waste and biomedical waste (as part of Domestic Hazardous Waste) generated from homes/ quarantine homes/ home care facilities [sic]” in its *Guidelines for Handling, Treatment and Disposal of Waste Generated during Treatment/Diagnosis/Quarantine of COVID-19 Patients*). The EU stated that “[t]he Commission will continuously monitor the situation with the Member States and waste operators and invites them to communicate measures taken in response to the coronavirus crisis in the area of waste management” (European Commission 2020b, p. 5).

Technology, research and development aspects

75. As some countries have started to emerge from the COVID-19 pandemic, this has coincided with the adoption of measures for further technology, research and development which support integrated waste management.
76. In Australia, for example, the Federal Government held a National Plastics Summit in March 2020. Ideas generated at the summit informed the National Plastics Plan, launched in March 2021, which outlines how Australia will deal with the issue of plastic waste. Italy has established a €1m fund to incentivize an experimental programme for prevention, reuse and recycling of PPE and its disinfection for reuse (Relaunch Decree, art. 229-bis).
77. In September 2020, Peru issued a draft Decree which presented a framework to restore the waste management and recycling network in Peru, including measures for waste management in future emergency situations such as requiring district and provincial authorities to implement pre-emptive plans (Ministerial Resolution No. 199-2020-MINAM). Canada has provided research and development grants for alternatives to single-use PPE, and instituted a number of research projects.
78. The French Environmental Code incorporates the country’s national waste prevention and management policy, described as “an essential lever in the transition to a circular economy” (art. L541-1). In relation to plastic pollution, it states that public policies “promote research and development, relying whenever possible on know-how and local resources or raw materials, and healthy, sustainable, innovative and inclusive substitutes or alternatives” (art. L541-1). Specific research and development initiatives in France relevant to COVID-19 waste have included €2m of funding from the provincial government that includes Paris (Île-de-France region) for the recycling of single-use masks “to identify and support collection systems and recycling as part of the development of the circular economy” (Région Île-de-France 2021).

Chapter 4:

Analysis of adopted measures



Overview

1. This chapter draws on findings of the in-depth case studies and online survey, including examples identified in chapter 3, to identify key trends and gaps in waste management responses to the COVID-19 pandemic. It analyses how effective national measures were across the stages of the pandemic response, including the initial emergency response, the management phase and the recovery phase (which encompasses the development of preparedness measures) (see Figure 7).

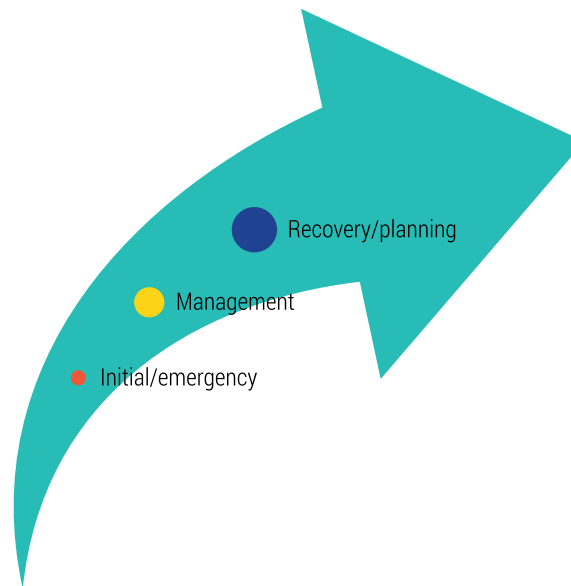


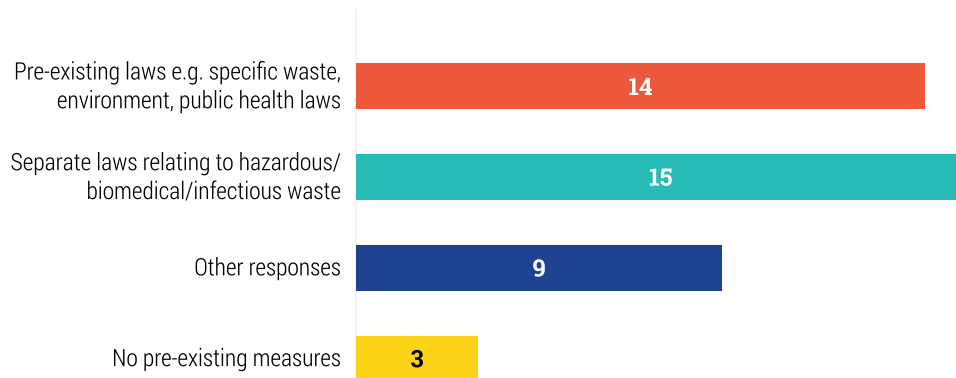
Figure 7: Stages of the pandemic response

2. This analysis shows that no one jurisdiction has emerged from COVID-19 as a clear leader for best-practice integrated waste management during the pandemic. Rather, multiple countries provide evidence of legislative and policy measures that could be consolidated to develop a best-practice waste management model for COVID-19-related wastes and greater preparedness through more integrated responses in future pandemics.

COVID-19 measures: models and approaches

3. Survey results showed that countries adopted a mix of legislative and policy responses to the COVID-19 pandemic and differed in the regulatory models they used to implement COVID-19 waste measures.
4. Most countries had measures in place prior to the pandemic (e.g. under legislation, regulations, orders or government policies) at the national, provincial or municipal level that were applicable COVID-19 wastes. These included specific waste legislation (e.g. a Waste Act or Law or regulations), environmental protection legislation (e.g. an Environmental Management Act), or public health

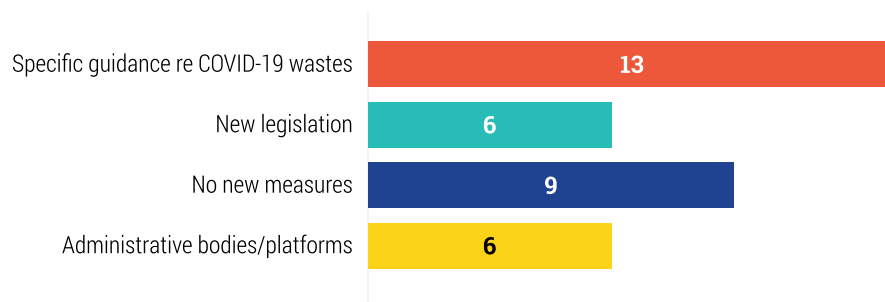
legislation (e.g. a Health Code), as well as separate measures specifically relating to hazardous, biomedical or infectious waste (see Figure 8).



Note: Respondents were asked whether, prior to the pandemic, their country had existing measures (legislation, regulations, orders or government policies) at the national, provincial or municipal level that could apply to COVID-19-related wastes. They were advised that measures might apply to one or more sectors (e.g. healthcare, disaster management, emergency response, waste management, biosecurity). Results are based on the analysis of these responses.

Figure 8: Pre-existing measures for COVID-19 wastes

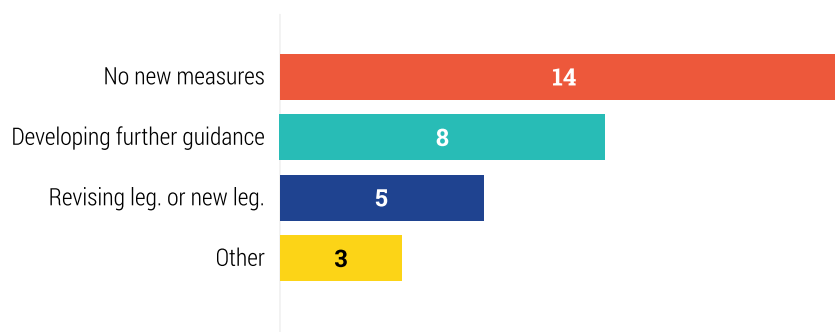
- Respondents were also asked if their country had introduced any measures during the pandemic to deal specifically with COVID-19-related wastes. Again, a variety of approaches were adopted, with some countries predominantly relying on pre-existing frameworks, while other countries introduced guidelines and new legislation (see Figure 9).



Note: Results are based on the analysis of free-text survey responses.

Figure 9: New measures adopted during the COVID-19 pandemic

- Survey respondents were also asked if there were any new or revised measures in the pipeline at the national, provincial or municipal level to deal with COVID-19-related wastes. Responses were mixed (see Figure 10).



Note: Results are based on the analysis of free-text survey responses.

Figure 10: Measures in the pipeline for COVID-19 wastes

7. The responses show that while some countries developed new legislation or regulations on waste management during COVID-19, others relied predominantly on their existing legislative framework. Preparedness for the outbreak, and the extent to which the country was affected by the pandemic, appeared to be key factors in the level of legislative activity on COVID-19 wastes.
8. The following sections elaborate on these indicative results by discussing the key trends and gaps in national and regional waste management responses to the COVID-19 pandemic, to analyse how effective they were across the stages of the pandemic response.

Trends and gaps

Initial or emergency response

9. Initial COVID-19 measures were often put in place through executive power (e.g. regulations, orders, decrees, resolutions, policy or guidelines including health-related directives), under a declared state of emergency or public health emergency, or through existing legislation. Health expertise, from both international organizations and national health officers, was key to the design of general COVID-19 responses.
10. The reliance on executive powers reflected the critical need for immediate responses and generic legal and institutional infrastructure in health and environmental/waste fields that could be rapidly adapted to COVID-19 requirements (e.g. legislative purposes and objectives of integrated waste management, definitions of waste streams).
11. Where countries either lacked pre-existing legal and institutional infrastructure for waste management, or legal and institutional structures were not sufficiently adaptable to manage pandemic waste streams, this resulted in challenges including the following reported by survey respondents:
 - a. “[p]oor understanding of institutional mandates has led to duplication and confusion of mandates among Government institutions”;

- b. “conflict of mandates of the various institutions”;
 - c. excessive bureaucratic requirements also slow the effective implementation of legal and administrative requirements regarding waste management...[and] the competencies on waste management shared between [municipalities and the local authority] generate confusion when applying the legal framework and differentiating responsibilities”;
 - d. [i]nadequate institutions to address COVID-19, and inadequate implementation of COVID-19-related plans and strategies”;
 - e. [t]here is no clear-cut legislation on COVID-19 waste management”;
 - f. [t]here is weak regulatory framework to effectively manage the country’s waste”;
 - g. “the management of COVID-19-related wastes was not a priority in my country”.
12. Moreover, the extent to which countries relied on time-sensitive executive powers to introduce COVID-19 waste measures may have contributed to downplaying certain environmental aspects of integrated waste management (e.g. minimizing pollution from COVID-19 wastes), and a focus on health-care wastes to the exclusion of other waste streams (e.g. recyclables, plastic waste). For example, few countries introduced integrated waste management purposes and objectives across COVID-19-specific legislation and policy measures.
13. Early COVID-19 measures also often included a designation of waste collection as an “essential service” to ensure that waste-collection services continued despite lockdowns. These measures emphasized the importance of continuity in waste service provision during a pandemic. Countries also included stipulations for essential workers, including those in waste services, to be provided with appropriate PPE.
14. However, gaps arise where “essential service” designations do not cover all waste workers, such as countries with a large informal sector or those in recycling services, and where countries do not have adequate access to PPE or training for all workers.

Key points: Gaps in COVID-19 initial or emergency waste responses

- There is a lack of adequate pre-existing legal and institutional infrastructure for COVID-19 waste management, including a lack of clear institutional responsibilities and incomplete coverage of waste streams in legislation, policies or practices.
- There is a lack of integrated waste management purposes and objectives across COVID-19 legislation and policy.
- Essential service designations do not cover all those employed in the waste sector.
- There is inadequate access to PPE or training in COVID-19 waste sector regulation.

Management

15. As noted earlier, many COVID-19-related waste measures lacked focus on “environmental protection”. For example, there was limited integration of waste minimization measures into COVID-19-specific

laws and guidelines. This was particularly the case in terms of minimizing waste from health-care facilities (compared with other settings such as households, for which waste minimization is more feasible given the generally non-hazardous characteristics of these wastes). This lack of waste minimization measures is likely due to the need to ensure infection protection and control and human protection in COVID-19 responses.

16. Many countries require mandatory segregation of wastes in their laws and policies. However, implementing segregation requirements in practice, and waste management systems in general, has been a challenge for some countries during the COVID-19 pandemic. For example, survey respondents cited challenges in “the appropriate management and separation of other waste from waste generated by COVID-19 patients”, “challenges in segregating COVID-19 waste and other waste from sources [sic]”, and stated that “the country lacks proper waste management system [sic]: waste separation, collection of domestic and business waste, and disposal.”
17. In addition, requirements for the safe storage, handling and transport of COVID-19 wastes, which have largely been found in policy and guidelines, are dependent on adequate access to resources and facilities. For example, where a country’s waste system is overwhelmed, some countries have temporarily stored COVID-19 wastes, which increases human health and environmental pollution risks. Furthermore, some countries do not have appropriate vehicles or tracking technology to safely transport hazardous health-care wastes.
18. Safe disposal of COVID-19 wastes is a challenge and a key gap in countries where, for example, in the words of some survey respondents, there is a lack of “modern waste disposal facilities e.g. sanitary landfills” (“although some medical facilities use licensed incinerators to dispose medical waste, the rest end[s] up at open dumpsites [sic]”) and there are “no waste disposal facilities to handle hazardous waste”. Stockpiling or dumping of health-care wastes in general dump sites may lead to exposure of dump staff and informal waste pickers, who are overrepresented by women and children in some nations.
19. A common requirement imposed by COVID-19-related health-care waste measures is incineration of these wastes. In practice, incineration requirements may be difficult to fulfil in some countries where there is a lack of sufficient incinerators, or where incinerators are not working at an effective capacity or at all. As highlighted by survey respondents, “[c]hallenges regarding medical waste in general is that all incinerators of the hospitals are functioning accordingly [sic]. Some are defect[ive] or some hospitals do not have an incinerator.”
20. Lack of resources generally is a key challenge for managing COVID-19 wastes. For example, survey respondents noted “lack of capacity, resources and expertise”, “financial challenges”, “inadequate financial resources allocated to improving infrastructure for managing waste and monitoring” and that “[the waste framework] to classify and recycle domestic and industrial wastes...has never been implemented due to a lack of financial and institutional resources, amongst other reasons”.
21. It may also be that waste-management systems are overstretched: the increase in health-care waste during the pandemic has overwhelmed existing treatment or disposal capacity in some instances. For smaller States where there is limited space for final disposal of waste, the increase in COVID-19 waste, especially single-use plastics and single-use foodware, can pose a significant challenge. This is compounded by a lack of export markets for recyclable or recoverable wastes (Peel *et al.* 2021).

Key points: Gaps in COVID-19 waste management responses

- Waste minimization measures are limited in COVID-19 laws and guidelines.
- There is a need to implement fully integrated waste segregation systems (e.g. segregating COVID-19 wastes from cases in health-care facilities, those quarantining at home etc.).
- There is a lack of proper storage and transport facilities to manage COVID-19 wastes.
- Some COVID-19 wastes are disposed of in informal settings such as open-air dumpsites and landfill.
- There are inadequate resources to implement integrated waste management systems.
- Waste management systems are overwhelmed.
- Limited space for final disposal of waste.

Recycling, reuse and recovery

22. At the beginning of the COVID-19 pandemic and during countries' management of the pandemic, there were few examples of recycling, reuse and producer responsibility principles in COVID-19 waste legislation and policy, and limited incorporation of circular economy objectives.
23. In particular, largely no new plastic waste laws were introduced as a result of the pandemic while in other cases, laws were rolled back or exemptions allowed in practice for greater single-use plastic to avoid contamination. Furthermore, few countries required PPE to be recycled, with health and infection control priorities generally prevailing in COVID-19 guidelines and policies.
24. However, as time has gone on, this gap is starting to be addressed, with countries adopting legislative and policy responses that are less focused on rapid deployment of waste measures and more focused on integrated waste management considerations. This includes recycling initiatives, resumption of comprehensive waste services such as recycling collections, and technology, research and development programmes (see chapter 3).
25. One gap that has emerged relates to the implementation and enforcement of laws, regulations and guidelines. Many of the directions and guidelines issued under state of emergency powers have focused on infection control and technical or scientific management of the COVID-19 waste process. Less attention has been paid to institutional or organizational compliance and monitoring of whether the COVID-19 waste protocols for segregation, treatment, handling, and appropriate disposal such as incineration are being adhered to.
26. Challenges with compliance and enforcement were also commonly noted among survey respondents. Respondents pointed to a lack of public awareness as a key contributor: "[t]he public and key stakeholders have not been sensitized on the proper disposal of COVID-19 waste(s)." Inadequate resourcing for monitoring, compliance and enforcement was also highlighted: "[i]nstitutional arrangements are not adequately resourced to ensure compliance" and "[t]here is the issue of lack of logistics for compliance monitoring and enforcement on arbitrary disposal of waste."
27. Finally, there has been a significant gap in COVID-19 policies in terms of general integration of the environmental and social impacts of COVID-19 waste management. While some countries have introduced discrete measures that take into account the needs of vulnerable groups, (for example,

exempting pregnant women and the elderly from essential worker designations), less attention has been paid to the broader socioeconomic and gender effects of COVID-19.

Key points: Gaps in COVID-19 responses concerning recycling, reuse and recovery

There are few examples of recycling, reuse and producer responsibility principles, and circular economy objectives in COVID-19 waste legislation and policies.

There are few examples of recycling initiatives to manage particular waste streams (i.e. plastics and used PPE).

Limited attention is paid to compliance and enforcement.

Inadequate attention is paid to the environmental and social impacts of COVID-19 waste management measures.

Chapter 5:

Guidance for integrated waste management during a pandemic



Overview

1. During pandemics, the increase in health-care wastes, quarantine-related wastes (including certain plastic wastes) and wastes generated through vaccination procedures poses challenges for designing waste systems and associated laws and regulation that protect both human health and the environment. While it is vital to address the immediate impacts of a pandemic, “there is also an opportunity, over the longer term, to improve waste management systems and build a better future in light of lessons being learned today” (UNEP and IGES 2020, p. 6).
2. This chapter provides guidance for countries in developing or revising legislation and strategies to facilitate an integrated waste management approach to pandemic waste which is environmentally sound and addresses health and social impacts. It builds on previous chapters that have discussed international guidance on integrated waste management and analysed national legislative responses to the COVID-19 pandemic to provide a checklist that countries can consider for future pandemic-ready waste laws, regulation and policy guidelines.
3. The guidance should be read in combination with the 2016 UNEP guidelines (the framework set out in Part 1 with illustrative examples in Part 2), which emphasize that: “[l]egislation can either provide the foundation to integrated waste management or as a supplement to a strategy with voluntary, informational and educational programmes that are already running in a country [sic]” (p. 15). Waste legislation should be recognized as being one tool rather than a complete solution, and it should be formulated within the political, economic, social, cultural, institutional and environmental constraints of a country.
4. The checklist presented focuses on elements of framework legislation that could be adopted by countries (or used as a basis for revision of existing structures) to enhance preparedness to deal with waste management challenges in future pandemic scenarios. Rather than recommending a one-size-fits all approach, the guidance provides a menu of options for countries to consider for inclusion in pandemic-ready waste legislation and policy guidelines, recognizing the varying contexts for application in different countries. Countries can therefore use the checklist to develop “legislation that is appropriate to their own situation” (UNEP 2016, p. 15). In particular, in reviewing checklist items, each country should consider whether the item is needed, the options best suited to their circumstances and how chosen options can be framed to best fit their situation.
5. In each section of the chapter, options are proposed in relation to the following elements of potential framework measures, including:
 - a. statements of legislative purpose and objectives framed around integrated waste management;
 - b. definitions of waste;
 - c. allocation of major responsibilities for waste management;
 - d. provisions pertaining to waste sector regulation;
 - e. integrated waste management principles for application in pandemics, related to the whole life cycle for waste management;

- c. Establishment of integrated waste management legislative objectives or technical regulation standards for specific parts of the pandemic waste management cycle (e.g. specifying that single-use non-infectious pandemic waste is to be recycled using best available technologies).
- d. Establishment of a general duty requiring pandemic waste to be managed in accordance with integrated waste management principles. While a specific duty make generators of waste accountable, it might mean that collective, public sector goals are not prioritized.

Waste definitions

10. Pandemic waste definitions should be standardized across waste management sectors and aligned with integrated waste management principles, where feasible. For example, definitions of biomedical or infectious wastes should be consistent across health-care, environmental and commercial or residential waste sectors, and across all institutions with waste management responsibilities, as well as regulatory agencies. Consistent definitions signals that all pandemic waste streams are subject to integrated waste management principles.
11. Options for specifying definitions of different waste streams in pandemic-ready waste management legislation include:
 - a. Defining pandemic waste with reference to international guidance (e.g. WHO 2014) and in accordance with integrated waste management principles. The WHO definition is very specific and well targeted to the most urgent forms of pandemic waste management, but might be too narrow to capture indirect generation of such wastes (e.g. single-use plastics and wastewater).
 - b. Defining pandemic waste under health-care legislation to encompass waste streams that have increased due to the pandemic, such as waste from quarantine settings and certain plastics such as food containers.
 - c. Including pandemic waste in the term “hazardous waste” as defined under existing legislation, and specifying that this is to be managed in accordance with integrated waste management principles. A broad category such as “hazardous waste” might need to be further defined to differentiate specific components, such as toxic chemicals or “sharps”, which require different treatments and storage processes.

Major responsibilities for waste management

12. A clearly articulated structure of responsibilities for waste management within a country, based on integrated waste management principles, is important for protecting human health and the environment when managing pandemic waste. It is important to implement these structures effectively to ensure their success, which includes encouraging proactive steps and ensuring access to, and sharing of, information.
13. This structure typically requires a mix of regulatory responsibilities for waste management distributed across national, regional and local governments, along with accompanying processes for standard setting, monitoring and enforcement. Such structures which are necessary for pandemics might be implemented alongside broader arrangements for disaster readiness and response.

14. In specifying responsibilities for waste management across different authorities, options for implementing institutional models include:
 - a. National standard-setting that is applied across subnational governments – this might involve comprehensive waste legislation at the national level that provides national rules and standards for regulating the management of wastes by all levels of government.
 - b. Coordination of standards and guidelines across government levels and sectors – this might involve a higher-level national strategy which sets out operational guidelines for waste management, including in pandemic situations, and operates in conjunction with general health-care and waste management legislation, policies and legislative standards at the subnational government level.
 - c. Deployment of pre-existing frameworks for coordinated or decentralized responses to emergencies that apply integrated waste management principles – this might involve a system of national waste standards that are adapted in subnational governments' emergency declarations.

Waste sector regulation

15. Waste sector regulation adopted in the COVID-19 pandemic was characterized by two major aspects: (a) recognition of the importance of the continuity of waste collection by designating it as an essential service, or otherwise exempting waste-related services from lockdown or quarantine restrictions; and (b) directions issued under occupational health and safety laws or labour laws issued directions for employee and other protections for those handling COVID-19 wastes. Integrated waste management is easier to achieve in a pandemic through these types of service provision and mandatory protections, which safeguard human health and minimize environmentally harmful waste-related pollution.
16. In considering options for waste sector regulation during a pandemic, much will depend on the configuration of the waste sector in the country or region (e.g. whether it is managed by the public or private sector, by municipal or national authorities, and whether it involves only formal or also informal, unregulated elements such as waste pickers). Potential options for regulating the waste sector as part of an integrated waste management pandemic response include:
 - a. An "Emergency Declaration" designating waste sector activities in the collection, storage, handling, treatment and safe disposal of wastes an essential service. A declaration of this kind may be issued as a short-term response under general emergency powers or relevant legislation. Ideally, reciprocal provisions should be enacted in relevant pandemic waste legislation and associated health-care legislation, and cross-referred to the emergency powers, as a longer-term, forward-planning measure.
 - b. Insertion of a directive or similar measure implementing a general duty of care for waste sector personnel (in both the formal and informal sector), including safety procedures for waste collection, storage, handling, treatment and safe disposal. These measures could be adopted both in occupational health and safety laws and codes, and as mirror provisions in pandemic waste legislation. Ideally, they should be coupled with mandatory infection control measures for waste workers such as the provision of PPE, and environmental controls such as adequate ventilation and supply of sanitizers.

- c. Progressive adoption of integrated waste management principles, including waste hierarchy approaches, such as waste minimization and recycling, as an overarching objective in relation to different forms of waste-sector regulation.

Integrated waste management principles during a pandemic

Minimization

17. Waste minimization is a fundamental aspect of integrated waste management and should inform all areas of waste management in order to reduce environmental and social impacts. Many countries already have waste minimization or waste reduction provisions embedded in environmental or waste legislation as part of a circular economy approach. The adoption of the waste minimization principle, however, must be carefully and selectively adopted in pandemic waste contexts to ensure coherence between human health and environmental outcomes.
18. Options for embedding waste minimization principles in pandemic-ready waste management measures include:
 - a. Where the principle of waste minimization already exists in waste legislation, transposition of this principle into health-care legislation and specific pandemic waste guidance, and in health-care, medical and quarantine settings. This would require appropriate consultation between personnel with expertise in waste management and health-care infection control, and safe handling of pandemic wastes.
 - b. Adoption of waste minimization principles in pandemic-relevant waste management legislation and policy in infection control and non-infectious waste settings (e.g. commercial and residential settings). This exercise would require appropriate consultation between personnel with expertise in waste management and health-care infection control, and safe handling of pandemic wastes, and with recognition that the principle may not be applicable where health priorities take precedence.
 - c. Institution of capacity-building and training in the pandemic waste sector to include integrated waste management, including waste minimization objectives, in pandemic-safe waste procedures. Template models for training and capacity-building with respect to pandemic-safe procedures are found in many international pandemic health guidances, as well as national health-care and biomedical legislation and policy guidelines. Transposing such models into mandatory legislative requirements aligned with feasible waste minimization training might be considered either a component of legislation on waste, health-care and quarantine, or part of non-infectious pandemic waste management procedures.
 - d. Adoption of measures to support the establishment and retention of a trained pandemic workforce is vital to implementing joint health and environmental measures. This could include recommendations for ensuring adequate remuneration of workers as a key measure in supporting pandemic waste measures. Alternatively, it could include legislative requirements for provision of additional support measures for waste workers and their dependents, such as tax exemptions for pandemic waste-specific income earned by essential service workers or pensions for families of deceased workers.

Segregation

19. Waste segregation is a critical initial step in the life-cycle approach to waste management that provides the platform for later stages of the waste hierarchy, such as recovery of economic value from waste operations.
20. Waste segregation is a common element of integrated waste management found in general waste laws and in health-care and biomedical waste management regulation. The use of such measures in health-care and biomedical settings was intensified during the COVID-19 pandemic, although understandably, infection control was prioritized. The challenge is to ensure that the segregation principle is consistently adopted over all sectors involved in managing pandemic wastes.
21. Options for embedding a waste segregation principle in pandemic-ready waste management measures include:
 - a. New legislative measures (to progressively replace short-term policy guidance) requiring mandatory segregation of pandemic wastes according to health priorities, and where feasible, providing for segregation for reuse and recovery of materials such as plastics in non-infectious wastes (see also UNEP and IGES 2020, p. 31). Institution of a mandatory segregation requirement would assist in monitoring and enforcement, though such an approach needs to be well supported by staff training and general public awareness.
 - b. Adoption of, or revisions to strengthen, existing legislative requirements for waste segregation (e.g. segregation of hazardous wastes in pandemic waste settings). This includes procedures for segregation and management of different types of wastes in various settings (e.g. health-care facilities, households, workplaces). The advantage of this approach is that procedures, training and technologies may already be in place that can be readily adapted to pandemic waste settings, although generic waste segregation requirements may not be fully suited to pandemic-specific challenges, especially in health-care contexts where increased quantities of waste are likely.

Storage, handling and transport

22. Integrated waste management principles relating to appropriate storage, handling and transport of waste within relevant waste and health-care laws are desirable to support sustainability, resource efficiency and recovery of materials where feasible. In addition, mandatory arrangements for storage, handling and transport of pandemic wastes, in both health-care and non-health-care settings, can reduce environmental and social impacts. These impacts include disproportionate risks for women and children, who are more likely to be involved in unprotected forms of waste storage, handling and transport in household and community settings, and the informal waste sector, such as waste pickers.

Storage

23. Long-term storage of infectious pandemic waste may not be an optimum outcome given some residual infection concerns. However, storage of infectious and non-infectious waste at certain points in the pandemic waste management chain is inevitable, and some amendment to existing laws governing waste storage may be necessary as an emergency response.
24. Where pandemic waste is stored in residential self-isolation settings or local business settings, detailed regulations around storage requirements can reduce risks to households and consumers.

- 25.** Options for pandemic-ready measures to minimize infection risk and reduce long-term waste storage include:
- a.** Legislative requirements and policy guidelines that adopt a precautionary approach where pandemic waste storage is necessary. Recording, reporting and monitoring requirements will support such an approach.
 - b.** If hazardous pandemic waste is stored, especially in health-care or commercial waste sector storage, mandating procedures for regular monitoring and reporting of the integrity of the storage.
 - c.** If pandemic waste is stored in landfill sites, requirements for segregated containment within the landfill, and regular monitoring to check storage integrity and monitor environmental risks (e.g. groundwater contamination). Such procedures may be mandated under general pollution controls.
 - d.** Regulation of pandemic waste storage, drawing on existing legislative provisions, such as those mandated for health-care wastes under pandemic emergency guidelines and response plans, or through adaptation of existing general provisions for hazardous waste.

Handling

- 26.** Safe management and handling of pandemic waste require policy and legislation within the health-care sector and at waste treatment sites to ensure that good practice is maintained in accordance with integrated waste management, for environmental protection (Wolff 2018, p. 170).
- 27.** Options for pandemic-ready measures to ensure safe management and handling of pandemic waste include:
- a.** Adaptation of existing environmental regulation of hazardous waste to provide legislative requirements for safe handling of pandemic waste. Generic hazardous waste regimes may be inappropriate due to the lack of technical specificity required for waste handling in a pandemic, unless such provisions are supported by detailed regulatory standards.
 - b.** Adaptation of existing health-care regulation around waste handling to specific pandemic waste purposes. This might involve, for example, a standard that specifies provisions and requirements for the safe management of health-care risk waste generated by registered health-care professionals and non-health-care professionals.
 - c.** Safe waste handling requirements for individuals and classes of workers, such as mandatory provision of PPE. Such provisions may be included in revisions to occupational health and safety laws, public health or labour codes or in stand-alone emergency directives. Requirements for monitoring and spot audit of waste-sector handling sites can assist in the implementation of such measures.
 - d.** In relation to increased amounts of health-care waste from disposable materials used by vaccination teams, measures requiring vaccination teams to practice on-site segregation and return such items for inclusion in mandated hazardous-waste handling facilities.

Transport

28. Transport of pandemic waste is an important component of integrated waste management.
29. Options for pandemic-ready measures to ensure safe transport of pandemic waste include:
 - a. Issuance of guidelines on the transportation of infectious substances, which mandate specific packaging and transportation requirements for the movement of hazardous health-care wastes.
 - b. Adaptation of established hazardous waste regulation to pandemic waste settings through specification of special transport vehicles requirements and measures regarding tracking and tracing procedures to be followed.
 - c. Despite obligations to ensure safe transport of highly dangerous substances, there may be instances of evasion of such requirements, with dumping of hazardous materials (UNEP and IGES 2020) and little if any implementation in informal waste sector settings (e.g. in terms of waste pickers). Anti-dumping requirements in relevant pandemic waste legislation may help reduce the risks to human health and the environment from non-adherence to transport, registration and tracking requirements.
 - d. Establishment of online tracking and registration systems, where possible and available, for waste under pollution control laws, to ensure stronger compliance in transport of pandemic waste.
 - e. The 2030 Agenda “seeks to realize the human rights of all and to achieve gender equality”, hence more research on this intersection is crucial (United Nations 2021, p. 18).

Collection, treatment and disposal

Treatment

30. As highlighted earlier, identification of pandemic waste treatment options should be oriented to each country’s context, and “consider many aspects, not limited to national and international regulations, environmental and occupational safety, waste profile (characteristics and quantity), technology capabilities and requirements, costs, operation and maintenance requirements” (UNEP and IGES 2020, p. 46). Legislative and policy measures adopting integrated waste management principles for waste treatment will need to respond to multiple factors.
31. Options for pandemic-ready measures for appropriate treatment of pandemic waste include:
 - a. Adaptation of existing laws to pandemic waste treatment requirements, which will typically include a definition of “treatment”. Such provisions may need to be expanded by regulations that reference technical, pandemic-specific treatment standards and procedures, including international best practice and cross-sectoral responsibilities. Similarly, provisions targeting solid waste may not be sufficiently broad to capture other forms of pandemic waste, such as those in water and aerosol form which will also require treatment.
 - b. Enactment of new pandemic-specific waste legislation (which may formalize emergency-phase guidelines) adopting minimum technical standards and technologies, or best available technology models. This might include powers to introduce technical minimum standards for treatment activities but a useful addition to such pandemic waste treatment legislation

could be controls on emissions and pollution reduction targets for the treatment process, if these are not already provided for under existing environmental protection laws.

Disposal

- 32.** In the integrated waste management waste hierarchy, disposal is the last resort and should only occur when forms of reuse, recycling, and recovery have been exhausted or are not viable (Gillespie 2015, p. 73). Strong and specific legislation or guidelines around treatment and disposal options (including licencing and operating requirements) are important for preparedness for future pandemics.
- 33.** Disposal options will also depend on the degree of waste sorting and handling protocols. In respect of pandemic waste, there are concerns around infection control and protocols for infectious health-care waste disposal that require attention (e.g. preferences for incineration). In addition, there may be specific medical requirements for hazardous and infectious pandemic waste as identified in international pandemic health guidance and under national emergency responses.
- 34.** Options for pandemic-ready measures for disposal of pandemic waste where alternatives are not available include:
 - a.** A general provision regarding disposal of hazardous waste, which can capture many types of hazardous pandemic waste without the need for specific listing. This approach has the advantage of accommodating changing modes of hazardous pandemic waste production as new technologies and infectious materials become involved in pandemic waste management. Limitations include potential inconsistency with international health guidance in terms of priority disposal methods, and it may lead to non-differentiated, non-specialized disposal of pandemic infectious waste. Furthermore, it does not consider environmental consequences of hazardous waste disposal in terms of the necessary infrastructure and energy use impacts.
 - b.** Adaptation of existing biomedical or health-care requirements and adoption of generic protocols for disposal by incineration, which may be a more targeted option. These measures will typically capture well-established technologies and procedures for disposal, with associated institutional capacity and staff training. Limitations include assumption of availability of environmentally sound technologies for incineration and their ongoing maintenance; an absence of consideration of alternatives where technologies are unavailable; and the air quality and energy impacts of such technologies.
 - c.** Adoption of highly targeted, infectious pandemic waste disposal provisions that identify the methods of disposal required for waste generated in different settings (e.g. PPE used by workers managing quarantine facilities). Clearly targeted, detailed infectious waste disposal requirements can incorporate international best practice and health-care practices as they evolve. Limitations include the need for timely and responsive specialized legislative and regulatory expertise to translate health guidance in national settings; and dissemination and technical competency issues with highly detailed regulatory frameworks.
 - d.** Recognizing that disposal of pandemic waste may not occur as a matter of best practice, adoption of “safety net” requirements for disposal of infectious pandemic waste in landfills and temporary storages, potentially through the revision of existing pollution control legislation. In these instances, consideration should be given to human health impacts from direct-contact transmission, as well as diffuse transmission risks and the environmental impacts of improper disposal.

Reuse, recycling and producer responsibility

35. Pandemic waste measures are still evolving as part of the longer-term response to pandemics. To ensure health priorities are met where pandemic waste is highly infectious, a cautious approach is needed to mandating measures such as recycling, which may develop in conjunction with technological and waste sector industrial developments. In other settings, such as household quarantine, a lack of, or inadequate, segregation may limit opportunities for later stages of the waste hierarchy to operate.
36. Despite constraints, there is significant opportunity for countries to begin to adopt strategies and regulation in this area, as several of the case-study countries are already doing (see chapter 3).
37. Options for pandemic-ready measures embedding requirements for reuse or recycling, or a broader circular economy approach, include:
 - a. Building on existing legislation or policy promoting general reuse, recycling and producer responsibility principles in environmental and/or waste laws to extend these principles with appropriate qualification to the health-care waste sector and other pandemic waste settings. However, while this model extends established legislative provisions, the principles developed in generic environmental and waste laws may not be well targeted to pandemic waste settings, especially if technologies are new or emergent.
 - b. Developing reuse, recycling and producer responsibility principles in pandemic-specific legislation, matched with health-care legislation and pandemic waste guidelines. This option has the advantage of targeting pandemic waste management specifically, but countries may require more time to develop these laws.
 - c. Embedding reuse, recycling and producer responsibility principles in specific pandemic waste laws and guidelines with circular economy goals and progressively extending these principles, including in forward-planning and pandemic response and preparedness planning. This option has the advantage of being specifically targeted to pandemic waste management. Countries might choose to set overarching circular economy objectives for the pandemic waste sector (e.g. in respect of ongoing vaccination programmes and home testing kits where producer responsibility might be encouraged).

Measures for specific pandemic waste

38. Research has identified large increases in certain types of waste due to the COVID-19 pandemic, such as single-use plastics and PPE (UNEP and IGES 2020, p. 9). While it is recognized that specific pandemic waste management strategies and requirements may need to address other waste streams (e.g. vaccination-related wastes), the following sections address plastics and PPE as two of the most pressing pandemic-related waste stream issues.

Plastic waste

39. The extent of plastic waste's environmental, social and economic impacts is well recognized internationally and reflected in national law and policy. However, the COVID-19 pandemic has demonstrated that progress on particular initiatives, such as single-use plastic bans, may be affected in such emergency situations, as countries resort to plastic products and packaging for infection control.

- 40.** Options for countries to consider in formulating measures for plastic waste management during a pandemic include:
- a.** Adapting existing legislation and regulation on plastic waste to a pandemic setting. This might involve specific provisions on certain types of plastics (such as single-use plastics and microplastics), recycling and EPR. More specific targeting to health-care and biomedical plastic wastes may be required if environmental laws are used as the template for such measures. Environmental law models related to controls on single-use plastics may be effectively transposed to non-health-care pandemic waste settings with appropriate safeguards for infection control.
 - b.** Developing principles in stand-alone legislation or a specific regulation governing pandemic-related plastic waste across the waste hierarchy, combined with health-care legislation or pandemic waste guidelines. This option is specifically targeted to pandemic waste management and would give countries more time to develop the measures around certain types of plastics given the urgent need for health priorities in the immediate response to a pandemic.

PPE

- 41.** PPE has emerged as a specific pandemic waste issue, as noted throughout the guidance. There are opportunities to reduce PPE as a waste stream notwithstanding health priorities and, where PPE littering occurs, to contribute to infection control. This is an area where it may be helpful to provide policy support for initiatives in the short term, and for legislation and regulation to evolve.
- 42.** Options for countries to consider in formulating measures for PPE waste management during a pandemic include:
- a.** Adapting existing littering and solid waste management laws to accommodate settings where most single-use PPE is regarded as non-hazardous waste and disposed of in municipal solid waste landfills. This may extend to the introduction of recycling initiatives to manage discarded PPE, recognizing limits on adopting such initiatives in some countries.
 - b.** Providing minimum environmental measures related to PPE to promote environmental sustainability and reduce pollution caused by single-use PPE. Such measures would address the increase in waste generated by the widespread use of disposable masks and gloves.
 - c.** Introducing a dedicated regulation for PPE management across all integrated waste management principles for application under a range of existing legislation (e.g. environmental, health care). Such a regulation could evolve in tandem with technology and research and development processes.

Environmental and social impacts

- 43.** There is growing acknowledgement of the environmental and social impacts of waste, and concerns in relation to the wastes generated during pandemics (UNEP and IGES 2020, pp. 23, 29). The capacity of countries and regions for rapid and comprehensive change to relevant laws to deal with such impacts may vary.
- 44.** Options for responding to the discriminatory social impacts of pandemic waste include:

- a.** Rights-based approaches in legislation recognizing the right to live in a healthy environment that bring attention to the environmental and social impacts of waste (e.g. on workers including those the informal sector, women, children).
 - b.** Alignment of “right to life” and “right to health” concepts with pandemic waste management and the explicit recognition that waste management and regulation are not gender-neutral in their structure, assumptions and implementation, nor are the impacts of pandemics equally felt in societies. This approach could form the basis for amendments to existing environmental and waste laws, including the adoption of governing principles (such as a right to health that addresses social and environmental risks from pandemic waste), and gender-awareness and antidiscrimination requirements in pandemic waste settings, including PPE designed to fit and protect both female and male healthcare workers, perhaps as a component of occupational health and safety laws or labour codes.
 - c.** Revision of existing legislation to direct decision makers’ attention towards the gender, social and equity implications of existing waste laws and policy guidance, such as information gaps on safe handling in pandemic contexts where certain groups including women, children and the informal sector have high risk exposure but are not targeted in communication strategies.
 - d.** Development of specific policies or strategies to promote gender equality in waste management, such as legislative targets for women’s participation across the waste sector.
 - e.** Development of specific policies or strategies to protect vulnerable groups including waste workers, the informal sector, women and children.
- 45.** Concerning environmental impacts, while there is a clear, urgent need to control infection and prevent transmission in pandemics, waste treatment risks to the environment may not be as apparent. These may include harmful secondary emissions and new wastes that pose new hazards (Wolff 2018, p. 167). Legal and policy measures not only play a critical role in structuring the waste sector around integrated waste management principles, but also contribute to management of inherent waste-related risks, including environmental and social impacts.
- 46.** Options for addressing the environmental impacts of pandemic waste include:
 - a.** Institution, as part of a waste strategy, of an audit of the environmental impacts of pandemic waste procedures, such as treatment, to identify and report on specific risks. The audit could provide an information baseline for a more comprehensive programme of review and revision of laws relevant to pandemic waste management, including integrated waste management principles.
 - b.** Establishment of a programme of continual review of legislation and policy relevant to pandemic waste (e.g. using adaptive management models), which may assist in achieving well-planned law, regulation and policy revisions. Reviews should ensure that any suspension of environmental controls required by a pandemic are time-bound and later reinstated.
 - c.** Implementation of measures to prevent and reduce possible obstacles to transboundary movements of waste, and facilitate implementation of guidelines/rules on waste shipments e.g. timely communication/action, clear procedures, close/effective cooperation.

Public participation and information

47. Public participation and information are an important element of many existing environmental and waste management laws, contributing to awareness-raising and education around pandemic waste. However, the requirements for information provision on pandemic waste management, and consequently regarding any environmental impacts generally, are underdeveloped in most countries beyond basic tracking of wastes.
48. Options for achieving greater public participation and access to information regarding waste management during a pandemic include:
 - a. While many countries may choose to provide pandemic waste information under emergency directives and similar measures, a longer-term role for information provision and awareness-raising could be made a legislative requirement under environmental “right to know” models.
 - b. Adaptation of community awareness programmes on pandemic-related wastes (such as those adopted during the COVID-19 pandemic), to build stronger responses in relation to mitigation of the environmental and social impacts of pandemic waste.
 - c. Provision for community education (e.g. on proper pandemic waste disposal) under legislative measures or policy guidelines. A disadvantage of legislative entrenchment, however, is that information often changes rapidly in pandemic waste settings, in which case a process that allows for an evolving and timely response may be more appropriate.

Compliance, enforcement and penalties

49. Compliance, enforcement and penalties are vital for effective pandemic waste systems. Nonetheless, findings on existing environmental legislation, regulations and waste laws that predate the COVID-19 pandemic have shown that often, effective implementation is either inadequate or incomplete, despite the existence of compliance, enforcement and penalty regimes “on paper”.
50. Compliance, enforcement and penalty measures that might be adopted as part of pandemic-ready legislative or policy measures include:
 - a. Application of existing legislative measures and policy guidance for compliance, enforcement and penalties in relation to waste segregation, handling, collection, reuse, recycling, treatment and disposal to pandemic waste, although applicability to health-care settings would need to be carefully assessed. There are efficiencies in transposing existing procedures to pandemic waste, but penalty regimes may need to be adjusted, or temporary measures put in place during the emergency response phase of a pandemic.
 - b. Development of targeted enforcement and penalty systems in relation to pandemic waste management. A regulatory enforcement pyramid model that operates in many countries’ pollution laws (where, for example, higher-risk waste is associated with higher penalties), may be an appropriate template for such systems.
 - c. Development of compliance and enforcement regimes in association with education and awareness-raising models. Such measures may be better placed in policy guidance and strategy documents than legislation.

Technology, research and development

51. Many longer-term responses to managing pandemic wastes will hinge upon research and development, and advances in waste management and health-care technologies that can support integrated waste management outcomes.
52. Further research into the linkages between gender and waste management is required on a global scale. The collection of sex-disaggregated data and the promotion of women in leadership and decision-making roles in integrated waste management roles is crucial if we are to make progress in achieving the SDGs (UNEA 2019; UNEP 2019, p. 65).
53. While many countries may choose to build support for technology, research and development outside formal legislative models, the importance of such programmes for achieving integrated waste management outcomes in a pandemic may be reinforced by legislative entrenchment.
54. Alternatively, such support may be better aligned with policy guidance and preparedness and response planning to allow for timely responses by governmental agencies to new developments.
55. Legislative support could be provided for funding programmes for research and development measures related to waste management technologies that promote integrated waste management, including circular economy objectives, in health-care, domestic and commercial waste settings, as well as in pandemic waste settings.

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