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Ongoing developments with relevance for the work of the Joint Task Force

Draft assessment of land and soil, and chemicals and waste in the pan-European region*

Note by the Secretariat

Summary

At its twenty-fifth session (Geneva, 13–15 November 2019), the Committee on Environmental Policy requested the secretariat and the United Nations Environment Programme, working in close cooperation with the European Environment Agency, to prepare a limited indicator-based and thematic pan-European environmental assessment.

This document sets out the draft content of two sections of the assessment, covering: (a) land and soil; and (b) chemicals and waste.

The Joint Task Force is invited to review and comment upon these sections.

* An agreement was reached to publish the present document after the standard publication date so as to include the most recent information.

I. Introduction

1. At its twenty-fifth session (Geneva, 13–15 November 2019), the Committee on Environmental Policy requested the secretariat and the United Nations Environment Programme, working in close cooperation with the European Environment Agency, to prepare a limited indicator-based and thematic pan-European environmental assessment.[1] The Committee also welcomed document ECE/CEP/AC.10/2019/6, which identified the environmental topics to be addressed by the assessment, together with the two themes of the Ninth Environment for Europe Ministerial Conference (Nicosia, 5–7 October 2022).

2. This document sets out the draft content of two sections of the assessment, covering land and soil, and chemicals and waste.

II. Draft assessment of land and soil, and chemicals and waste in the pan-European region

A. Land and soil

1. Key messages and recommendations

Key messages

3. Land use and land-use change in the pan-European region continue to be mainly driven by agriculture. In Eastern Europe and Central Asia, agricultural production is rising and rapidly approaching Soviet levels, while domestic demand has fallen due to a drop in livestock inventory. The current land-use dynamic shows only a moderate increase of the sown area in fertile soil (steppe and forest-steppe) zones and no sign of agriculture recovering in marginal (forest) areas. However, driven by their desire for a rapidly growing share of the world grain market, countries such as Kazakhstan, the Russian Federation and Ukraine are determined to bring millions of ha of abandoned lands back into cultivation. At the same time, the utilized agricultural area in the European Union is expected to continue declining smoothly towards 2030, though at a slower pace than in the past decade.[2]

4. Soil organic carbon (SOC) content is the most important element of soil due to its role in improving aeration, water retention, nutrient supply, soil biodiversity and climate change mitigation. For example, in Eastern Europe, large-scale land abandonment switched agricultural land from being a small source of atmospheric carbon dioxide (CO_2) to a significant sink of atmospheric CO_2. Conservation agriculture practices in the pan-European region may play an important role in carbon sequestration and raising soil productivity.

5. Land erosion is one of the results of land-use dynamics, and it shows different characteristics throughout the region**.** Field measurements in European Union countries show an average rate of soil erosion of 0.2–3.2 t ha^{-1} $year^{-1}$ on a per country basis. In Eastern Europe, the average rate of soil erosion has decreased over the past 30 years following massive cropland abandonment and climate change. In the Russian Federation, the total amount of washed soil and the rate of erosion have been reduced by 56.1 per cent and 15 per cent respectively in the past 30 years due to the widespread abandonment of cropland and lower spring runoff. In Central Asia, wind erosion is a dominant type of land degradation, but the contribution of irrigated and rainfed cropland is limited by their relatively small area and relatively low rate of erosion. Erosion can be further reduced in most affected areas by implementing conservation agriculture.

[1] ECE/CEP/2019/15, para. 37 (k) (ii).

[2] Land abandonment in the European Union might reach 4.2 million ha, or 3–4 per cent of current utilized agricultural area, by 2030, see Carolina Perpiña Castillo and others, “Agricultural Land Abandonment in the EU within 2015–2030”, Joint Research Centre Policy Insights, European Commission, October 2018.

6. The European Union, following changes in consumer behaviour, is increasingly focusing on food safety by developing local, organic, genetically modified organism-free or other types of certified production,[3] which results in more sustainable agriculture practices. Eastern Europe and Central Asia feel the need to prioritize self-sufficiency in key foodstuffs, which might lead to less sustainable agriculture practices.

Recommendations

7. The pan-European countries should increase efforts to provide better guidance to farmers on using soil conservation methods in areas of degraded (eroded) soils. There are already simple models (based on the Universal Soil Loss Equation)[4] allowing farmers to explore different options to decrease the rate of erosion on their plots at an economically acceptable cost; however, these methods cannot be used at larger scale or with all types of soils and further research and development is required.

8. Policymakers should strive to maintain a judicious balance between SOC accumulation for higher crop productivity and SOC storage for climate change mitigation, as this is critical for mainstreaming global sustainable initiatives such as "4 per 1,000".[5]

9. The pan-European policy in respect of land resources should focus on consumers' rights to healthy (i.e. free from pesticides and antibiotic, hormone or steroid residues) food, a healthy environment (including animal welfare), stable food prices, and low household expenditures on food. This could be achieved by promoting environmentally sound agriculture practices and a reliable food supply (of domestically produced and imported items) and redirecting investments to storage facilities and transportation where needed.

10. In a condition of intense rural exodus, more active measures should be implemented to reverse the depopulation trend through the diversification of incomes, such as by the development of rural tourism, and the attraction of new settlers. Recognizing the biodiversity value of low-intensity farmland, the European Union provides agroenvironmental subsidies in support of farming in marginal areas, but the economic impact of existing European Union programmes in support of rural tourism is modest, while their effects depend on the specific characteristics of the areas.

2. Context

11. Being parties to the United Nations Convention to Combat Desertification (UNCCD), European and Central Asian countries share an ambition to achieve Land Degradation Neutrality (LDN) by 2030. Having an offsetting scheme is a new component of the LDN approach, meaning that land degradation should be compensated for by the restoration or rehabilitation of degraded lands elsewhere. Yet the methodology related to the LDN target does not exist.

12. Most terrestrial carbon (1,500 Gt) is held in soils, more than twice as much as in vegetation or the atmosphere. The soils in the countries that are members of the European Environment Agency hold around 5 per cent of the global SOC pool, whereas the Russian Federation alone holds about 21 per cent. The increase of SOC in pan-European soils can positively contribute to the mitigation of greenhouse gas emissions globally, but nearly 75 per cent of the territory of the Russian Federation lies in the permafrost zone, whose SOC

[3] European Commission, Directorate-General Agriculture and Rural Development, *EU agricultural outlook for markets and income, 2019–2030* (Luxembourg, Publications Office of the European Union, 2019).

[4] The Universal Soil Loss Equation model is used to calculate potential erosion on fields as a result of a combination of "pre-disposing factors" such as rainfall pattern, topography, soil texture, cropping systems and management practices. The target audience of the model is farmers who can use the Universal Soil Loss Equation guideline (in a simple table format) to receive advice for their routine practices (A.J. Jones and others, Universal Soil Loss Equation: a Handbook for Nebraska Producers, Nebraska Cooperative Extension Service EC 88-116 (n.p., University of Nebraska-Lincoln, 1987).

[5] "4 per 1000" is a voluntary action initiative adopted at the 2015 Paris Climate Change Conference that aims to boost carbon storage in agricultural soils by 0.4 per cent each year (www.4p1000.org/).

reserve is susceptible to decomposition upon climate warming, thus contributing to the enhanced emission of greenhouse gases.

13. The members of the European Environment Agency recognize agriculture as essential for maintaining biodiversity of extensive farmland biotopes and early successional habitats, such as heathland and meadows. The biodiversity of low-intensity farming land can be higher than that of rewilded, semi-natural and forested areas, and farmers in those areas are producers of both food and ecosystem services. Therefore, the abandonment of such areas is perceived in the European Union as a serious threat to biodiversity. Depopulation (or "desertification") of rural settlements, and not just cropland abandonment, needs to be reversed.

14. A primary role of land and soil resources is food production. Soil underpins 90 per cent of all food, feed and fibre production. The European Union and Western Europe are observing a shift in consumer behaviour towards local, organic, genetically modified organism-free and other types of certified production. The resulting changes in agriculture should be spread over the rest of the pan-European region into subregions where the consumer's right to healthy food is not clearly articulated in food security strategies.

3. State, main trends and recent developments

15. The European Union Thematic Strategy for Soil Protection adopted in 2006[6] names the following major threats to soil: erosion, organic matter decline, contamination, compaction, salinization, decline in biodiversity, soil sealing, landslides and flooding. Desertification was later included as a further threat. For most of these threats, neither regional nor subregional assessments have been performed because of a lack of systematic approaches and data.

16. In most European Environmental Agency member countries, information about SOC is obtained from local soil surveys undertaken by different national or regional institutions, making comparison of the data difficult. The most comprehensive SOC observation network, in England and Wales (United Kingdom of Great Britain and Northern Ireland), shows loss of SOC in all types of ecosystems and land-use classes. The reason for loss is probably increasing decomposition of organic matter with higher temperatures caused by climate change.

17. Support from the European Union Common Agricultural Policy could slow the process of cropland abandonment and rural depopulation in the bloc, but it is not expected to reverse it. In Eastern Europe and Central Asia, about 58 million ha of cropland were abruptly abandoned during the 1990s and are unlikely to be fully restored because of rapid depopulation of marginal rural areas and because no support policy like the Common Agricultural Policy exists in these countries.

18. Numerous field studies show a significant reduction in soil erosion on no-tilling land; moreover, carbon sequestration after no-till is higher than after conventional ploughing. However, there are no explicit national or regional policies in respect to conservation agriculture. Conservation agriculture in the pan-European region demonstrates very limited growth (for example, 2.5 million ha of no-tilling arable land in the European Union) as compared with other world regions. Farmers face a trade-off immediately after adopting no-till: on the one hand, crop yields are often lower; on the other, production costs decrease due to limited use of machinery, fertilizers and less working time per unit area. Farmers following a no-till approach often resort to high and regular applications of herbicides, though longer-term benefits can arise from certified organic produce.

19. Rural tourism can be important for revitalization of abandoned rural settlements. Shifting policymakers' concern from cropland abandonment to "desertification" of thousands of villages throughout the pan-European region is necessary, as low yields are unlikely to be the reason for villages to be left, while an intense demographic rural exodus can certainly

[6] Commission of the European Communities, Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, Thematic Strategy for Soil Protection, COM(2006)231 final. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52006DC0231.

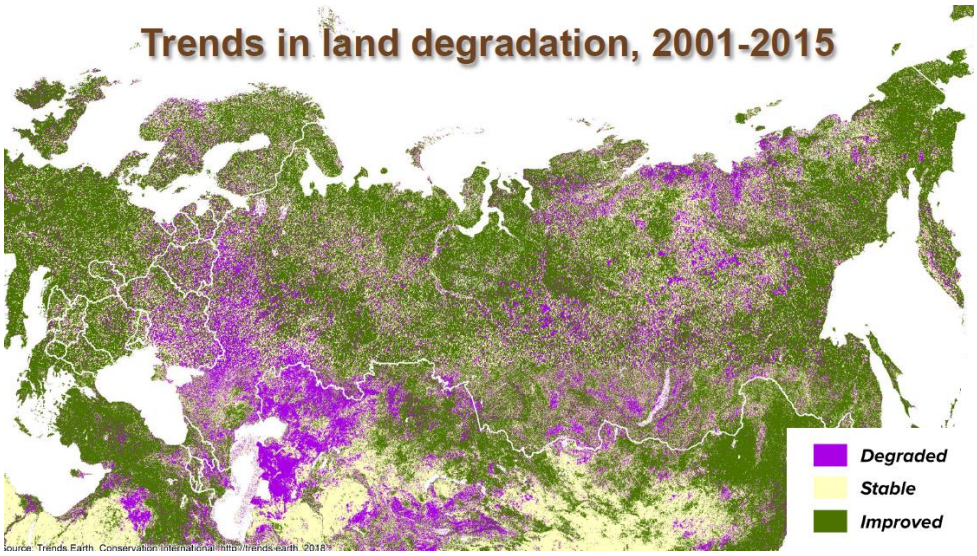
cause land negligence. Due to the development of new communication technologies, isolation and lack of employment opportunities are no longer reasons for abandoning small rural and mountainous villages, as the response to the coronavirus disease (COVID-19) pandemic has amply demonstrated with the temporary relocation of urban dwellers to rural areas.[7] An analysis of numerous existing projects for recovering abandoned villages in Italy shows that, among different approaches, rural tourism has the largest potential to succeed.[8]

4. Indicators

Proportion of land degraded

20. Land degradation and erosion is identified by the European Parliament as "probably the most significant environmental problem in Europe".[9] Most research on land degradation assesses territories in terms of potential risk of erosion because field measurement of actual erosion rates is difficult to conduct, especially at a larger scale. No regional pan-European scale assessment of land degradation is available. At the global level, the UNCCD assessment methodology consists of all three subindicators: land cover change, land productivity change and carbon stocks. Parties to UNCCD provide information on the total area of degraded land and level of confidence of assessment,[10] though Conservation International provides complete coverage using remotely sensed data (see figure I below).

Figure I
Trends in land degradation in the pan-European region (2001–2015)[11]



Source: Sara Minelli and Jamal Annagylyjova, "Proportion of land that is degraded over total land area – Sustainable Development Goal indicator 15.3.1", presentation, Informing biodiversity restoration policies Shared Environmental Information System and the environmental dimension of

[7] Organisation for Economic Co-operation and Development (OECD), "Policy implications of Coronavirus crisis for rural development", 16 June 2020, available at www.oecd.org/coronavirus/policy-responses/policy-implications-of-coronavirus-crisis-for-rural-development-6b9d189a/.

[8] Kristen Elizabeth Sloan, "Reawakening 'Ghost Towns', Alternative Futures for Abandoned Italian Villages", Doctor of Philosophy thesis, University of Wollongong, 2018, available at https://ro.uow.edu.au/theses1/437.

[9] Joint Research Council, *Addressing soil degradation in EU agriculture: relevant processes, practices and policies. Report on the project "Sustainable Agriculture and Soil Conservation (SoCo)"*, (Luxembourg, Office for Official Publications of the European Communities, 2009), available at https://publications.jrc.ec.europa.eu/repository/handle/JRC50424.

[10] ICCD/CRIC(17)/2.

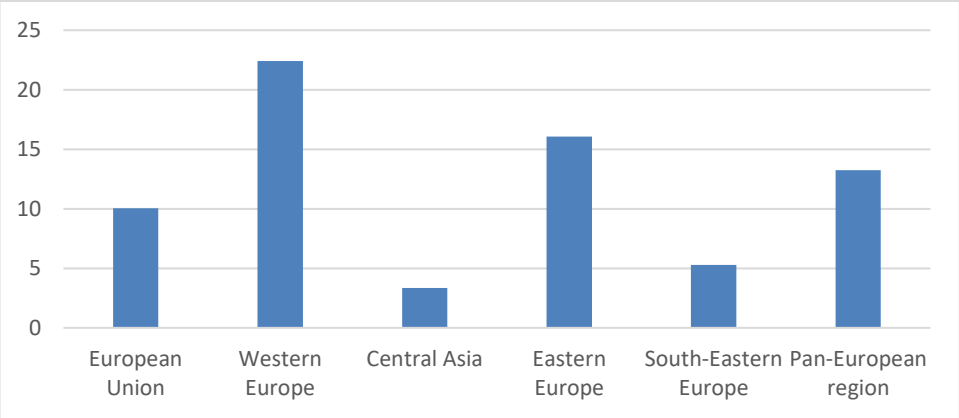
[11] This figure will be replaced by a high-quality map complemented by a bar chart showing land degradation data by subregion, courtesy of Conservation International.

the Sustainable Development Goals – webinar series, 26 May 2021, available at https://unece.org/sites/default/files/2021-05/2.2_UNCCD_SDGIndicator1531_merged.pdf.

Topsoil organic carbon content

21. The Soil Framework Directive[12] called for the delineation of the areas in Europe threatened by a decline in soil organic matter below a definite critical level and for elaboration of appropriate measures to avoid the decline. The "critical" concentration of SOC at 2 per cent (or 3.4 per cent of soil organic matter according to a standard conversion ratio) is the most cited threshold in policy documents. The European Commission Road map for a resource-efficient Europe[13] proposed a goal that SOC levels should not decrease overall and should increase for soils currently with less than 2 per cent SOC by 2020.[14] Figures II (overleaf) and III (below) illustrate the variation in SOC across the region, with 20 g/kg SOC being equivalent to the 2 per cent threshold (coloured green in figure II).

Figure III
Soil organic carbon content by subregion, weighted average 0–30 cm (g/kg)



Source: Derived from SoilGrids, courtesy of International Soil Reference and Information Centre – World Soil Information.

Cropland area

22. There is no definite threshold for agricultural land dynamic, although any decrease of cropland is regarded by default as negative in terms of food security. In the past decade, the long-term trend of a decline in cropland continued in the European Union, though at a slower pace. Moreover, in recent years, a positive trend is observed (see figure IV below). However, the positive trend may reverse in the next decade.[15] Interestingly, in Eastern Europe and Central Asia, current land-use dynamics also show some increase of sown area, especially in productive areas of Kazakhstan, the Russian Federation and Ukraine.

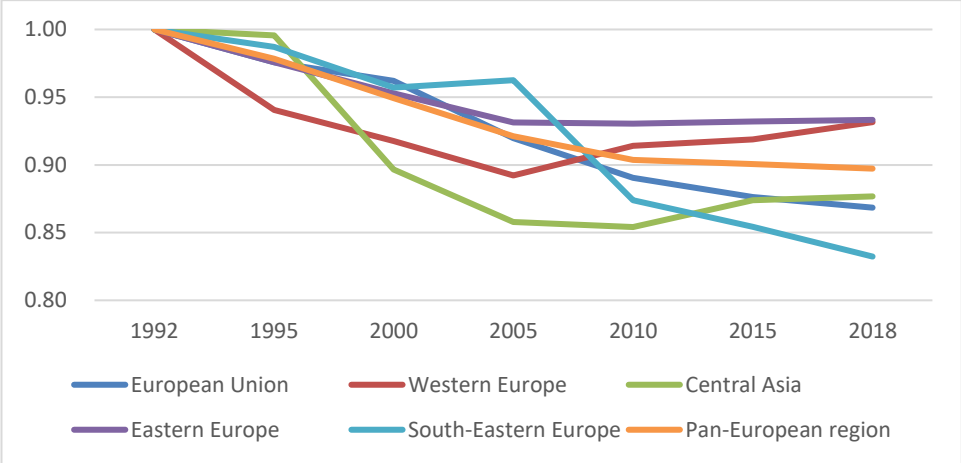
[12] Adopted in 2006 but withdrawn by the European Commission in 2014.

[13] European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Road Map to a Resource Efficient Europe, COM(2011) 571 final, available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011DC0571.

[14] Panos Panagos and others, "Estimating soil organic carbon in Europe based on data collected through a European network", *Ecological Indicators*, vol. 24 (January 2013), pp. 439–450.

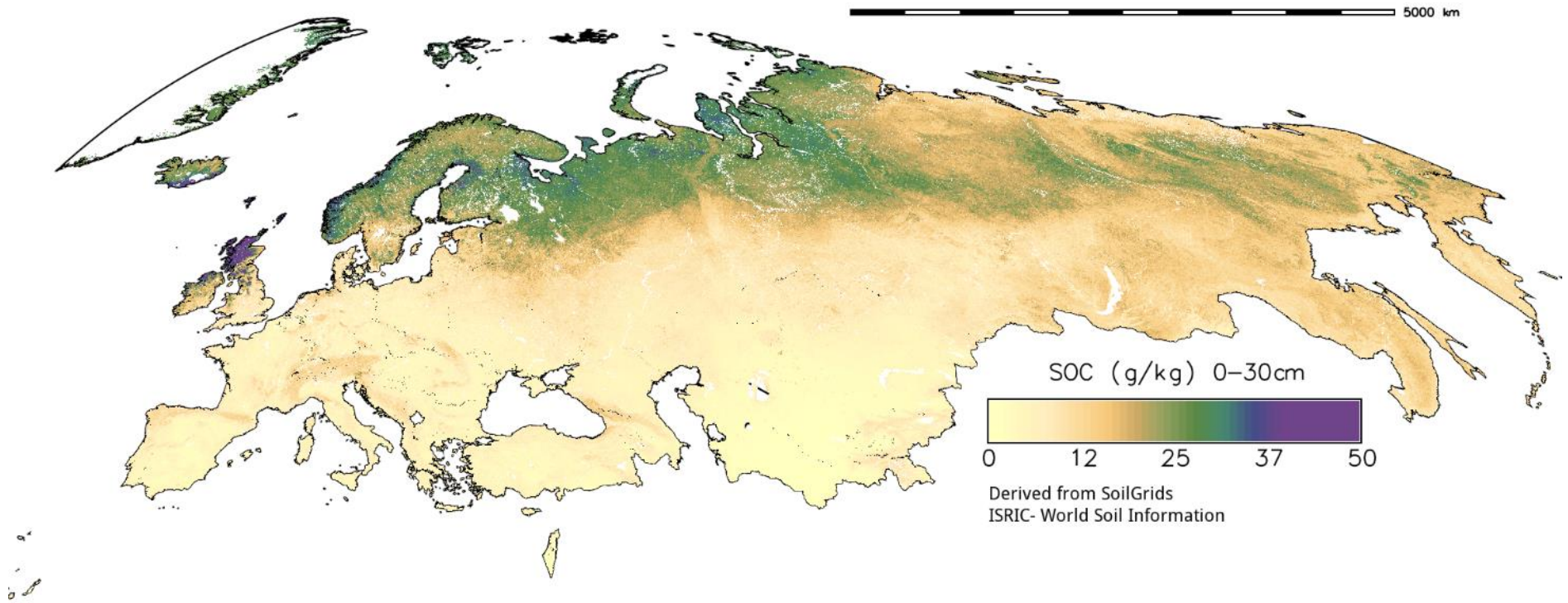
[15] Cristian Andronic and others, *The challenge of land abandonment after 2020 and options for mitigating measures* (Brussels, European Parliament/Policy Department for Structural and Cohesion Policies, 2020), available at www.europarl.europa.eu/thinktank/en/document.html?reference=IPOL_STU%282020%29652238.

Figure IV
Cropland area in 1992–2018 (1992=1)



Source: Food and Agriculture Organization of the United Nations Statistics, Data – Land Use, available at www.fao.org/faostat/en/#data/RL.

Figure II
Soil organic carbon content, 0–30 cm, g/kg



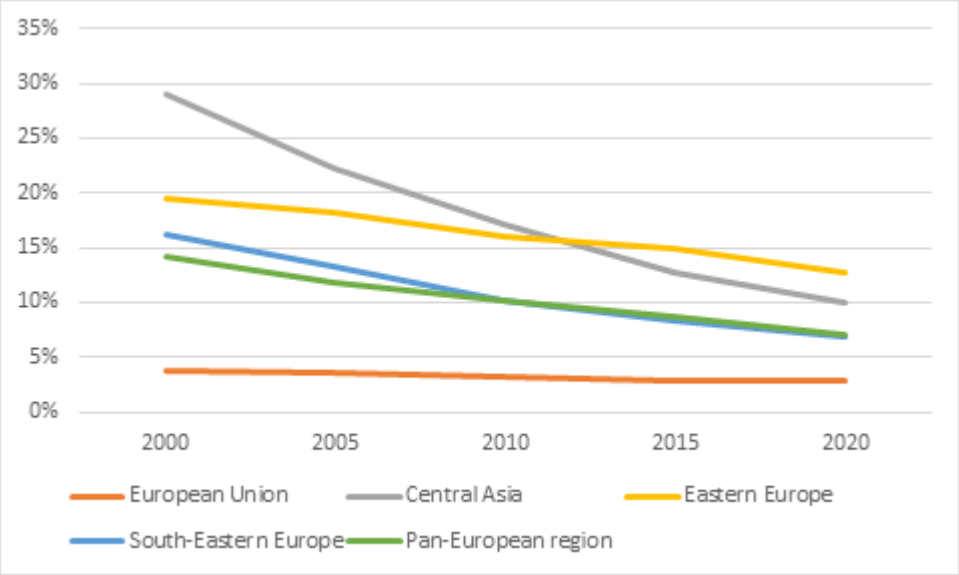
Source: Derived from Soil Grids, courtesy of International Soil Reference and Information Centre – World Soil Information.[16]

[16] Date will be indicated.

Prevalence of stunting among children aged under five years

23. The malnutrition rate among children aged under five years is an indicator of food security and safety. The indicator is especially important for monitoring progress in the quality of food diet in Eastern Europe and Central Asia. Figure V below demonstrates the impressive progress made this century. The post-Soviet countries can be classified into three broad categories in terms of food and nutrition security: (a) those primarily affected by undernutrition and micronutrient deficiencies (Kyrgyzstan, Tajikistan and Uzbekistan); (b) those facing the triple burden of malnutrition, characterized by residual undernutrition, persisting micronutrient deficiencies and increasing rates of obesity (Kazakhstan); and (c) countries primarily affected by overnutrition (Russian Federation).[17]

Figure V
Prevalence of stunting among children aged under 5 years, per cent



Source: United Nations Children's Fund (UNICEF), World Health Organization and World Bank Joint Child Malnutrition Estimates Expanded Database: Stunting (Survey Estimates), April 2021, New York, Malnutrition in Children.

Notes: No data for Western Europe (non-European Union), the Russian Federation and Turkey. Within European Union, data for Belgium, Bulgaria, Czechia, Estonia, Germany, Greece, the Netherlands, Poland, Portugal and Romania.

5. Case studies

Portuguese *montado* and Spanish *dehesa*: surviving farming in a marginal environment

24. The Common Agricultural Policy supports marginal farming by providing for agro-environmental subsidies in the framework of its second pillar, on rural development. About 4 per cent of the European Union subsidies are directed to agriculturally Less Favourable Areas, which are supposed to have a high level of biodiversity.[18] Some experts challenge this policy, wishing to see subsidies for marginal land without connection to farming activities.[19] However, though few, some positive examples are available of where farming on marginal lands leads to both environmental and economic benefits. Two of the best examples come

[17] Saule Burkitbayeva, Johan Swinnen and Nele Warrinnier, "Food and nutrition security in Eurasia: Evolution, shocks and policies", *Russian Journal of Economics*, vol. 6, No. 1 (March 2020), pp. 6–25.

[18] European Commission, *Rural development in the European Union: Statistical and Economic Information – Report 2013* (Luxembourg, Publications Office of the European Union, 2013).

[19] Thomas Merckx and Henrique M. Pereira, "Reshaping agri-environmental subsidies: From marginal farming to large-scale rewilding", *Basic and Applied Ecology*, vol. 16, No. 2 (March 2015), pp. 95–103.

from the Portuguese *montado* and the Spanish *dehesa*. These agroforestry systems are dominated by cork oak and holm oak woodland, which produce cork as a forestry product and acorns for livestock breeding, respectively. In between trees, farmers seed pastures and cereals. The biodiversity of these systems is very high and they have retained many of the main characteristics of the original vegetation. Also, many of these farms are economically viable because of this multifunctionality and their large operational spatial scale.[20]

Mogliazze, Italy: regeneration of "ghost" village

25. In Italy, 267 deserted villages have been well documented. The most frequent reason for their abandonment has been outmigration of residents to cities in the period from the 1950s to the 1980s. The so-called new ruralism movement has brought regeneration to at least 51 of these villages, where different reawakening projects have been successfully implemented, mostly on a crowdfunding basis. "Mogliazze is a small rural village in the hills of Emilia Romagna, part of the municipality of Bobbio, founded by monks in the ninth century a.d. Mogliazze suffered severe population decline because of urban migration and, in the 1950s, lost its entire population to more urbanized areas. In the 1970s, a group of ecological activists recuperated the abandoned homes of Mogliazze to become an eco-village; the Mogliazze Ecovillaggio Cooperative Biologica, which opened at the beginning of the 1980s. Today, the almost entirely renovated village is home to members of a farming cooperative, Soc. Coop Mogliazze, which produces organic fruit and vegetables, honey and grains, which they sell at local farmers' markets and online. The cooperative converted some of the old homes into laboratories where members create secondary products including organic fruit preserves, biscuits and herbal health products."[21]

B. Chemicals and waste

1. Key messages and recommendations

Key messages

26. Chemicals and waste management is at the heart of many solutions to the current challenges faced as a part of the transition to a zero carbon and sustainable economy. In the region, capacities to make well-informed decisions on chemicals and waste issues are often either missing or expertise is not well integrated into decision-making processes. Government decision-makers, industry and the public do not have easy access to information and knowledge that will support the making of impact-oriented choices.

27. Chemicals play a vital role in the economy today and are essential in paving the way towards a green economy. However, it remains difficult to capture what is full exposure of humans to hazardous chemicals. No set of impact-oriented indicators is regularly monitored across the region. There is also a lack of information regarding the impact of chemicals on the efficiency and economic viability of circular economy schemes such as recycling.

28. While the waste management hierarchy assigns highest priority to waste prevention, waste generation continues to rise across the region. Even where a strong political commitment to a circular economy exists, such as in the European Union and other western European countries, the quantities of waste generated are growing.

29. A specific challenge is waste electrical and electronic equipment (e-waste), which contains both hazardous and precious components. Average e-waste generation is stabilizing in the region as a whole, but it continues to increase rapidly in the economically less mature subregions. E-waste collection and recycling are highly deficient across all subregions; the recovery rates are low. Thus, an important opportunity is being missed to harness economic

[20] T. Pinto-Correia, N. Ribeiro and P. Sá-Sousa, "Introducing the *montado*, the cork and holm oak agroforestry system of Southern Portugal", *Agroforestry Systems,* vol. 82, No. 2 (April 2011), pp. 99–104.

[21] Sloan, "Reawakening 'Ghost Towns'".

value for the region and to reduce the region's dependency regarding the sourcing of critical raw materials, which are bottlenecks in the shift towards resilient future economies.

30. Recycling rates differ significantly among the countries and are particularly low in Eastern Europe and Central Asia. Municipal waste recycling rates above 45 per cent exist only in a few European Union countries and Switzerland. Progress is being achieved in all subregions, but slowly.

Recommendations

31. ECE member States should increase efforts to equip public administrations with a skilled work force, ready to engage with all sectors of society, and to increase broad access to reliable and detailed information, in order to achieve sound management of chemicals and waste. Governance of chemicals and waste must be made fitter for the challenges of today and the years of transition of economies that lie ahead by better balancing risks and opportunities.

32. Governments should strive to further advance full and coherent implementation of multilateral environmental agreements, including the Protocol on Pollutant Release and Transfer Registers to the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters. Administrations should make efforts to establish a region-wide, impact-oriented monitoring scheme, as a form of cooperation between science and policy, to build up a better picture of the adverse impacts of chemicals on human health and the environment, and to address them.

33. ECE and member States should work on establishing a mechanism across countries and sectors to identify and share benchmarks and good practices for resource efficiency in production processes. Sharing of knowledge will allow decision-makers at all levels to tap into the potential gain from using existing good practices.

34. The countries of the region should establish a resource-oriented, pan-European e-waste management partnership, which would aim at the effective collection and sound handling of recyclables to enable the recovery of valuable resources. An urgent priority is the recovery of secondary resources from e-waste, especially in view of the rapidly growing quantities across Eastern Europe, South-Eastern Europe and Central Asia.

35. Governments should support repair, refurbishment and remanufacturing, including through financial incentives such as tax relief, in order to reduce waste. These waste prevention efforts would improve resource efficiency.

2. Context

36. Usage of chemicals and the occurrence of waste are tightly interwoven with standards of living and economic prosperity. An estimated 40,000 to 60,000 industrial chemicals are commercially traded worldwide[22] and used, for example, in agriculture, health care and the manufacturing of items such as electronics, textiles, furniture and toys. Chemicals also have a major role to play in the transition towards a green economy, since they represent building blocks of resource-efficient technologies and products.[23] However, some chemicals cause risks to the environment and human health. Chemicals released into air, water and soil can influence individual species, alter biodiversity and undermine the resilience of ecosystems. Harmful exposure to chemicals can negatively affect human health through a broad range of implications, including damage to immune, endocrine and reproductive systems, genetic effects and chronic diseases such as cancer, cardiovascular disorders and asthma.

[22] United Nations Environment Programme (UNEP), *Global Chemicals Outlook II: From legacies to innovative solutions – Implementing the 2030 Agenda for Sustainable Development* (n.p., 2019), available at www.unep.org/resources/report/global-chemicals-outlook-ii-legacies-innovative-solutions.

[23] European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Chemicals Strategy for Sustainability Towards a Toxic-Free Environment, COM(2020) 667.

37. The occurrence of large amounts of waste is linked to inefficient use of resources as part of unsustainable consumption and production practices in modern-day societies. Some waste has hazardous properties and its sound handling is an essential element in reducing chemical pollution. Other waste streams cause losses of materials and energy and aggravate pressures on the environment, for example, the introduction of microplastics into the food chains, affecting biodiversity and human health. At the same time, sound and value-oriented management of solid waste can substantially contribute to the mitigation of climate change by potentially displacing around 15 to 20 per cent of greenhouse gas emissions worldwide.[24]

38. The pan-European region faces the dual challenges of protecting the ecosystem services available to current and future human societies and decoupling environmental degradation from economic prosperity. To meet these challenges, the adoption of more sustainable consumption and production patterns, and the sound management of chemicals and waste, as parts of the transition to a green economy, are required. Risks and opportunities must be well understood and responded to with effective measures.

3. State, main trends and recent developments

39. In 2017, the global chemical industry's production capacity amounted to 2.3 billion tons, making the chemical industry the second-largest manufacturing industry in the world in terms of economic relevance.[25] The volume of traded chemicals is expected to significantly grow in the future;[26] the number of new chemicals is also rising.[27] Of the 345 million tons of chemicals consumed in the European Union in 2016, 62 per cent belonged to categories classified as hazardous to human health and 35 per cent were hazardous to the environment.[28] The latest European Environment State and Outlook report identified as a specific issue of concern the potential combined effects of different chemicals.[29] The full extent of exposure to hazardous chemicals and the impacts on environmental and human health are difficult to capture because of the complexity of this field and the high number of different chemicals in use, and because no concise set of impact-oriented indicators is regularly monitored across the region. Methodologies for such risk assessments are still rather fragmented.[30] The knowledge base is reasonably broad although still fragmented for the European Union[31] but strongly deficient for other subregions.

40. A complex body of legislation addresses usage and handling of chemicals. The most stringent regulations exist in the European Union, with approximately 40 legislative instruments.[32] These include the European Regulation on Registration, Evaluation, Authorization and Restriction of Chemicals,[33] which identifies the key characteristics of the

[24] UNEP and the International Solid Waste Association, *Global Waste Management Outlook* (n.p., 2015), available at www.unep.org/resources/report/global-waste-management-outlook.

[25] UNEP, *Global Chemicals Outlook II*.

[26] Ibid.

[27] Beate I. Escher, Heather M. Stapleton and Emma L. Schymanski, "Tracking complex mixtures of chemicals in our changing environment", *Science*, vol. 367, No. 6476 (January 2020), pp. 388–392.

[28] European Environment Agency, "Consumption of hazardous chemicals", briefing, 26 November 2019, available at www.eea.europa.eu/airs/2018/environment-and-health/production-of-hazardous-chemicals.

[29] European Environment Agency, *The European environment — state and outlook 2020: Knowledge for transition to a sustainable Europe* (Luxembourg, Publications Office of the European Union, 2019), available at https://www.eea.europa.eu/soer/publications/soer-2020.

[30] S. Rotter and others, "Overview on legislation and scientific approaches for risk assessment of combined exposure to multiple chemicals: the potential EuroMix contribution", *Critical Reviews in Toxicology*, vol. 48, No. 9 (2018), pp. 796–814.

[31] Milieu Ltd, Ökopol, Risk and Policy Analysts and the National Institute for Public Health and the Environment of the Netherlands, *Study for the strategy for a non-toxic environment of the 7th Environment Action Programme: Final Report* (Luxembourg, Publications Office of the European Union, Luxembourg, 2017), available at https://op.europa.eu/en/publication-detail/-/publication/89fbbb74-969c-11e7-b92d-01aa75ed71a1.

[32] European Commission, Chemicals Strategy for Sustainability.

[33] Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH),

listed chemicals. In October 2020, the European Union Chemicals Strategy for Sustainability – Towards a Toxic-free Environment was launched; it aims to phase out the most harmful substances from consumer products and to support financially the uptake of safe and sustainable chemicals.[34] For all countries, the Globally Harmonized System of Classification and Labelling of Chemicals has established standards for hazard classification, labelling and elaboration of material safety sheets since 2002; adoption was much slower than foreseen,[35] but the region is now on the right path.[36] Furthermore, the Strategic Approach to International Chemicals Management, hosted by UNEP, has advanced policy responses to issues of particular concern, including lead in paint,[37] and, together with the chemical manufacturing industry's Responsible Care initiative,[38] has contributed to capacity-building. The mandate of Strategic Approach to International Chemicals Management expired in 2020; designing the process for the period beyond 2020 represents an opportunity to further strengthen multilateral cooperation and advance frameworks that ensure that stakeholders have adequate data and knowledge at their disposal during their decision-making processes, and adequate capacities when it comes to the implementation of measures.[39]

41. Several multilateral environmental agreements regulate the processing of substances that are of high concern for human and environmental health. These instruments establish a powerful framework, but full benefits can only be unlocked if universal ratification is achieved across the region, which is currently not the case. Eight out of fifty-four countries of the pan-European region are not party to the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. Only thirty-seven countries of the region are party to the Protocol on Pollutant Release and Transfer Registers.

42. Regarding waste management, strong differences continue to exist between Western Europe and the other subregions. As a common challenge, total waste generation has continued to increase in most countries, even though waste prevention is the top priority in the waste management hierarchy. National waste prevention programmes exist for European Union and European Free Trade Agreement countries – promoting reuse and repair activities is a frequent focus – but only a few programmes explicitly support market-driven reuse activities such as refurbishment or remanufacturing.[40]

43. The European Union waste regulations establish a fairly robust framework for the collection, valorization or sound disposal of waste. Average European Union recycling rates of municipal solid waste have been continuously increasing over the last 10 years and, since March 2020, the new Circular Economy Action Plan is in place as part of the European Green Deal. Countries joining the European Union show pronounced progress on waste management, which illustrates the effectiveness of the bloc's regulations. Across Eastern Europe, South-Eastern Europe and Central Asia, valorization of municipal solid waste has made some progress; however, overall, the recycling rates remain at relatively low levels and

establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, *Official Journal of the European Union*, L 396 (2006), pp. 1–849.

[34] European Commission, "Green Deal: Commission adopts new Chemicals Strategy towards a toxic-free environment", press release, 14 October 2020, available at https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1839.

[35] UNEP and ECE, *GEO-6: Global Environment Outlook: Regional assessment for the Pan-European Region* (Nairobi, 2016).

[36] ECE, "GHS implementation", available at https://unece.org/ghs-implementation-0.

[37] UNEP Strategic Approach to International Chemicals Management (SAICM), website, https://www.saicm.org/, accessed 2 September 2021.

[38] International Council of Chemical Associations, "Responsible Care", available at https://icca-chem.org/focus/responsible-care/.

[39] To be revised in 2022.

[40] European Environment Agency (EEA), *Waste prevention in Europe — policies, status and trends in reuse in 2017*, EEA Report No. 4/2018 (Luxembourg, Publications Office of the European Union, 2018), available at https://circulareconomy.europa.eu/platform/sites/default/files/eea_report_waste_prevention_in_europe_2017_th-al-18-0008-en-n.pdf.

the change is slow. This signals that circular economy schemes are not yet effectively in place across these subregions. Some countries, however, have initiated ambitious reforms of waste management frameworks, including the specification of target municipal solid waste recycling rates (Russian Federation, Uzbekistan).

44. Rapidly rising volumes of e-waste across Central Asia, Eastern Europe and South-Eastern Europe are a specific challenge. In the European Union and Western Europe, e-waste quantities are stabilizing, but at a remarkably high level; per capita e-waste generation was more than twice the global average of 7.3 kg per capita in 2019 (see below). Of particular concern are the low shares of e-waste collection; collection is a prerequisite for valorization. Even in the European Union, where advanced schemes are in place, less than 45 per cent of the estimated generated e-waste volume was collected in 2017.[41]

45. Circularity-oriented initiatives have also emerged in the region as an effort of civil society or the private sector. Repair initiatives, sharing approaches and remanufacturing schemes are only a few examples of new business models, community schemes and alternative production systems. They signal that all sectors of society have started to respond to the need for more sustainable resource usage and the prevention of wastes.

46. Implementation of a circular economy represents a major opportunity to ensure future prosperity in the region. One promising element to support sustainable consumption is the introduction of a right to repair. Urgent measures must also be taken to end premature obsolescence of products. Two circular economy schemes to reach an industrial scale are remanufacturing and industrial symbiosis. Independent and transparent sustainability assessments are essential. International expert groups could help countries analyse their future needs for specific resources and how these can be met.

47. Greenwashing, by misleading consumers and exploiting their environmental concerns, can have severe detrimental impacts and is not acceptable. Countries that manage their transition well today will be the ones with a competitive advantage in a few decades.

4. Indicators

Compliance with multilateral environmental agreements on hazardous waste and other chemicals (indicator 12.4.1 of the Sustainable Development Goals)

48. This indicator identifies progress in managing chemicals and hazardous wastes in a sound way, as regulated by the Rotterdam Convention, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Stockholm Convention on Persistent Organic Pollutants and the Montreal Protocol on Substances that Deplete the Ozone Layer. The Minamata Convention on Mercury has recently been added; the first full report is due in December 2021.[42] Compliance in meeting reporting obligations as required by the multilateral environmental agreements is monitored in 5-year cycles (annual monitoring is not possible because the multilateral environmental agreements foresee differing time schedules to submit reports). While the region performs well regarding the Montreal Protocol, insufficient performance is recorded regarding the Stockholm Convention with all subregions, apart from South-Eastern Europe, performing worse than in the previous period and average compliance below 60 per cent (see figure VI below). For the Basel and the Rotterdam Conventions, average compliance in the region ranges between 70 and 80 per cent; the European Union and South-Eastern Europe perform better than the other subregions. There has been an improvement across South-Eastern Europe and, for the Rotterdam Convention, also across Eastern Europe.

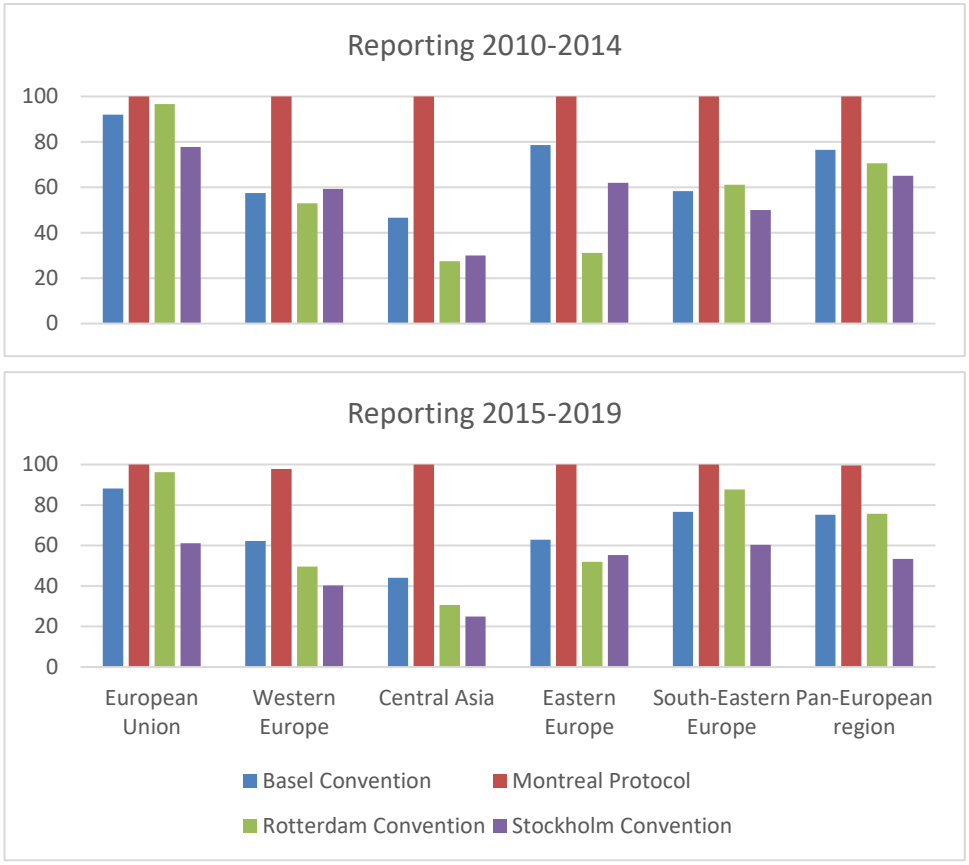
49. All countries have room for improvement. Participation in multilateral environmental agreements enables Governments to co-shape international negotiations and policymaking in the environmental field and facilitates coordinated measures. Effective implementation of

[41] Eurostat, Waste statistics – electrical and electronic equipment, data from August 2020, available at https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics_-_electrical_and_electronic_equipment (accessed 29 May 2021).

[42] To be updated in 2022.

multilateral environmental agreements requires continued efforts and the allocation of sufficient financial resources to the responsible environmental institutions.

Figure VI
Compliance with multilateral environmental agreements in the reporting cycles 2010–2014 and 2015–2019, per cent with trend also indicated



Source: Global Sustainable Development Goal Indicator Database, https://unstats.un.org/sdgs/indicators/database/, retrieved 18 May 2021.

Notes: The trend is calculated as a percentage change between reporting periods 2010–2014 and 2015–2019, with an improvement shown as an upwards arrow and a worsening as a downwards arrow (horizontal arrow means no change). The arrow is shown in black unless the change is an improvement of at least 5 per cent (green) or a worsening of at least -5 per cent (red).

Total waste generation per capita

50. This indicator describes the quantity of total waste (hazardous and non-hazardous) produced in a country per year, by all sectors. Waste generation is an ECE environmental indicator; good progress was reported in the Shared Environmental Information System assessments (ECE/CEP/AC.10/2021/6) and thus it represents a robust indicator. Average waste generation per capita increased in the region by 31 per cent between 2012 and 2018 (see figure VII overleaf), and by 7 per cent when excluding major mineral wastes. Most countries have witnessed growth of waste occurrence. Large variations exist between countries; some of this difference can be explained by specific economic sectors being dominant in certain countries. As an example, in Estonia, much of the waste comes from the oil shale industry, a unique situation in the region. Mining waste largely explains the high quantities across Eastern Europe and Central Asia. Although progress has been made regarding the reporting of relevant data, it is not possible to derive waste quantities excluding major mineral wastes for all countries.

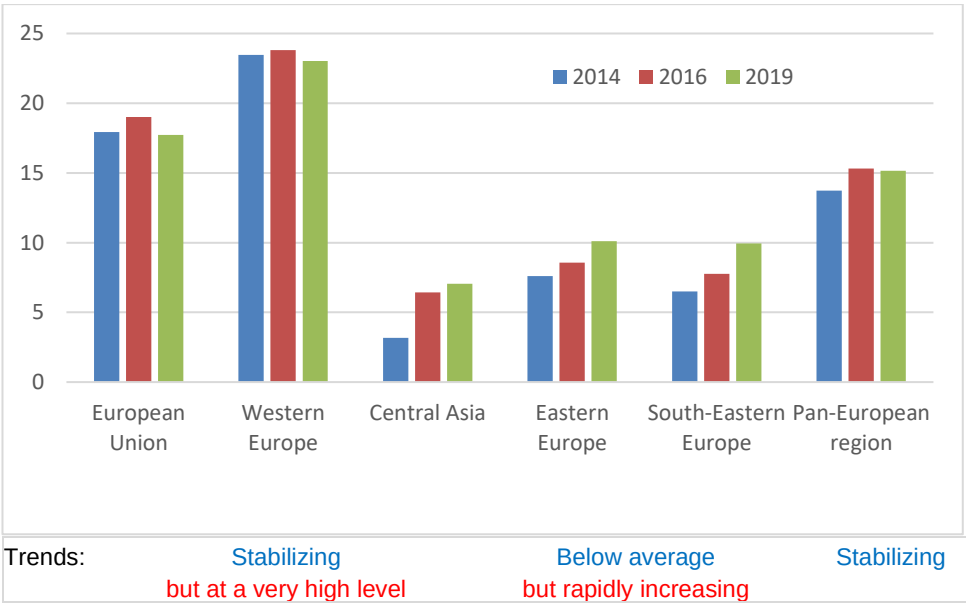
51. Despite the commitments of countries to foster waste prevention, overall, waste generation is growing across the pan-European region and all subregions. More efforts are

required. Benchmarks are needed to assess the waste quantities that can be prevented in different sectors. To foster waste prevention, economic instruments, such as landfill taxes, deposit-refund systems, tax reductions or other fiscal incentives for innovative businesses and extended producer responsibility, should be explored urgently.

E-waste generation per capita

52. E-waste contains both hazardous components and precious resources such as critical raw materials. For the pan-European region, the average annual e-waste generation per capita is plateauing at around 15 kg, with differing trends in the subregions (see figure VIII below). This is mainly due to a stabilized or slightly declining quantity in the European Union and in Western Europe, while it continues to grow at a rapid pace across Central Asia, Eastern Europe and South-Eastern Europe. The level of e-waste generation in the region is much above the global average,[43] but countries in Western Europe on average generate more than three times the per capita volumes in Central Asia. Separate collection is a prerequisite for high-value valorization of this material stream. However, even across the European Union and Western Europe, where collection and recycling infrastructures are in place, significant quantities of e-waste do not enter the official collection and valorization schemes.[44]

Figure VIII
Domestic e-waste generation per capita in the region and the subregions, kg per capita, with trends



Sources: *Global E-Waste Monitor*, 2014, 2017 and 2020 editions.

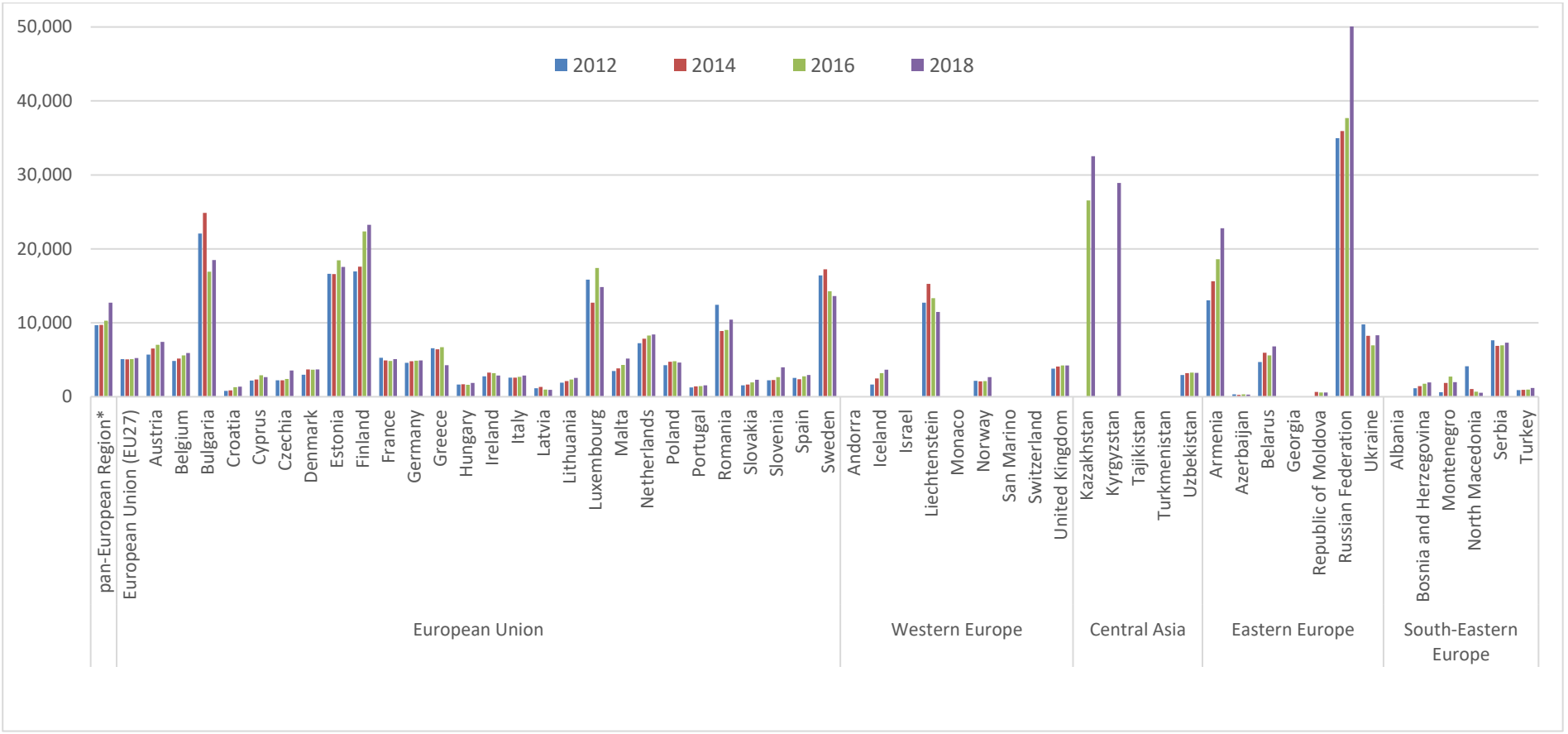
Notes: 48–50 countries; no data for Andorra, Liechtenstein, Monaco or San Marino in all years, and no data for Tajikistan and Uzbekistan in 2016 and 2019.

[43] At a global level, e-waste generation per capita increased from 5.8 kg in 2014 to 7.3 kg in 2019, according to Cornelis Peter Baldé and others, *The Global E-waste Monitor 2014: Quantities, flows and resources* (Bonn, United Nations University (UNU), 2015); and Vanessa Forti and others, *The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential* (Bonn, Geneva and Rotterdam, UNU/United Nations Institute for Training and Research/International Telecommunication Union (ITU)/International Solid Waste Association (ISWA), 2020).

[44] Cornelis Peter Baldé and others, *The Global E-waste Monitor 2017: Quantities, flows and resources* (Bonn, Geneva and Vienna, UNU/ITU/ISWA, 2017); and Forti and others, *The Global E-waste Monitor 2020*.

Figure VII

Total waste generation per capita, kg per capita and year, with trends



Trends:	Increase in average waste generation; 21 out of 27 countries with an increase in period 2016–2018	Mixed picture	Increase in nearly all countries in period 2016–2018	Mixed picture

Sources: national statistics; for the European Union, Iceland, Liechtenstein, Norway, the United Kingdom of Great Britain and Northern Ireland, and South-Eastern Europe except Albania: Eurostat data, retrieved 20 May 2021; other countries: national data published by country statistical entities, retrieved May–July 2021.

Notes: No data for Andorra, Georgia, Israel, Monaco, San Marino, Switzerland, Tajikistan and Turkmenistan. 2019 value instead of 2018 for Uzbekistan; 2017 value instead of 2016 for the Republic of Moldova. Limited data for the Republic of Moldova, Kazakhstan and Kyrgyzstan. Average value for pan-European region is calculated based on the available country data in each year (weighted average by considering population in each country and year).

Recycling rate of municipal solid waste

53. There are significant differences in municipal solid waste recycling between the subregions (see figure IX below), but all subregions have made some progress. Some countries of the European Union, such as Austria, Germany, the Netherlands and Slovenia, have the highest recycling rates in the world. The average European Union recycling rate has increased from 37.3 per cent in 2009 to 47.7 per cent in 2019. Five European Union countries still have municipal solid waste recycling rates below 25 per cent. Croatia, Latvia, Lithuania, Slovakia and Slovenia, which joined the bloc around 15 years ago, present the most pronounced improvement. Across Eastern Europe, South-Eastern Europe and Central Asia, no country has a municipal solid waste recycling rate of above 25 per cent and rates tend to be substantially lower than 25 per cent or even negligible. A few positive cases stand out, such as Uzbekistan, where the municipal solid waste recycling rate is currently around 20 per cent (see case study below). Overall, the region is advancing to more recycling and thus to a more circular economy, but progress is slow. To accelerate the transition, a strong commitment by policymakers is required, along with an adequate allocation of financial resources and the readiness to learn from successful schemes.

5. Case studies

Reforming the waste management framework in Uzbekistan

54. Uzbekistan has initiated ambitious reforms of its environmental frameworks, including new institutional arrangements for waste management since 2017 and the launch of a strategy on municipal waste management for the period 2019–2028.[45] Coverage of the population by waste services increased from 22 per cent in 2016 to 53 per cent in 2018.[46] The national target is to reach 100 per cent of the population covered by waste collection services by 2025; furthermore, the strategy aims to achieve 45 per cent municipal solid waste recycling by 2025 and 60 per cent by 2028. The country is on the right path; the municipal solid waste recycling rate in 2019 was close to 20 per cent, up from 9 per cent in 2017.

Chemicals in plastics

55. Recent research identified more than 6,000 different additives in plastic products.[47] Only some are polymerized within the plastic matrix, while many can leach and potentially have an impact on the environment and humans.[48,49] When plastics are recycled, individual chemicals or cocktails of substances can unintentionally be transferred to the new products as contaminants, which creates new risks in the value chains. Such cross-contamination has been identified in, for example, children's toys and food contact articles.[50]

[45] UNEP, *Waste Management Outlook for Central Asia* (n.p., 2017).

[46] *Environmental Performance Reviews: Uzbekistan – Third Review* (United Nations publication, Sales No. E.20.II.E.26).

[47] Nicolò Aurisano, Roland Weber and Peter Fantke, "Enabling a circular economy for chemicals in plastics", *Current Opinion in Green and Sustainable Chemistry*, vol. 31, special issue (October 2021).

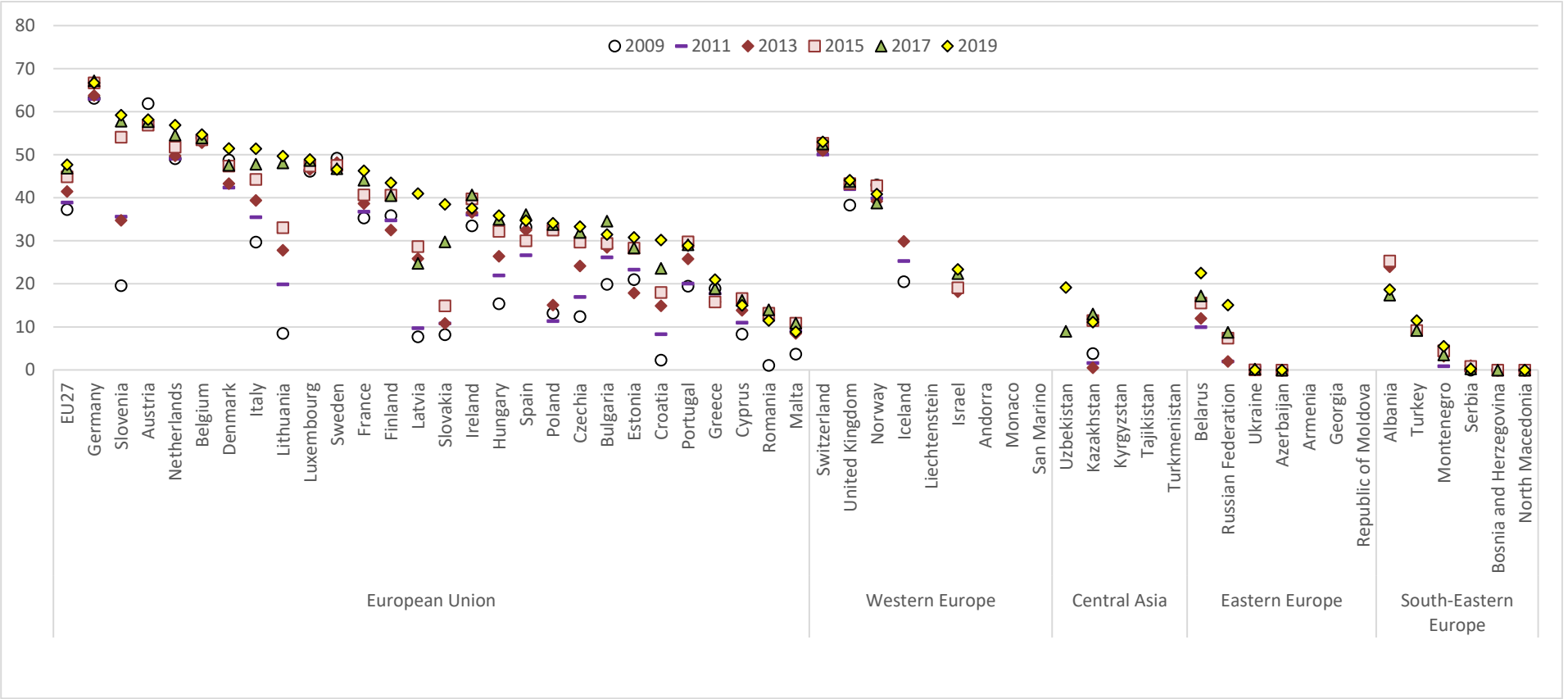
[48] John N. Hahladakis, "An overview of chemical additives present in plastics: migration, release, fate and environmental impact during their use, disposal and recycling", *Journal of Hazardous Materials*, vol. 344 (February 2018), pp. 179–199.

[49] Lisa Zimmermann and others, Benchmarking the in vitro toxicity and chemical composition of plastic consumer products, *Environmental Science and Technology*, vol. 53 (2019), pp. 11467–11477.

[50] Antonella Guzzonato, Franky Puype and S.J. Harrad, "Evidence of bad recycling practices: BFRs in children's toys and food-contact articles", *Environmental Science: Processes and Impacts*, vol. 19, No. 7 (June 2017), pp. 956–963; and Alin C. Ionas and others, "Downsides of the recycling process: harmful organic chemicals in children's toys", *Environment International*, vol. 65 (April 2014), pp. 54–62.

Figure IX

Recycling rate of municipal solid waste, including composting and anaerobic digestion, per cent (biennially 2009–2019)



Status and trends	Average over 45 per cent, with 7 countries over 50 per cent and up to 67 per cent; increasing average, with good improvement in most countries and strong improvement in some countries; 5 countries still below 25 per cent	Mixed picture; only 1 country over 45 per cent	Mixed picture; some countries good progress; all below 25 per cent; for some no data available	Slow change; all countries still below 25 per cent

Sources: National statistics; for the European Union, Iceland, Liechtenstein, Norway, Switzerland, the United Kingdom of Great Britain and Northern Ireland and South-Eastern Europe except Albania: Eurostat data, retrieved 27 May 2021; other countries: data published by country statistical entities, retrieved May–July 2021.

Notes: 2018 instead of 2019 data for Bulgaria, Montenegro, Serbia, the United Kingdom of Great Britain and Northern Ireland; for Ireland 2012 instead of 2013, 2014 instead of 2015, 2016 instead of 2017, 2018 instead of 2019 data; for Israel 2014 instead of 2013; for Belarus 2012 instead of 2011; for the Russian Federation and Turkey 2016 instead of 2015; Albania: urban waste only.