



Environmentally sustainable health systems: a strategic document



ABSTRACT

This strategic document builds on the evidence that health systems have a considerable environmental impact but that they can also have positive effects on the environment. A vision for an environmentally sustainable health system is put forth, as being a health system that improves, maintains or restores health, while minimizing negative impacts on the environment and leveraging opportunities to restore and improve it, to the benefit of the health and well-being of current and future generations. Ten avenues for action are proposed that can form the core of a strategy for fostering environmental sustainability in health systems, namely adopting a national environmental sustainability policy for health systems; minimizing and adequately managing waste and hazardous chemicals; promoting an efficient management of resources; promoting sustainable procurement; reducing health systems' emissions of greenhouse gases and air pollution; prioritizing disease prevention, health promotion and public health services; engaging the health workforce as an agent of sustainability; increasing community resilience and promoting local assets; creating incentives for change; and promoting innovative models of care. The WHO Regional Office for Europe encourages Member States to take an active role in environmental stewardship efforts.

KEYWORDS

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FOREWORD

Health systems are fundamental to achieving and maintaining societal health and welfare, and are key factors for development and economic growth. They also represent a large share of the economy, globally and in most Member States of the WHO European Region, and employ large workforces, notably in health care. Taken as a whole, the health sector consumes considerable amounts of energy and resources and produces major streams of emissions and waste, either directly or through the goods and services it procures, uses and disposes of.

Ideally, an environmentally sustainable health system improves, maintains or restores health, while minimizing negative impacts on the environment and leveraging opportunities to restore and improve it, to the benefit of the health and well-being of current and future generations. Actions in stewardship, service delivery, resource generation and financing can contribute to these goals.

The WHO Regional Office for Europe has a clear policy mandate in this area. Health 2020, the Tallinn Charter: Health Systems for Health and Wealth, and the Parma Commitment to Act on Environment and Health provide a solid basis upon which to engage in technical work, advocacy and support to Member States in policy development, adoption and implementation.

This document proposes a range of practical actions that can help Member States to further strengthen environmentally sustainable health systems.

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ABBREVIATIONS

EDC	Endocrine-disrupting chemical
ESHS	Environmentally sustainable health systems
EU	European Union
NHS	National Health Service, England, United Kingdom
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WASH	Water, sanitation and hygiene
WHA	World Health Assembly
WHO	World Health Organization

EXECUTIVE SUMMARY

Health systems are fundamental to achieving and maintaining societal health and welfare, and are key factors for development and economic growth. They also represent a large share of the economy in most Member States of the WHO European Region, and employ large workforces, notably in health care. Due to its size and processes, the health sector as a whole consumes considerable amounts of energy and resources and produces major streams of emissions and waste, either directly or through the goods and services it procures, uses and disposes of.

This entails direct and indirect environmental impacts, which have traditionally been addressed through compliance with increasing regulatory demands. However, more and more frequently, the health sector in many Member States is taking an active role in environmental stewardship efforts. This proactive stance is supported by various facts: 1) several environmental sustainability interventions can support the tackling of upstream determinants of health; 2) environmental sustainability action can provide benefits for patients, providers, the health workforce and health systems' core functions, and can also decrease environmental health risks; and 3) environmental sustainability can help reduce costs and increase the resilience of health systems.

The global context in the private and public sectors clearly tends to mainstream environmental sustainability into core organizational functions. The question is, therefore, how health systems can do so within their existing institutional frameworks, core mandates and resource constraints.

The WHO Regional Office for Europe has a clear policy mandate for action in this area. Health 2020, the Tallinn Charter: Health Systems for Health and Wealth and the Parma Commitment to Act on Environment and Health provide a solid basis upon which to engage in technical work, advocacy and support to Member States in policy development, adoption and implementation.

An environmentally sustainable health system would improve, maintain or restore health, while minimizing negative impacts on the environment and leveraging opportunities to restore and improve it, to the benefit of the health and well-being of current and future generations. Sustainability-oriented actions in stewardship, service delivery, resource generation and financing (the core health systems functions) can all contribute to attaining this goal. A first step in this process is a clear mandate in Member States. This could take the form of a national environmental sustainability policy for health systems, developed through inclusive and transparent procedures. A route map could then establish mechanisms for progress that are measurable through locally and nationally relevant indicators.

Based on experiences in Member States and the scientific literature, the plan may include the following actions:

- overarching action: adopting a national environmental sustainability policy for health systems;
- minimizing and adequately managing waste and hazardous chemicals;
- promoting an efficient management of resources;
- promoting sustainable procurement;
- reducing health systems' emissions of greenhouse gases and air pollutants;
- prioritizing disease prevention, health promotion and public health services;
- engaging the health workforce as an agent of sustainability;
- increasing community resilience and promoting local assets;
- creating incentives for change; and
- promoting innovative models of care.

The WHO Regional Office for Europe can support Member States throughout the process by acting as a convener; collecting and assessing the evidence on the topic; promoting research and development in this area; providing methods and tools for country support and communication; and developing framework strategic documents to be discussed by Member States at appropriate policy meetings.



INTRODUCTION

Health systems are “the ensemble of all public and private institutions and resources, mandated to improve, maintain or restore health”. They encompass “personal and population services, as well as activities to influence the policies and actions in other sectors to address the social, environmental and economic determinants of health” (WHO Regional Office for Europe, 2008). They are fundamental to achieving and maintaining societal health and welfare, and are key factors for development and economic growth (WHO Regional Office for Europe, 2008, 2015a).

Owing to their broad mandate and scope, health systems represent a large sector of the economy in most countries of the WHO European Region. Government spending on health in 2012 was around 10.2% of gross domestic product in European Union (EU) countries and 6.4% in the rest of the Region (WHO Regional Office for Europe, 2014). Health care is a highly labour-intensive activity: in 2010 there were around 17.1 million jobs in the health care sector, which accounted for 8% of all jobs in the 27 countries of the EU as of 2010 (European Commission, 2012).

Partly due to its size, but also to its specific processes and operations, the health sector as a whole – encompassing great internal variability – is a sizeable consumer of energy and resources and a major producer of emissions and waste, with associated direct and indirect environmental impacts. In today’s world, health systems cannot separate themselves from their responsibility towards environmental sustainability.

Thinking on the environmental sustainability of private and public organizations has evolved significantly over the past 50 years. It has been driven forward by changes in the way society perceives the relationship between activities in the private sector and the environment. For many years, the central concern was minimizing the negative impacts of human activities on the environment, or doing less harm. Innovation was mainly driven by the need to comply with environmental regulations. This changed in the 1990s with the emerging consensus that, in addition to being accountable to shareholders for profits, responsible companies also needed to be accountable to society for the social and environmental impacts of their activities. Thinking evolved further as it became clear that environmental sustainability could also provide a competitive advantage: efforts to foster sustainability often generate added value for organizations’ core activities.

The case of environmental sustainability in health systems, however, differs from that in other organizations in at least one crucial aspect – namely, the trade-offs that are not acceptable in the name of environmental sustainability. In most public and private large organizations, short-term trade-offs between certain core goals (for example, profits or return on investment) and environmental sustainability are possible in the context of long-term planning and operational management. However, no trade-offs can be accepted between environmental sustainability and core health systems functions performance. Here, the emphasis should be placed on win-win solutions whereby environmental sustainability actions reinforce health system functions.

Health systems in the Region have been taking important measures to reduce these environmental impacts for decades, mainly motivated by the need to comply with environmental regulations. Furthermore, in recent years, health systems in many countries (including within the Region) have taken an active role in environmental stewardship efforts (WHO, Health Care Without Harm, 2009). Increasingly, the driving force for pursuing environmental sustainability in health systems stems from a recognition of the synergies that exist between health and environmental sustainability. For example, while the intent of measures to promote active modes of transportation may be to increase levels of physical activity, these efforts will also yield clear benefits to the

environment. In summary, health systems can benefit from integrating environmental sustainability action into their core functions.

The mandate for environmentally sustainable health systems (ESHS) in the Region is solidly supported by the following policy documents and declarations.

- The 2030 Agenda for Sustainable Development highlights the responsibility of every sector to contribute to the Sustainable Development Goals (SDGs). For health systems, this entails not only working towards health-related SDGs, but also making a sectorial contribution to the achievement of other SDGs (United Nations, 2015).
- Health 2020, the comprehensive policy framework agreed upon in 2013 by all 53 Member States of the Region, calls for the local promotion of services for environment and health and the encouragement of the health sector to act in a more environmentally responsible manner (WHO Regional Office for Europe, 2013a).
- In the Tallinn Charter: Health Systems for Health and Wealth, Member States of the Region recognized the contribution of improved health to social well-being and emphasized the importance of both improving and being accountable for the performance of their health systems (WHO Regional Office for Europe, 2008).
- In the Parma Commitment to Act on Environment and Health, ministers of health and of the environment called for Member States to “collaborate to increase the health sector’s contribution to reducing greenhouse gas emissions and strengthen its leadership on energy- and resource-efficient management and stimulate other sectors, such as the food sector, to do the same” (WHO Regional Office for Europe, 2010).

Moreover, the importance of environmental sustainability is explicitly highlighted in the document outlining the strategic priorities of the WHO Regional Office for Europe for strengthening health systems (WHO Regional Office for Europe, 2015b). Based on this mandate and its ongoing background technical work in this area, WHO is committed to supporting Member States in their efforts towards greater environmental sustainability in their health systems.

This strategic discussion document addresses the environmental sustainability of health systems and how it can support their social and economic sustainability. However, this document does not aim to address health systems’ social and economic sustainability issues *per se*. It is based on the notion that health systems can benefit from implementing and mainstreaming environmental sustainability action across their core functions, as well as by playing a key role in promoting opportunities for health. The following sections are organized into a vision; a concise summary of the existing evidence; key categories of actions to implement and mainstream environmental sustainability in health systems; strategies for change management; and next steps.



VISION

Beyond its intrinsic value, the environment contributes to social well-being by providing the natural resources and ecosystems services that fuel economic development and enable the achievement of wealth. The activities of health systems result in positive and negative impacts on the environment within which they are embedded.

In addition to reducing damage or harm, environmental sustainability implies achieving simultaneous improvements in human and environmental well-being. Fostering environmental sustainability in health systems is both a responsibility and an opportunity, and is consistent with the values of the European health policy framework Health 2020.

Therefore, Member States are urged to consider a vision whereby **health systems can improve, maintain or restore health, while minimizing negative impacts on the environment and leveraging opportunities to restore and improve the environment to the benefit of the health and well-being of current and future generations.**



THE KNOWLEDGE BASE ON ENVIRONMENTAL SUSTAINABILITY IN HEALTH SYSTEMS

Box 1. Summary of the evidence on environmental sustainability in health systems

The evidence on the environmental impacts of health systems is steadily increasing, as is the evidence on the opportunities that improved environmental sustainability presents.

The main environmental impacts of health systems come from their consumption of energy and resources, production of greenhouse gas emissions, use and disposal of toxic chemicals, and production of waste and wastewater. While many of these impacts are associated with health-care facilities, a substantial proportion of them take place upstream in association with procured goods and services.

Fostering environmental sustainability in health systems can provide measurable benefits and opportunities in terms of health protection and promotion, financial savings and improved efficiency, increased community resilience and social capital, and reduced environmental risks.

Several factors can act as either barriers or facilitators to the adoption of environmentally sustainable practices in health systems. These include individual-level factors such as lack of knowledge or awareness, organizational-level factors such as corporate or organizational views and practices on environmental sustainability, and system-level factors such as regulations, compliance and governance.

For a list of possible elements of a national environmental sustainability policy for health systems, **see Fig. 1 on page 9.**

Health systems in the Region constitute a large and complex sector requiring for their activities considerable amounts of energy and resources, both physical and human. These activities entail consequences for the environment, which may result in a relative increase in adverse health outcomes and a subsequent increase in demand pressure on health care systems. Conversely, there are proven benefits and opportunities associated with fostering environmental sustainability. The WHO Regional Office for Europe has periodically gathered the relevant scientific evidence on these interrelations, along with information from international organizations and key stakeholders.

This section provides summary of relevant facts and figures for illustrative purposes. It is based on a recent integrated evidence review (WHO, 2016), as well as on prior reviews and collections of case study reports at the international and regional level. Further detailed information can be found in these publications, as well as in previous meeting reports¹ on ESHS convened by the WHO Regional Office for Europe.

1 See: <http://www.euro.who.int/en/health-topics/environment-and-health/Climate-change/publications>.

ENVIRONMENTAL IMPACTS AND PRESSURES

There is clear evidence that health system activities entail significant impacts and pressures on the environment. These include the generation of hazardous and conventional waste, wastewater and greenhouse gas emissions, and the high consumption of resources (for example, water and energy). Below is a brief overview of each of these categories.

Health-care waste. Health systems are among the highest waste-generating sectors. Between 75% and 90% of waste produced in health care is comparable to domestic waste in composition and environmental implications; the remaining “hazardous health-care waste”² may pose a wide range of environmental and health risks (Chartier et al., 2014). In fact, there is evidence that the health of populations in a number of low- and middle-income countries has been adversely affected by failure to properly manage health-care (and other) waste materials. Awareness of health-care waste management has rapidly increased in the Region, as have regulatory and technical developments. High-income countries in the Region tend to produce more health-care waste per capita than low- and lower-middle-income countries, but they also tend to dispose of it more effectively and have a stronger regulatory framework for doing so. The increasing use of disposable instruments and prepackaged materials is one factor behind growing levels of waste generation, particularly in high-income countries. For inpatient facilities, volumes of waste generated per bed-day vary widely between institutions, largely irrespectively of hospital size or type. Increasingly large volumes of clinical waste are being produced in community settings, including private households, as a result of the trend for delivering more care outside of hospital settings. Waste disposal practices have frequently not kept up with this change in the delivery of clinical services. The environmental impact of health-care waste depends largely on the method of disposal. While landfills are typically the least expensive option, they may create both environmental and health risks when improperly managed. Incineration, regarded as the least environmentally damaging way of disposing of hazardous waste, also has drawbacks: in a number of European countries, ash from the incineration of medical waste has been found to contain high levels of heavy metals, along with variable levels of other pollutants.

Wastewater. Water pollution from health systems can originate directly from health care facilities, through patients as a result of health systems activities, through activities in the health systems supply chain, and from inadequate health-care waste disposal. Frequent pollutants in hospital wastewater include pharmaceutical products, microorganisms, heavy metals, cleaning products and other chemicals such as organic halogens or free chlorine. The presence of unmetabolized pharmaceutical compounds has been a particular focus for research, both because of their potential impacts and because conventional treatment plants are in general unable to remove many pharmaceutical compounds found in wastewater.

Greenhouse gas emissions. Evidence suggests that health systems are a significant emitter of greenhouse gases. These stems mainly from embedded emissions in procured goods, direct energy use in health care facilities, and patient and staff travel. Several studies, mainly from high-income settings, provide measures of the carbon footprint of particular services or patient pathways within health systems, but thus far the only European health system for which a systematic carbon accounting exercise has been published is England’s National Health Service (NHS) (NHS Sustainable Development Unit, 2013). In 2012, it produced 24.7 million tonnes of carbon dioxide emissions. To put this figure in context, it is roughly the equivalent of the total greenhouse gas emissions of the entire country of Croatia that same year (UNFCCC, 2015). Other estimates from outside the Region (Chung & Meltzer, 2009) support the notion of a large carbon footprint of health systems.

2 The nomenclature and classifications used in this document follow, if available, applicable WHO standards and guidelines. In this subsection, the nomenclature follows that of Safe management of wastes from health-care activities (Chartier et al, 2014).

Toxic chemicals. The health-care industry is a major consumer of chemicals, including several known to have serious impacts on health and the environment. These hazardous chemicals include mercury, polyvinyl chloride, flame retardants, phthalates and volatile organic chemicals, among others. Impacts occur throughout the life cycle of products containing these chemicals (that is, during manufacturing, use and disposal). Vulnerable populations include “patients, health-care workers who are routinely exposed, factory workers involved in the manufacture of health-care products, workers in waste disposal facilities and people who live near manufacturing plants or waste disposal sites” (UNEP, WHO, 2006). Toxic chemicals of concern in health systems include, among others, endocrine-disrupting chemicals (EDCs) and heavy metals. Regarding EDCs, there is ongoing debate regarding safe levels of exposure; several countries in the Region have adopted a precautionary approach, phasing out the use of specific EDCs in medical equipment with a particular focus on paediatric, neonatal and maternity care uses (Amaral, 2014). In some cases, substitution is not feasible. However, where possible and cost-effective, shifting to less hazardous alternatives can be an important step to reduce exposure to chemicals and for countries to meet their obligations under international environmental agreements. These include the Stockholm Convention on Persistent Organic Pollutants (UNEP, 2001) and the Minamata Convention on Mercury (UNEP, 2013). Regarding heavy metals, their human and environmental impact is well established. While several types of heavy metals are used in health systems, mercury has long been associated with various health care activities. Estimates suggest that in some countries, health systems account for 10% of all mercury air releases and over one third of mercury emissions in wastewater (Rustagi & Singh, 2010; WHO, 2005). The use of mercury in health care settings has come under particular criticism given that alternatives are available for most uses. The Minamata Convention on Mercury, agreed in 2013 and signed thus far by 128 countries, commits signatories to reducing mercury pollution.

Resource consumption – water and energy. While the direct water consumption of health systems is relatively minor compared to other sectors (for example, the NHS is responsible for around 1.3% of England’s total water use (Department of Health, 2013)) the indirect or so-called embedded water consumption (for example, from electricity generation or the production of procured health care products) is significant. For example, disposable cotton materials have a significant embedded environmental impact because cotton is a highly water-intensive crop to grow. Similarly, because of their operational and setting specificities, health systems are frequently highly energy intensive, both directly and indirectly through inputs and facilities (USEIA, 2012). High resource consumption entails indirect pressures on the environment and impacts across the life cycle of products and inputs.

OPPORTUNITIES AND BENEFITS

As environmental sustainability is more widely mainstreamed, the opportunities and benefits it entails in health systems are becoming more apparent. This evidence complements a large body of knowledge on the general benefits of environmental sustainability in large organizations within various sectors, both private and public. Below is a brief overview of the main types of these benefits in health systems.

Health protection and promotion. Several measures have shown the potential to provide health and environmental benefits simultaneously. For instance, selected electronic health (e-health) interventions have been proven to improve health outcomes and access to care, reduce pollution and out-of-pocket expenses through reduced need for travel, and save costs through reduced need for care. Travel and mobility management systems for staff, the promotion of active travel (for example, cycling or walking) and the promotion of low-meat diets have all shown potential to reduce the burden of cardiovascular and other noncommunicable diseases while also helping to mitigate climate change. After evaluating their benefits for patients, various medical devices and technologies (for example, improved dialysis equipment, automated control of anaesthetic gases, etc.) have also been evaluated in terms of environmental benefits; these range from reduced water use and production of wastewater to decreased production of greenhouse gas emissions. In addition, by decreasing their own environmental impacts (for example,

water pollution, waste, greenhouse gas emissions), health systems are leading by example in reducing environmental risks. This would result in a strengthened position for subsequent actions to reduce environmental health impacts in other sectors.

Financial benefits. The cost-saving potential of a more efficient use of energy and other resources in health systems is clear. For example, an analysis of data from five hospitals in the United States of America estimated that if implemented nationwide, a package of interventions designed to reduce the environmental impact of hospitals (including measures on waste, energy and single-use devices) could generate financial savings exceeding \$5.4 billion over five years and \$15 billion over 10 years (Kaplan et al., 2012). A modelling exercise conducted for the NHS Sustainable Development Unit identified actions with the greatest environmental and financial and effects; these included: 1) installing combined heat and power generation in hospitals; 2) improving heating and lighting controls, and switching to energy-efficient lighting; and 3) reducing thermostat temperature settings by 1 °C in winter. The combination of all actions included in the modelling exercise was predicted to yield cost savings of over €214 million per year (NHS Sustainable Development Unit, 2010). Changes in nonclinical behaviours (such as turning off electrical equipment when not in use, switching off lights where possible and closing doors and windows) through workforce education have shown potential for cost savings with carbon reduction cobenefits. Another area with observed potential for financial gains is waste reduction (through savings in procurement and in waste management fees). Importantly, gains from effective health-care waste management are observed in lower-middle-income countries in the Region.

Other opportunities. The retrofitting of health care facilities provides ample opportunities for increasing sustainability and climate resilience, as does taking sustainability into account in the design phase. For instance, efficiently designed and run hospitals have been shown to use up to 40% less energy per square metre than others in comparable climates (Burpee & McDade, 2014). Simultaneous improvements in public health and community resilience can be achieved by promoting social capital and local economic development, and by building other community-level assets through partnerships between the health system and other sectors (Bajayo, 2012).

ENABLERS AND BARRIERS

The existing evidence also points to certain factors that either enable or hinder progress in fostering ESHS. These can be divided into the following three main categories (WHO, 2016).

Individual-level barriers and enablers. Lack of knowledge or awareness among those working in health systems is the most commonly described barrier to sustainable practices in health systems. It has been described in low-, lower-middle- and high-income countries regarding knowledge of waste disposal and segregation, energy conservation, and water use, among other areas. Education and training have been found to be effective in improving knowledge and behaviours in several settings, but not enough to ensure widespread change. Various studies show cultural and psychological barriers (for example, diffusion of responsibility, moral offset of being a health care worker, prioritization of immediate concerns, etc.) to the adoption of sustainable practices. This, and solid evidence from sustainability in other sectors, suggests the need to address employee engagement at all levels, including organization-wide settings.

Organizational-level barriers and enablers. Organizational factors can make it harder for individuals to act on environmental considerations. For example, inappropriate containers for medical waste collection have been found to discourage correct segregation and disposal in lower-middle-income settings. The poor maintenance of waste-management resources and facilities has a similar effect in high-income settings. Shifting organizational roles in health systems can also create barriers to environmental sustainability. For instance, the growth of home-delivered

health care entails more clinical waste from domestic properties that municipalities may not be equipped to deal with. Transferable evidence in other sectors shows the effectiveness of a shift from viewing sustainability from a regulatory-compliance perspective to adopting it as a core element of the organization's strategy for improving performance.

System-level barriers and enablers. Certain factors can impede the adoption of sustainable practices at the systemic level. These vary by setting, but typically include weak governance, lack of appropriate regulatory frameworks and/or weak enforcement of existing ones. A range of financial incentives have been used to encourage environmental sustainability in several sectors, including low-interest financing, tax incentives and seed funding to support innovation; their success depends critically on their structure and application. Nonfinancial incentives are also used – these frequently capitalize upon the image benefits of environmental excellence (for example, eco-labelling, environmental awards and certifications, etc.). Evidence of the application of incentives for environmental sustainability in health systems in Europe is still anecdotal, but suggests an opportunity for action.

KNOWLEDGE GAPS

Gradually, knowledge is increasing on the environmental impacts of health system activities and on the benefits of promoting sustainable practices. In addition, the increasing involvement of the research community is helping to highlight best practices and to systematize the analysis and presentation of results. However, the distribution of the evidence base is uneven, and some areas are far better researched than others. Crucially, there are challenges in the comparability of data and the availability of systematic statistics and indicators across the Region. A recent review (Naylor & Appleby, 2012) mapped out the research needs across a number of areas, and suggested several priorities. These include:

- developing standard metrics and research methods for assessing the environmental costs and benefits of health system activities;
- calculating the environmental costs and benefits of discrete components of activity, which could be used to build models for estimating the impacts of different options and pathways;
- embedding environmental sustainability in wider health research, with environmental costs and benefits treated as an outcome measure or a dimension of quality akin to access or equity;
- conducting research focused on supporting implementation, for example, understanding the barriers to change or assessing the cobenefits of sustainable approaches;
- conducting interdisciplinary research supported by collaborative funding between research funders in health and other sectors; and
- coordinating research efforts across countries.

In summary, despite the caveats, there is no doubt that health systems have a substantial impact on the environment, and that in their current form they are highly energy dependent and resource-intensive. In the context of wider pressures on environmental systems, resource scarcity and increasing concerns about energy security and cost, this provides reason enough for pursuing efforts to foster ESHS in the Region.



KEY TYPES OF ENVIRONMENTAL SUSTAINABILITY ACTIONS

OVERARCHING ACTION: ADOPTING A NATIONAL ENVIRONMENTAL SUSTAINABILITY POLICY FOR HEALTH SYSTEMS

There is no one-size-fits-all approach to integrating environmental sustainability concerns into the operations and functions of health systems. Nonetheless, regardless of the specific context, there is value in adopting a formal policy framework, developed through a consultative process involving health workers and other major stakeholders.

This framework, called here the **national environmental sustainability policy for health systems**, expresses the principles, commitments and priorities of the organization with respect to the environment. Fig. 1 reflects the possible common elements of this policy/approach. Each is further described below, including key actions that could help in that process.

Fig. 1. Possible elements of a national environmental sustainability policy for health systems



This national policy would be best accompanied by:

- a strategy or action plan including measurable performance objectives and clear roles and responsibilities to ensure transparency, accountability and effective partnerships; and
- an environmental sustainability assessment to provide information on the footprint of the organization and the stakeholders that should be involved in the change process.

MINIMIZING AND ADEQUATELY MANAGING WASTE AND HAZARDOUS CHEMICALS

The issues of health-care waste and the use and disposal of hazardous chemicals in health systems are highly related. Health-care waste includes general waste that is comparable to domestic waste; infectious waste such as pathological waste; sharps, chemicals; pharmaceuticals; genotoxic waste; radioactive waste; and heavy metals such as broken mercury thermometers (WHO, 2015a; Guardino Solá, 2011). Poor management of health-care waste exposes health care workers, waste handlers and the community to infections, toxic effects, injuries, and poisoning and pollution by toxic elements or compounds such as mercury or dioxins that are released during incineration (Chartier et al., 2014). If properly segregated, much of health care facilities' general waste stream can be recycled.

In addition, a number of the products used in health services (for example, cleaners, disinfectants, some medical devices, electronic equipment, etc.) contain hazardous chemicals that can cause occupational risks as well as downstream health impacts through pollution and inadequate disposal. This is linked with the issue of waste management in health systems.

Possible actions include 1) ensuring adequate management of health-care waste and promoting the minimization of general nonhazardous waste; and 2) minimizing the use of products containing hazardous chemicals in health systems. This can be done by:

- developing and implementing measures to manage and minimize the production of health-care waste in line with the recommendations of the WHO guidance handbook *Safe management of wastes from health-care activities* (Chartier et al., 2014);
- minimizing the production of general nonhazardous waste through adequate classification, waste reduction, reuse and recycling;
- developing a chemicals policy in health systems in accordance with local, national and supranational regulations;
- prioritizing chemicals for minimization and substitution based on scientific and economic evidence; and
- where medically, technically and economically feasible, substituting products containing hazardous chemicals for less hazardous alternatives within health systems.

PROMOTING AN EFFICIENT MANAGEMENT OF RESOURCES

Safe water, sanitation and hygiene (WASH), buildings, and energy are all essential components of basic health services provision. Large efficiency gains can be achieved by adequately managing the use of such basic resources in health systems, specifically health care facilities and utilities. Evidence from a wide variety of countries illustrates the potential for resource and cost savings based on conscious, data-driven health care facility management.

Possible actions include encouraging efficiency in the design, operation and maintenance of facilities and systems, and in the use of resources. Below are examples from the areas of WASH, buildings and energy.

- **WASH.** Developing and implementing water safety plans is an effective means to provide safe drinking-water for common domestic uses in health care facilities (for example, hydration, personal hygiene, food preparation) as well as care-related uses. These plans should place specific emphasis on the needs and requirements of different patient groups (Adams, Bartram & Chartier, 2008; Cunliffe et al., 2011). Reducing water usage in health care facilities contributes to conservation of local water sources and to health systems resilience, especially in water-stressed regions, and is possible through various interventions (for example, installation of water-saving armatures and devices). Safe management and disposal of wastewater and/or human waste by health care facilities is essential for protecting patients, staff, communities and the environment. Moreover, since poor WASH can cause outbreaks and thereby lead to high demand on health services, engaging in broader advocacy for safe WASH – in the facility and the community – is in the interest of health systems’ sustainability and resilience (to climate change and extreme events).
- **Buildings.** Environmental sustainability considerations can be incorporated during the design, construction and/or rehabilitation of buildings housing health care facilities. In the design phase, harmful pollution and carbon emissions from the extraction of raw materials can be minimized. Improving elements of building planning and design such as site location, artificial lighting, natural ventilation, and open and green spaces can also minimize environmental impacts, improve patient experience (for example, thermal comfort) and increase resilience to the projected impacts of climate change. Throughout the lifetime of a building, efficiency measures can include improved insulation, the use of natural ventilation, energy-efficient lighting or the installation of combined heat and power systems. In the rehabilitation of buildings, eliminating harmful substances is an important aspect.
- **Energy.** Three main principles can help guide action related to the use of energy within health systems: 1) reducing unnecessary usage, 2) increasing energy efficiency, and 3) understanding where energy supply resilience can be improved. Benefits include improved security of energy supply for operating theatres and incubators, providing hot water and improved medicines, and refrigerating vaccines, as well as decreased emissions of air pollutants with associated advantages for the health of the population. In turn, improved energy security increases health systems resilience. Any energy savings, however, must not compromise patient and staff safety.³

PROMOTING SUSTAINABLE PROCUREMENT

Health systems procure and use significant amounts of goods and services which can have effects on the environment throughout their life cycle – from the initial extraction of raw materials to their manufacture, transport, use and disposal. In fact, evidence suggests that most of the operational environmental footprint of health systems is related to procured goods and services.

Possible actions to encouraging sustainable procurement include:

- using health systems’ buying power to maximize positive environmental outcomes, recognizing that influencing suppliers to factor environmental impacts into their manufacturing processes is a powerful lever for significant change;
- reducing demand by looking for opportunities to buy and use less, constantly questioning whether procured products are necessary, supporting interventions that reduce demand for products or use them more efficiently, and ensuring that procured products are not wasted;

³ For example, to minimize risks of Legionella infections in health-care facilities, water temperatures of above 50 °C in hot water systems need to be maintained. Lowering the hot water temperature in favour of saving energy may compromise patient and worker safety.

- increasing efficiency by buying products, equipment or services that consume less and have a lower environmental impact during their in-use life and at disposal; and
- assessing the environmental impact of products and services used or delivered by the health system and, where appropriate, substituting or innovating with alternative products, materials or approaches that have less impact on the environment and are more sustainable.

REDUCING HEALTH SYSTEMS' EMISSIONS OF GREENHOUSE GASES AND AIR POLLUTION

Health systems as a whole are carbon intensive, thus contributing to climate change. In turn, health effects from climate change will continue to add pressure to health systems through an increase in the overall burden of disease. World Health Assembly resolution WHA68.8 urges health systems to address air pollution comprehensively: 1) with a cross-sectoral, health-in-all-policies approach, and 2) by minimizing “as far as possible air pollution specifically associated with health care activities, including by implementing, as appropriate, relevant WHO guidelines” (WHA, 2015). Health systems face an opportunity to lead by example in this area, and to promote reduction in emission of air pollutants and greenhouse gases from a health standpoint.

Possible actions to reduce health systems' emissions include:

- developing and implementing an action plan for reducing emissions of air pollutants and greenhouse gases, informed by periodic carbon and pollution accounting exercises;
- promoting policies and interventions in all relevant areas that simultaneously reduce air pollution emissions and exposure as well as greenhouse gas emissions through a cross-sectoral, health-in-all-policies approach;
- prioritizing low-carbon alternatives in the design and operation of the built environment, procurement and purchasing, energy efficiency, energy sourcing, retrofitting and equipment; and
- promoting low-carbon alternatives in ancillary areas to health systems, such as non-motorized and/or public transportation, administration services, etc.

PRIORITIZING DISEASE PREVENTION, HEALTH PROMOTION AND PUBLIC HEALTH SERVICES

Preventive approaches are cost-effective ways to reduce morbidity and premature mortality, and can contribute to wider sustainability with economic, social and environmental benefits (Merkur, Sassi & McDaid, 2013; WHO Regional Office for Europe, 2015a). Furthermore, scaling up intersectoral action on environmental sustainability and public health services can reduce negative health outcomes at their source (WHO Regional Office for Europe, 2012a, 2012b) and facilitate earlier, more effective responses to environmental and climate-related risks. Health-centred policies and programmes in sectors such as agriculture, transport, housing, and energy can lead to reduced environmental and health risks and improved health practices, behaviours and processes.

Possible actions to strengthen health protection and promotion services include:

- taking intersectoral action, providing evidence and raising awareness of environment and health aspects, and engaging in joint monitoring of environmental exposures and health outcomes;
- developing the institutional capacity for disease prevention, health promotion and public health services;
- strengthening monitoring compliance with environmental norms, regulations and standards; and

- further improving the performance of and access to environmental and occupational health services, promoting healthy environments (including healthy workplaces), safe and healthy foods, good air quality, and supply chain safety and security.

ENGAGING THE HEALTH WORKFORCE AS AN AGENT OF SUSTAINABILITY

Efforts to strengthen environmental sustainability in health systems can succeed only with the active collaboration of an engaged health workforce. By engaging health workers in the process of creating, implementing and managing the environmental sustainability policy, organizations in the health system can foster a sense of ownership in and responsibility for the policy's success. Health workers will be far more likely to be successful in their efforts to foster sustainability if an empowering institutional environment is put in place through the adoption of a sustainability policy and strong support from executive management.

Possible actions to facilitate the leadership of health workers in environmental sustainability include:

- engaging the health workforce and its associations and unions in embedding environmental sustainability and resilience into health system culture through clear policies, capacity-building and motivation;
- educating the health workforce about the environmental impact of health systems;
- ensuring that staff development and performance-management processes support a shift to more environmentally sustainable and resilient health care;
- ensuring the health workforce is prepared and able to adapt to the projected impacts of climate change;
- ensuring the health workforce is protected from environmental hazards and that health is promoted in the workplace; and
- preparing the health workforce for environmental emergencies, and different environmental conditions (e.g. a changing climate).

INCREASING COMMUNITY RESILIENCE AND PROMOTING LOCAL ASSETS

The location and surroundings of health services entail both responsibilities and opportunities tied to the local context. On one hand, health systems can strengthen local assets and foster their own resilience and the community's; on the other, health systems' managers and workforces have a responsibility to promote environmental sustainability locally.

Possible actions to strengthen local assets, community resilience and environmental sustainability include:

- promoting environmentally sustainable actions that increase health systems' resilience to climate change, such as those fostering energy and water security, zoning regulations for health facilities, etc.;
- promoting and enabling the use of public transportation and non-motorized transportation (cycling and walking) for patients, visitors and staff;
- using local green spaces for health promotion activities and, where feasible and appropriate, other selected health systems activities (for example, nature-based therapy);
- ensuring that the planning and design phases for the construction of new health infrastructure consider areas that provide staff, visitors, patients and suppliers with good access via public transportation and active mobility, as well as appropriate facilities (for example, safe parking spaces, changing rooms and green spaces);
- sourcing food and other goods and services locally, where feasible and appropriate; and
- informing local communities about health systems activities and opportunities for involvement in health promotion activities and others where appropriate.

CREATING INCENTIVES FOR CHANGE

The uptake and implementation of policies and efforts towards greater environmental sustainability in health systems are unlikely to succeed without the right structure of incentives in place. While there are inherent incentives to greater environmental sustainability (for example, cost reductions), an adequate regulatory and institutional environment is needed to make them effective. Health authorities and regulators can devise additional incentives for the uptake and mainstreaming of environmental sustainability. These can be tangible or intangible, financial or otherwise.

Possible actions to contribute to or advocate for the creation of an incentive structure conducive to the uptake of environmental sustainability actions in health systems include:

- achieving cost savings through reduced consumption of energy and other resources that can be reinvested in core health-system functions;
- providing low-interest financing for projects enhancing environmental sustainability;
- implementing selected tax incentives linked to environmentally sustainable investments, etc.;
- making seed funding, additional funding or grants available for environmental sustainability initiatives; and
- creating reputational/image-based incentives, such as those from sustainability certifications and awards for institutions and professionals, or sustainability-related objectives in performance management schemes.

PROMOTING INNOVATIVE MODELS OF CARE

Besides their crucial potential for benefitting patients, practitioners and health systems at large, innovative models of care have great potential to deliver benefits in terms of environmental sustainability. Conversely, interventions towards greater environmental sustainability may help strengthen the overall sustainability of innovative models of care; this becomes clear as more and better estimates of the potential health and environmental benefits of innovative models of care become available (Weisz et al., 2011).

Possible actions to encourage innovative models of care – once their health benefits for patients and operational benefits for practitioners are clear – include:

- changing emphasis and improving coordination between primary, secondary and tertiary levels of care;
- encouraging the use of innovative technologies, including telemedicine, ehealth and mobile health; and
- changing clinical guidelines/standard operating procedures to reflect environmental sustainability.



MANAGING CHANGE

Health systems throughout the WHO European Region are highly diverse and comprise complex organizations and institutional relationships. Their progress and change processes are influenced by policy and regulatory requirements, as well as global trends and local factors. The adoption, implementation and/or mainstreaming of environmental sustainability entails a process of change that should be carefully timed and managed.

There are several examples, globally and within the Region, of planned change management in health systems regarding their core functions (governance, resource generation, service delivery and financing). Most examples of change management towards environmental sustainability, however, are bottom-up, local, and driven by providers. While bottom-up change is crucial, it needs to be complemented by governance-driven top-down change in order to have a significant effect throughout whole health systems. Solid examples of planned change for environmental sustainability in health systems exist in a few countries of the Region. For example, the NHS Sustainable Development Unit is using a “Route Map” to develop a sustainable health system by identifying areas that require progress and describing roles of different stakeholders. The Route Map is structured across a vision, or ultimate goal, and covers three periods: “Getting started”, “Transformation phase” and “Transformation occurs”. Ultimately, every health system should manage change according to its own institutional and organizational environment, as well as the broader local context.

To start the process of implementing and mainstreaming ESHS at the national level, national focal points and experts have generated a number of proposals at three meetings on ESHS organized by the WHO Regional Office for Europe (WHO Regional Office for Europe, 2013b, 2016, 2017). These proposals included:

- integrating health systems sustainability into national environmental programming;
- organizing national stakeholder consultations to agree on a national joint vision and objectives;
- using a route-map approach jointly agreed with stakeholders to highlight opportunities and coordinate action plans;
- identifying relevant entry points facilitated by local circumstances (for example, availability of EU accession funds, or obligations under binding multilateral environmental agreements);
- engaging in intensive awareness-raising among the public and within health systems;
- identifying champions within the leadership of health systems;
- elaborating on low-cost and high-opportunity priorities for the first five years;
- engaging in institutional capacity-building through hands-on learning; and
- communicating results systematically.

Technical components of change need to be embedded in a positive culture of improvement. Locally relevant approaches to policy work in this area should be combined with global and regional guidance, standards and evidence. Overall, fostering environmental sustainability may offer many win-win opportunities (for example, external resources and financing, societal appreciation, etc.) that would help promote change. However, these opportunities further highlight the need to establish proper accountability mechanisms, to measure progress or lack thereof, and to communicate successes or shortcomings. This is particularly important when dealing with external partners in the context of intersectoral action and stakeholder engagement.

NEXT STEPS

This document is part of a series of supporting materials, developed as a basis for including the topic of ESHS in relevant policy processes, particularly the Sixth Ministerial Conference on Environment and Health in Ostrava, Czech Republic, in June 2017 and the WHO Regional Committee for Europe in the same year. To this effect, the European Environment and Health Task Force has been regularly briefed on the outcomes of the meetings on ESHS hosted by the WHO Regional Office for Europe in Bonn, Germany, in November 2015 and November 2016. This document has also been circulated to a wide audience of experts and stakeholders for web-based commentary, and modified according to their collated feedback.

A firm commitment to ESHS at the Sixth Ministerial Conference will provide support for existing initiatives and also kick-start action in other areas. This commitment would ideally be accompanied by proposed basic indicators of progress, and should make explicit the links between the ESHS strategic framework and the SDGs.

In addition, and within the frameworks of the Global Programme of Work, Health 2020, the various environment and health ministerial resolutions and health systems, the Regional Office will continue to support Member States in their efforts to create ESHS by:

- commissioning studies and advocating for research to strengthen the evidence base on the benefits of environmental sustainability to health systems, and for understanding the change management required for fostering ESHS;
- developing policy support materials, concept notes and fact sheets;
- collating examples of good practices and case studies for the creation of a stronger evidence base for action and proof-of-concept, and documenting all steps of the process; and
- developing suitable materials on technical knowledge and skills for developing ESHS, especially on specific actions needed at the national level and obtaining maximum environmental return on investment.

The overall process can be greatly facilitated by strategic partnerships. Important partners include, but are not limited to, the Association of Schools of Public Health in the European Region, EuroHealthNet, the European Public Health Association, the Healthy Cities Network, the Regions for Health Network, the International Network of Health Promoting Hospitals and Health Services, and the Global Green and Healthy Hospitals Network. In addition, the WHO Regional office for Europe is linking to ongoing processes such as the United Nations Informal Interagency Task Team on Sustainable Procurement in the Health Sector and other relevant multilateral programmes.



REFERENCES

- Adams J, Bartram J, Chartier Y, editors (2008). Essential environmental health standards in health care. Geneva: World Health Organization (http://www.who.int/water_sanitation_health/hygiene/settings/ehs_health_care.pdf, accessed 22 May 2017).
- Amaral M (2014). Non-toxic healthcare: alternatives to phthalates and bisphenol A in medical devices. Brussels: Health Care Without Harm Europe (<https://noharm-europe.org/EDCs-report>, accessed 22 May 2017).
- Bajayo R (2012). Building community resilience to climate change through public health planning. *Health Promot J Austr.* 23(1):30–36.
- Burpee H, McDade E (2014). Comparative analysis of hospital energy use: pacific northwest and scandinavia. *HERD.* 8(1):20–44. doi:10.1177/193758671400800104.
- Chartier Y, Emmanuel J, Pieper U, Pruss A, Rushbrook P, Stringer R et al. (2014). Safe management of wastes from health-care activities. Second Edition. Geneva: World Health Organization (http://www.searo.who.int/srilanka/documents/safe_management_of_wastes_from_healthcare_activities.pdf?ua=1, accessed 22 May 2017).
- Cunliffe D, Bartram J, Briand E, Chartier Y, Colbourne J, Drury D et al. (2011). Water safety in buildings. Geneva: World Health Organization (http://apps.who.int/iris/bitstream/10665/76145/1/9789241548106_eng.pdf, accessed 22 May 2017).
- Chung JW, Meltzer DO (2009). Estimate of the carbon footprint of the US health care sector. *JAMA*, 302(18):1970–2. doi:10.1001/jama.2009.1610.
- Department of Health (2013). Health Technical Memorandum 07-04. Water management and water efficiency: best practice advice for the health care sector. London: HMSO.
- European Commission (2012). Eurostat [website]. Strasbourg: European Commission (<http://ec.europa.eu/eurostat>, accessed 22 May 2017).
- Guardino Solá X (2011). Waste anaesthetic gases. In: Encyclopedia of occupational health and safety. Geneva: International Labour Organization (<http://www.iloencyclopaedia.org/part-xvii-65263/health-care-facilities-and-services/165-chemicals-in-the-health-care-environment/waste-anaesthetic-gases>, accessed 22 May 2017).
- Kaplan S, Sadler B, Little K, Franz C, Orris P (2012). Can sustainable hospitals help bend the health care cost curve? Washington, DC: The Commonwealth Fund (<http://www.commonwealthfund.org/Publications/Issue-Briefs/2012/Nov/Sustainable-Hospitals.aspx>, accessed 22 May 2017).
- Merkur S, Sassi F, McDaid D (2013). Promoting health, preventing disease: is there an economic case? Geneva: World Health Organization (http://www.euro.who.int/__data/assets/pdf_file/0004/235966/e96956.pdf, accessed 22 May 2017).

- Naylor C, Appleby J (2012). Environmentally sustainable health and social care. Scoping review and implications for the English NHS. *Journal of Health Services and Research Policy*. 18(2):114–121. doi:10.1177/1355819613485672.
- NHS Sustainable Development Unit (2010). Save money by saving carbon. Decision making in the NHS using marginal abatement cost curves. Cambridge: NHS Sustainable Development Unit (www.sduhealth.org.uk/documents/publications/savemoney1.1.pdf, accessed 22 May 2017).
- NHS Sustainable Development Unit (2013). Carbon footprint update for NHS in England 2012. Cambridge: NHS Sustainable Development Unit (www.sduhealth.org.uk/documents/carbon_footprint_summary_nhs_update_2013.pdf, accessed 22 May 2017).
- Rustagi N, Singh R (2010). Mercury and health care. *Indian J Occup Environ Med*. 14(2):45–48. doi:10.4103/0019-5278.72240.
- United Nations (2015). Transforming our world: the 2030 Agenda for Sustainable Development [website]. New York: United Nations (<https://sustainabledevelopment.un.org/post2015/transformingourworld>, accessed 22 May 2017).
- UNEP (2001). Stockholm Convention on Persistent Organic Pollutants. Nairobi: United Nations Environment Programme (http://www.pops.int/documents/convtext/convtext_en.pdf, accessed 22 May 2017).
- UNEP (2013). Minamata Convention on Mercury. Nairobi: United Nations Environment Programme (<http://www.mercuryconvention.org/Convention/tabid/3426/Default.aspx>, accessed 22 May 2017).
- UNEP, WHO (2006). Strategic approach to international chemicals management. Nairobi: United Nations Environment Programme (https://sustainabledevelopment.un.org/content/documents/SAICM_publication_ENG.pdf, accessed 22 May 2017).
- UNFCCC (2015). GHG data from UNFCCC [website]. Bonn: United Nations Framework Convention on Climate Change (http://unfccc.int/ghg_data/ghg_data_unfccc/items/4146.php, accessed 22 May 2017).
- USEIA (2012). Commercial Buildings Energy Consumption Survey (CBECS): Energy characteristics and energy consumed in large hospitals in the United States in 2007 [website]. Washington, DC: United States Energy Information Association (<https://www.eia.gov/consumption/commercial/reports/2007/large-hospital.cfm>, accessed 22 May 2017).
- Weisz U, Haas W, Pelikan JM, Schmied H (2011). Sustainable hospitals: a socio-ecological approach. *GAIA – Ecological Perspectives for Science and Society*. 20(3):191–198. (http://www.fabrikderzukunft.at/fdz_pdf/sustainable_hospitals_gaia_2011_3_weisz.pdf, accessed 22 May 2017).
- World Health Assembly (2015). Resolution WHA68.8. Health and the environment: addressing the health impact of air pollution. Geneva: World Health Organization (http://apps.who.int/gb/ebwha/pdf_files/WHA68/A68_ACONF2Rev1-en.pdf, accessed 22 May 2017).
- WHO (2005). Mercury in health care. Policy Paper. Geneva: World Health Organization (http://www.who.int/water_sanitation_health/medicalwaste/mercurypolpap230506.pdf, accessed 22 May 2017).

- WHO (2015a). Health-care waste. Fact sheet No. 253 [website]. Geneva: World Health Organization (<http://www.who.int/mediacentre/factsheets/fs253/en/>, accessed 22 May 2017).
- WHO (2015b). Operational framework for building climate resilient health systems. Geneva: World Health Organization (http://apps.who.int/iris/bitstream/10665/189951/1/9789241565073_eng.pdf?ua=1, accessed 22 May 2017).
- WHO (2016). Towards environmentally sustainable health systems in Europe: a review of the evidence. Geneva: World Health Organization (http://www.euro.who.int/__data/assets/pdf_file/0012/321015/Towards-environmentally-sustainable-HS-Europe.pdf?ua=1, accessed 22 May 2017).
- WHO, Health Care Without Harm (2009). Healthy hospitals, healthy planet, healthy people. Addressing climate change in health care settings. Geneva: World Health Organization (http://www.who.int/globalchange/publications/climatefootprint_report.pdf?ua=1, accessed 22 May 2017).
- WHO Regional Office for Europe (2008). The Tallinn Charter: health systems for health and wealth. Copenhagen: WHO Regional Office for Europe (http://www.euro.who.int/__data/assets/pdf_file/0008/88613/E91438.pdf, accessed 22 May 2017).
- WHO Regional Office for Europe (2010). Parma Declaration on Environment and Health. Copenhagen: WHO Regional Office for Europe (http://www.euro.who.int/__data/assets/pdf_file/0011/78608/E93618.pdf, accessed 22 May 2017).
- WHO Regional Office for Europe (2012a). Review of public health capacities and services in the European Region. Copenhagen: WHO Regional Office for Europe (http://www.euro.who.int/__data/assets/pdf_file/0010/172729/Review-of-public-health-capacities-and-services-in-the-European-Region.pdf?ua=1, accessed 22 May 2017).
- WHO Regional Office for Europe (2012b). European Action Plan for Strengthening Public Health Capacities and Services. Copenhagen: WHO Regional Office for Europe (http://www.euro.who.int/__data/assets/pdf_file/0005/171770/RC62wd12rev1-Eng.pdf?ua=1, accessed 22 May 2017).
- WHO Regional Office for Europe (2013a). Health 2020. A European policy framework and strategy for the 21st century. Copenhagen: WHO Regional Office for Europe (http://www.euro.who.int/__data/assets/pdf_file/0011/199532/Health2020-Long.pdf, accessed 22 May 2017).
- WHO Regional Office for Europe (2013b). Greening health systems. Expert meeting. Bonn, Germany, 27–28 August 2013. Copenhagen: WHO Regional Office for Europe (http://www.euro.who.int/__data/assets/pdf_file/0010/236548/Greening-health-systems.pdf?ua=1, accessed 22 May 2017).
- WHO Regional Office for Europe (2014). European Health for All family of databases [website]. Copenhagen: WHO Regional Office for Europe (<http://www.euro.who.int/en/data-and-evidence/databases/european-health-for-all-database-hfa-db>, accessed 22 May 2017).
- WHO Regional Office for Europe (2015a). The case for investing in public health. Copenhagen: WHO Regional Office for Europe (http://www.euro.who.int/__data/assets/pdf_file/0009/278073/Case-Investing-Public-Health.pdf, accessed 22 May 2017).

WHO Regional Office for Europe (2015b). Priorities for health systems strengthening in the WHO European Region 2015–2020: walking the talk on people centredness. Copenhagen: WHO Regional Office for Europe http://www.euro.who.int/__data/assets/pdf_file/0003/282963/65wd13e_HealthSystemsStrengthening_150494.pdf?ua=1, accessed 22 May 2017).

WHO Regional Office for Europe (2016). Environmentally Sustainable Health Systems. Report of a meeting in Bonn, Germany, 11–12 November 2015. Copenhagen: WHO Regional Office for Europe (http://www.euro.who.int/__data/assets/pdf_file/0016/301552/ESHS-Bonn-Mtg-Report-1112-Nov15.pdf, accessed 22 May 2017).

WHO Regional Office for Europe (2017). Promoting and managing change towards environmentally sustainable health systems. Report of a meeting in Bonn, Germany, 24–25 October 2016. Copenhagen: WHO Regional Office for Europe (http://www.euro.who.int/__data/assets/pdf_file/0018/330219/ESHS-2016-meeting-report.pdf, accessed 22 May 2017).



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