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Climate Change and Health Impacts in Urban Areas: Towards Hybrid Evaluation Tools for New Governance

Luigi Fusco Girard ^{1,2,3,*} and Francesca Nocca ^{1,*}

¹ Department of Architecture, University of Naples Federico II, 80134 Naples, Italy

² Institute for Research on Innovation and Services for Development (IRISS), National Research Council (CNR), 80134 Naples, Italy

³ Department of Engineering, Università Telematica Pegaso, 80134 Naples, Italy

* Correspondence: girard@unina.it (L.F.G.); francesca.nocca@unina.it (F.N.); Tel.: +39-812-538-847/6 (L.F.G.); +39-338-130-7921 (F.N.)

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Abstract: The shift towards the new paradigm, that is, the “ecological and humanistic” paradigm, introduced by the United Nations in the Agenda 2030, and the current period of health emergency due to COVID-19 place the human dimension at the centre of the development strategies for our cities. The humanistic dimension, in particular, is related to human wellbeing, health and living conditions. The health and wellbeing of citizens depend on factors and actions that go beyond the health sector. In particular, here, the attention is focused on the negative impacts produced by pollution and climate change, issues that concern (and that are closely related to) most urban agglomerations in the world. The pandemic due to COVID-19 has highlighted the close relationship existing among social, natural and economic systems. Each system is interdependent on the other. Thus, the pandemic has boosted the necessity to accelerate efforts to address climate change. Therefore, in this framework, new urban development models are required. The circular economy model is proposed as a model able to reduce the negative impacts of urban transformations. The attention is then focused on implementation tools for improving decision-making processes and, in particular, on the evaluation tools for assessing the multidimensional impacts of urbanisation on human health.

Keywords: climate change; COVID-19; urban planning; hybrid evaluation tools

1. Introduction

The shift towards the new paradigm, that is, the “ecological and humanistic” paradigm, introduced by United Nations [1], poses the human dimension at the center of the development strategies of our cities. The humanistic dimension, in particular, is related to human wellbeing, health and living conditions, issues that in this period of health emergency due to COVID-19 are even more at the center of international debates.

The human right to the highest attainable standard of health is recognised by the Charter of the United Nations (Universal Declaration of Human Rights, 1948) and the World Health Organization (WHO) Constitution. Health is also one of the United Nations’ Sustainable Development Goals (SDG no. 3 “Ensure healthy lives and promote wellbeing for all at all ages”) and is a key element in the pursuit of sustainability in its three dimensions. People’s health has to be also integrated with the health of the ecosystem and the “health” of the economy.

The negative impacts of COVID-19 are not only related to the disease and the numerous deaths due to the virus itself, but, as the WHO Director General pointed out, this pandemic has brought to

the surface the inequalities, injustices and contradictions of our times, highlighting our strengths and vulnerabilities [2].

The health and wellbeing of citizens depend on factors and actions that go beyond the health sector [3]. A factor that impacts on human health and wellbeing is pollution. It is a key issue that concerns (and is closely related to) most urban agglomerations in the world. In fact, cities account for 3% of the Earth's surface, but are host to over half of the world's population (www.metabolic.nl), consume 78% of the world's energy, and produce more than 60% of greenhouse gas emissions and 50% of global waste. Thus, they play a central role in sustainable development and in the fight against the main challenges of our century, such as the fight against climate change, social inequalities, and environmental and economic crises.

The WHO, in its "COP24 Special Report: Health and Climate Change", calls for health to be considered in all cost-benefit analyses of climate change mitigation [4].

The problem of pollution in cities concerns, in particular, port areas and historical centres—places subject to strong pressures from traffic, people and activities, with inevitable environmental (but also social and economic) consequences.

The historical centres were conceived in a situation different from the present one. Designed to be walked on foot and for an economy that was far from being industrial, they did not have to cope with needs that took over with the rapid urbanisation processes for the growth of the city and the transformation of the economy from agricultural to industrial and services.

The increase in road congestion, the inadequacy of public transport, the lack of parking spaces, land consumption and environmental degradation have contributed to aggravating a situation in urban centres that was already critical due to their own configuration: narrow streets, high population densities and increased tourist activities certainly contribute to the concentration of pollutants in these areas.

In port areas, furthermore, ship traffic and activities related to the port contribute to the increase in emissions and the consequent deterioration of air quality. In fact, if on the one hand, the port cities are the place where the greatest amount of wealth is produced, on the other hand, greater negative impacts (in particular, on the environment and, therefore, on health) are produced [5].

The negative impacts of the port are due to both port activities and ships docking at the port and to emissions from intermodal transport serving the port hinterland [6]. A study estimates that there are more than 50,000 premature deaths in Europe due to pollution from shipping [6].

The pandemic due to COVID-19 has shown us what our "clean" world would be like and boosted the necessity to accelerate efforts to face climate change [2].

Understanding and analysing the impacts (and the distribution of these impacts) of cities' development on human health and wellbeing is fundamental for the goal "build healthy and liveable cities" [2].

In this framework, efficient tools to manage cities, to plan effective intervention policies and to evaluate the multidimensional impacts of city development models are absolutely necessary.

The identification of new organisational models for cities today is even more required due to the current period characterised by the pandemic caused by COVID-19, which has considerably changed the forms of living spaces, both public and private.

This paper proposes the model of the circular economy (understood in its wide sense) as an organisational model of the city capable of reducing (to a significant level) the trade-off between environmental health, community health and the "health" of the economy and therefore allowing sustainable development in all dimensions (economic, social and environmental). The thesis proposed in this paper is that cities can find economic, environmental and social benefits if they adopt the circular model, in which health impacts are clearly stressed. Considering the new humanistic and ecological paradigm that is emerging and the health emergency we are currently living, human health is at the centre of urban development. In this perspective, the attention is focused on the implementation tools for human-centred urban development and, in particular, on urban planning and evaluation tools. The

role of these tools in the implementation of the circular model focused on health is investigated, and a set of indicators is proposed to fill the gap in the evaluation of the impacts of urban development projects on health, considering both the impacts in terms of diseases and illness and the impacts on health determinants.

This contribution also aims to be a stimulus for the inclusion of the assessment of health impacts in urban transformation policies, an issue that is still little considered today, especially in Italy, as shown by the fact that this tool has only been adopted by a few cities in the northern part of the country. This is also important because there is a growing awareness that the Mediterranean basin is suffering a higher temperature increase than the rest of the world, with related negative impacts.

After outlining the negative impacts of urbanisation (Section 2) and the European and Italian framework on the existing documents related to the relationship between pollution and health (Section 3), the circular economy model is introduced (Section 4) as a model able to reduce the negative impacts of urban transformations. The attention is focused on the implementation tools for effective governance (Section 5) and, in particular, on the evaluation tools for improving decision-making processes (Section 5), providing a proposal of a set of indicators for assessing the impacts of urban development projects on human health and wellbeing (Section 6).

2. Increasing Urbanisation and Related Negative Impacts

Air pollution and climate change, consequences of increasing urbanisation, pose serious health risks. Despite the policies to reduce air pollution and the consequent reduction of emissions, the population still breathes very polluted air. “Air quality is essential for human health. It is also essential for environmental sustainability and to ensure social and economic benefits” [7]. In other words, air quality is a global common good to be managed by all with the highest attention.

The WHO has estimated that 9 out of 10 people breathe air containing high levels of pollutants [8]. Environmental causes account for 20% of mortality in Europe. In the EU, there are around 400,000 premature deaths due to pollution each year (with serious social and economic costs) [9]. The pollutants responsible for most of these deaths are particulate matter, NO_2 , and O_3 [9].

The most exposed populations are those living in urban areas, where there is a greater concentration of people and activities with the consequent concentration of pollutants. Such premature deaths also represent a cost for cities, in terms of social and economic costs. The WHO has estimated that air pollution in Europe in 2010 cost, in terms of premature deaths and disease, about USD 1600 billion, almost a tenth of the EU’s Gross Domestic Product (GDP) in 2013 [10].

According to the Lancet Countdown Reports [11], indicators related to air pollution highlight a worsening of the conditions in which we live. In fact, it emerges that 83% of cities exceed the WHO’s recommended safe concentrations (indicator 3.3.1). Energy use, particularly residential combustion, is a major contributor to this pollution. In reference to the “premature mortality from ambient air pollution” (indicator 3.3.2), in 2016, an estimated 2.9 million premature deaths from pollution caused by $\text{PM}_{2.5}$ were estimated, similar to estimates in 2015. Except in Africa, the main sectors contributing to high $\text{PM}_{2.5}$ concentrations are industry, transport, electricity generation and agriculture.

In terms of premature deaths from exposure to $\text{PM}_{2.5}$ fine dust, Italy is first in Europe and eleventh in the world: in 2016, there were 45,600 premature deaths due to $\text{PM}_{2.5}$ (281,000 across Europe), with an economic loss of EUR 20 million, the worst in Europe [12].

Another study, elaborated by the Euro-Mediterranean Centre on Climate Change and presented in 2019 at the Climate Conference in Madrid, predicted a 13.3% drop in labour productivity in Italy in the agricultural sector and 11.5% in the industrial sector by 2080 [12].

The growing interest in plans to assess health impacts is struggling to be translated into practice in terms of the effective allocation of resources (human and financial). Furthermore, despite the progressive participation of the public and politicians (indicators 5.1, 5.2 and 5.3), companies seem to lag behind (indicator 5.4), including those in the health sector [13].

According to an analysis of the UN Global Compact platform, only 15% of companies are aware of the relationship between health and climate. As far as public opinion is concerned, there is a lack of the necessary continuity of information; interventions are still mostly episodic and associated with key moments of global climate governance (e.g., Conference of the Parties—COP) (indicator 5.1).

In Italy, in 2017, there were 29,368 premature deaths due to air pollution (of which 11,851 were from cardiovascular diseases, 7919 from chronic respiratory diseases and 3764 from cancer) [10].

The pollutant that caused the highest number of premature deaths was PM_{2.5}: 374,000 premature deaths in Europe (EU-28) and 58,600 in Italy in 2016 [14]. This is followed by NO₂ (68,000 premature deaths in Europe and 14,600 in Italy) and O₃ (14,000 premature deaths in Europe and 3000 in Italy) (*Years of life lost (YLL): Italy: PM_{2.5}: 550,600, NO₂: 137,500, and O₃: 29,100. Europe: PM_{2.5}: 3,848,000, NO₂: 682,000, and O₃: 149,000*) [14].

Human activities are the main cause of pollution and consequent climate change. The IPCC (Intergovernmental Panel on Climate Change) report [15] underlines that reducing global warming by 2 °C (consistent with the Paris Agreement) requires interventions in urban systems and infrastructure and therefore changes in urban planning strategies and practices, as well as the reduction of pollutant emissions in the transport and construction sectors. Thus, a significant part of our future depends on urban transformation models and projects.

We need to “stop using taxpayers money to fund pollution” [16]. Among the money spent directly on the fossil fuels and related damage to health and the environment, each year, we shoulder a cost of over USD 5 trillion—more than all governments around the world spend on health care and about 2000 times the budget of the WHO [16].

“Placing a price on polluting fuels in line with the damage they cause would approximately halve outdoor air pollution deaths, cut greenhouse gas emissions by over a quarter, and raise about 4% of global GDP in revenue. We should stop paying the pollution bill, both through our pockets and our lungs” [16].

Indeed, the fight against climate change is not a constraint, but it represents an opportunity for cities of any size because it enables them to improve their overall productivity [17].

3. Environmental Pollution and Climate Change: The Global Framework

Climate change is occurring faster than expected. Environmental concerns are, for the first time, the most important long-term risks by probability and among the top five risks by impact according to the World Economic Forum’s Global Risks Perception Survey [18].

The Agenda 2030 and the Paris Agreement in 2015 (COP21) represent two key frameworks for facing climate change and guiding the world towards a more sustainable development model.

The Agenda 2030, a programme of action for people, the planet and prosperity endorsed by the United Nations in 2015, includes 17 Sustainable Development Goals (SDGs) to be pursued by 2030 to put the world on a path of sustainability and wellbeing. In particular, SDG3 (“Ensure healthy lives and promote wellbeing for all at all ages”), SDG7 (“Ensure access to affordable, reliable, sustainable and modern energy for all”), SDG11 on cities and specifically the target 11.6 (“reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality, municipal and other waste management”) and SDG13 (“Take urgent action to combat climate change and its impacts”) are linked to the reduction of pollution and the fight against climate change [19].

Looking back in time, climate change issues were first discussed at the World Conference organised by the United Nations in Rio De Janeiro in 1992, at which the United Nations Framework Convention on Climate Change (UNFCCC—also known as the Rio Convention) was adopted. This document stressed the need to adopt protocols with rules and limits on greenhouse gas emissions. It came into force in 1994 and provided the basis for subsequent meetings that led to the approval in 1997 of the first Kyoto Protocol (adopted at the Conference of the Parties “COP3”). The Protocol, which came into force in 2005, after tense discussions, had the objective of reducing the emissions of polluting gases derived from human activities by 2012.

More recently, the Paris Agreement, adopted at the Conference of the Parties “COP21”, is one of the global climate change agreements between the member states of the United Nations Framework Convention on Climate Change regarding the reduction of greenhouse gas emissions from the year 2020. This confirms the long-term objective of keeping the global average temperature rise below the 2 °C threshold.

In 2018, during the Conference between the Parties “COP24”, guidelines for the implementation of the Paris Agreement (2015) were defined, which state that the 2 °C limit is no longer sufficient. In order to avoid disasters, we cannot allow temperatures to rise above 1.5 °C.

Among the outcomes of COP24, there is the “Special report: Health and Climate Change” [4], which puts the link between health and climate change at the centre of attention, representing an important opportunity to relaunch climate policies to protect and safeguard the health of human beings and the planet. To this end, the report includes seven recommendations for political decision-makers: identify and promote actions to reduce both carbon emissions and air pollution; include the health implications of mitigation and adaptation measures in the design of economic and fiscal policies; include the commitments to safeguard health from the UNFCCC and Paris Agreement, in the rulebook for the Paris Agreement; systematically include health in NDCs, National Adaptation Plans and National Communications to the UNFCCC; remove existing barriers to investment in health adaptation to climate change, especially for climate-resilient health systems and “climate-smart” health care facilities; facilitate and promote the engagement of the health community as trusted, connected and committed advocates for climate action; mobilise city Mayors and other subnational leaders, as champions of intersectoral action to cut carbon emissions, increase resilience, and promote health; and systematically track progress in health resulting from climate change mitigation and adaptation, and report to the UN Framework Convention on Climate Change, global health governance processes and the monitoring system for the SDGs [4].

The Report identifies key areas relevant to health and climate change and encourages countries to consider health in all cost–benefit analyses of climate change mitigation. It also recommends that countries use fiscal incentives and subsidies to incentivise sectors to reduce their emissions of greenhouse gases and air pollutants [10].

Other important documents on the climate change issue are the IPCC Reports. The IPCC, established in 1988 on the basis of an agreement between two United Nations organisations (the United Nations Environment Programme (UNEP) and the World Meteorological Organization), proposed the first report in 1990. The report recognised that emissions due to human activities have increased over time, leading to increasing concentrations of CO₂, methane, nitrogen oxide, chlorofluorocarbons and other climate-altering gases, with a consequent rise in the average temperatures on Earth. The negative impacts of this global warming have been concentrated in some coastal regions characterised by intense poverty. Subsequent reports have confirmed the above.

Today, a package of incentives and initiatives are being promoted to face the economic crisis caused by the COVID-19 pandemic. During an emergency situation, often, urgent actions are taken in derogation of the recommendations that were being adopted before the event causing the emergency. For example, the strong attention paid to plastic pollution has been overshadowed by the use of single-use (often non-recyclable) items for hygiene and health reasons due to the COVID-19 emergency. Therefore, this is a crucial moment in which we must not lose control or the results achieved to date and orient actions for economic and social recovery in any case from an environmentally friendly perspective.

3.1. Environmental Pollution and Climate Change: Documents in the European Framework

Through the 7th Environment Action Programme (EAP) to 2020 [20], the European Commission provided a guide to orient European environmental policy until 2020.

It provides a long-term vision for living “within the ecological limits of the planet” by 2050. It highlights the role of the circular and innovative economy in ensuring prosperity and a healthy

environment. Furthermore, this vision is characterised by the protection of biodiversity and low-carbon growth [20].

It identifies three key objectives: to protect, conserve and enhance the Union's natural capital; to turn the Union into a resource-efficient, green and competitive low-carbon economy; and to safeguard the Union's citizens from environment-related pressures and risks to health and wellbeing [20].

To achieve the above objectives, the European Commission identifies four "enablers", related to better legislation, better information, more and wiser investment and the full integration of environmental requirements and considerations into other policies.

The European Environment Agency (EEA) stresses the usefulness of promoting non-technical measures to guide consumers towards energy saving and the use of low-carbon energy, such as, for example, through information initiatives and the dissemination of a guide for consumers on good practices in the management of domestic combustion plants [10]. In addition, specific measures are needed for building renovation and energy efficiency and to prevent energy poverty. Furthermore, the European Commission adopted a series of documents for the reduction of pollution and the transition to a "cleaner" Europe.

Among the various measures that Europe has adopted, there is the Clean Air Policy Package. It was adopted by the European Commission on 18 December 2013 to improve existing legislation and reduce the harmful emissions caused by industry, traffic, power plants and agriculture to protect health and the environment. The enhancement of the sharing of best practices at the EU level is recognised as a fundamental operational tool in the Clean Air Programme.

In 2016, the European Commission presented the Clean Energy Package, which is a package of legislative proposals that involves the sectors of renewable energy sources, energy efficiency, the electricity market, governance and mobility.

In December 2019, the European Commission approved the European Green Deal (EGD) [21]. It takes as its starting point the conclusions of the latest IPCC reports on global warming; the increasing pollution of air, water and soil; and the effects of climate change.

It is "a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use. It also aims to protect, conserve and enhance the EU's natural capital, and protect the health and wellbeing of citizens from environment-related risks and impacts. At the same time, this transition must be just and inclusive. It must put people first, and pay attention to the regions, industries and workers who will face the greatest challenges" [21].

The European Environment and Air Quality Directive (issued on 28 November 2019) [7] stresses that reduced air quality is a source of chronic diseases such as asthma, respiratory crises, cardiovascular crises, cancer etc., leading to many premature deaths. This pollution is caused by SO₂, PM₁₀, PM_{2.5}, NO₂, CO, ozone, benzene and benzopyrene, which particularly concerns urban areas, where production, industrial activities, transport and more intense mobility are concentrated. Here, combustion for heating houses is at its highest due to the building density, and the micro-climate is more compromised.

3.2. Environmental Pollution, Climate Change and Health Impacts

The first WHO Global Conference on Air Pollution and Health took place at the end of 2018 in Geneva (Switzerland). It was held in response to a resolution of the sixty-eighth World Health Assembly in 2015 calling for a greater effort by the health sector as well as other sectors in the prevention of diseases due to air pollution and the associated costs to society [22].

Considering the high number of deaths due to air pollution highlighted in the previous paragraphs, there is an urgent necessity to increase the global response to prevent diseases and deaths. This would contribute to reaching the targets in the 2030 Agenda for Sustainable Development and the objectives of the Paris Agreement on climate change.

A series of actions have been proposed in Geneva to reduce the number of deaths due to air pollution by 2030 [22]:

- Scale up efforts and mobilise action globally.
- Massively implement solutions to burn less in any form.
- Strengthen action to protect the most vulnerable populations, especially children.
- Greatly increase access to clean energy and technologies in Africa and other areas with populations in the greatest need.
- Support cities to improve urban air quality.
- Enhance education on air pollution as a key factor for improving health and quality of life, within a lifelong learning approach.
- Enhance joint action between the financial, health and environmental sectors, and other key sectors affecting air pollution to generate business plans and specific actions leading to improved air quality and the mitigation of climate change. This includes a redirection of investments and adequate implementation of fiscal instruments.
- Develop and implement occupational safety and health regulations and measures to protect workers from occupational exposure to air pollution outdoors and indoors.
- Continue the joint effort for harmonised air pollution monitoring.
- Strategically complete knowledge and share it efficiently to address health risks. The generation of evidence concerning costs to society and efficient and cost-saving solutions is needed.
- Build key partnerships, programmes and initiatives to reduce air pollution to healthy levels [22].

The ministerial conferences of the European Environment and Health Process bring together different sectors and partners to define actions and policies on environment and health [23].

The Fifth WHO Ministerial Conference on Environment and Health, held in Parma (Italy), focused on the protection of health, in particular, of children, by proposing the European agenda of emerging health and environmental challenges. The first result of this process of environmental and health protection was the “Parma Declaration” [24]. In particular, the document “Protecting health in an environment challenged by climate change” [24] proposes a European framework for action to address new risks related to climate change and protect the health of the most vulnerable groups of the population (including the elderly, lung disease patients, asthmatics and allergy sufferers).

The Parma commitments were confirmed and further strengthened during the Sixth Ministerial Conference on Environment and Health of the WHO/Euro (Ostrava 2016), which focused on some crucial points such as the need to fight against environmental degradation, air pollution and climate change; the need to take systemic, cross-sectoral actions, focusing on disadvantaged social groups; the need to involve citizens and different stakeholders; and the need to integrate health objectives in all policies (in line with the SDGs and the objectives of the Paris Agreement).

In 2012, the WHO Regional Committee for Europe adopted “Health 2020”, a policy framework for improving health and wellbeing. It presents evidence on a number of factors influencing health determinants and emphasises political, professional and civil society commitments to improving health and wellbeing (and reducing health inequalities) through a strategic approach involving all governments and society [25].

The pandemic is a reminder of the delicate relationship between man and nature. Any action to make the world safer cannot succeed unless it addresses this relationship and the existential threat of climate change [16].

Climate and health “travel in tandem”, as highlighted in the 2019 Lancet Countdown report, which associates climate change with an increased spread of infectious diseases [11].

As highlighted by the WHO in the document “Protecting nature protects health—lessons for the future from COVID-19”, nature has many impacts on health and wellbeing. On the one hand, it is a source of the clean air, water and food that support healthy human societies, but, at the same time, it is a source of infectious diseases. Human activities are undermining these ecosystem services.

On the one hand, the pandemic has had tragic impacts on people's health and their lives, but on the other, it has had a significant positive impact on the health of the environment, which, within a few months, has improved considerably (reduction of emissions, noise reduction etc.). In this framework, the WHO published its "Manifesto for a healthy recovery from COVID-19", whose first prescription is to protect and preserve the source of human health: nature. Natural environments support us and need our protection [26].

The negative impact of human activities on the environment is increasing the risk of infectious diseases (60% of which come from animals) in human beings. As highlighted by the WHO, post-COVID recovery plans and plans for the reduction of future epidemics have to go upstream, that is, by reducing our impact on the environment by acting at the source [26].

3.3. Climate Change and Health Impacts: Documents in the Italian Framework

Italy is adopting a series of documents and directives for the reduction of pollution and the consequent improvement of health.

In 2018, Legislative Decree no. 81/2018 was issued, transposing EU Directive 2016/2284, which establishes stricter limits for atmospheric emissions for certain parameters, such as SO₂, NO_x, non-methane VOCs, ammonia and fine particulate matter.

As early as 2007, the government approved the "Gaining Health: Making Healthy Choices Easy" programme, which focused on health. The Programme allows health-related decisions to be taken more easily and promotes information initiatives to reduce behaviour that encourages disease outbreaks. Its framework is the "Health in All Policies" strategy, which aims to reach people most at risk in their social context and encourage less harmful behaviour.

The National Plan of Prevention (PNP) 2014–2018 adopted the "Gaining Health" approach to promote integrated policies and actions, paying attention not only to health aspects, but also to the environmental, social and economic determinants of health. For example, the Plan included strategies to facilitate the choice of healthy and active lifestyles. The Macro Objective 2.8 "Reduce potentially health damaging environmental exposures" highlights the importance of knowledge and the use of effective tools (including Health Impact Assessment) for preventive health impact assessment in decision-making processes.

In order to support the Regions in the implementation of this objective, in 2017, an Environment and Health Task Force was set up with the objective of "Building a national strategy for the coordination and integration of national and regional environmental and health policies and actions: identification of shared standards and actions for the prevention, assessment, management and communication of environment and health issues" [10].

As part of the New Essential Levels of Care, efforts have been made to promote tools able to facilitate the health sector's intervention on environmental prevention. The "Collective Prevention and Public Health" level includes activities and services aimed at protecting the health and safety of the community not only from infectious risks, but also from environmental risks and risks related to working conditions and lifestyles.

In particular, programmes for the protection of health and safety in outdoor environments include the health and hygiene assessment of urban planning tools, the promotion of projects to improve the environment and reduce health impacts, and the assessment of the possible health effects of exposure to environmental risk factors.

One of the first steps of national policies for adaptation to climate change is the "National Strategy for Adaptation to Climate Change" (Directorial Decree no. 86 of 16 June 2015). It identifies the main impacts of climate change for a number of socio-economic and natural sectors and proposes adaptation actions covering all sectors and the responsibilities of different Ministries.

The "National Strategy for Sustainable Development" (Legislative Decree no. 221/2015) outlines "a vision of future and development focused on sustainability, as a shared and essential value to face the global challenges of our country" [13]. It defines a national reference framework for environmental

and territorial planning, programming and evaluation processes and represents the first step to setting up the principles and objectives of Agenda 2030 for Sustainable Development in Italy.

Furthermore, in 2019, Decree Law no. 111 of 14 October 2019 (“Urgent measures to improve air quality and tackle climate change”) was published for compliance with the obligations set out in Directive 2008/50/EC on air quality. The Decree Law acknowledges the need and urgency to adopt a national strategic policy to tackle the climate emergency, also on the basis of work carried out at the international level by the IPCC, which highlights how climate variability is closely linked to human activities and how temperatures and CO₂ emissions will continue to progressively increase, with negative impacts on many areas of the planet and public health.

Furthermore, in Italy, many cities are adopting the Local Integrated Health Promotion Plan (Milano, Brescia, Cremona, Pavia, Torino etc.) as an annual planning tool for interventions aimed at promoting health-friendly lifestyles and environments. These plans have been adopted by a few Italian cities, all from the north, showing little awareness of the importance of assessing the impacts of urban transformations on human health (especially in southern cities, where such plans are lacking).

These plans include initiatives aimed at raising individual citizens’ awareness of their role in health-oriented choices and actions aimed at creating the right environmental conditions to encourage the adoption of correct lifestyles and involving all levels concerned, from policy-makers to local communities [27].

These plans (e.g., the Integrated Health Promotion Plan 2020 of the City of Milan) are mainly aimed at promoting initiatives closely related to health in the strict sense of the term and at a local level. Given the close relationship between climate and health, these plans could include recommendations and actions (individual or collective, public and private) that can contribute to reducing pollution, which in turn will have health impacts. If single cities adopt such plans, these, even if implemented at a local level, would, as a whole, achieve benefits on a larger scale.

4. The Circular Economy and Circular City Models

At this time of increasing unsustainability, a change of route is necessarily needed as a global response. Therefore, it is necessary to identify new models and development strategies for cities, which, as highlighted in the previous paragraphs, play a key role in the fight against climate change and the economic and social crisis. Cities today also have to be “reviewed” in light of all the needs and changes in lifestyles arising from the COVID-19 pandemic.

The impacts of COVID-19, not only on health but also on social, political, economic and financial systems, are reshaping urban life around the world. Urbanisation has the potential to create opportunities to improve quality of life and act as an engine for economic growth [28].

According to the new paradigm that is emerging, human beings have to be placed at the centre of this process. The human-centred approach places particular emphasis on health.

As highlighted by the Lancet Report, focused on the objectives of the Paris Agreement and the indications of the report of the Intergovernmental Panel on Climate Change (IPCC) 2018, “the economic benefits from the health benefits would substantially outweigh the cost of any intervention in a ratio of 1.45 to 2.45, saving thousands of billions of dollars worldwide” [13].

In this perspective, the model here proposed is that of the circular economy. This model, based on the principle that in nature, nothing is waste and everything can become a resource, aims to make the principles of sustainable development operational. The circular economy can be defined as the restructuring the industrial systems to support ecosystems through the adoption of methods to maximise the efficient use of resources by recycling and minimising emissions and waste [29]. Reference is made to how resource flows can be closed more quickly.

The circular economy represents an “umbrella concept” that encompasses various forms of economy, from the sharing economy, to the bio-economy, to the green economy, to the social economy, to the wellbeing economy etc. Therefore, it integrates different forms of economy that express dissatisfaction with traditional models of economy.

The United Nations introduced the notion of the circular economy both in Agenda 2030 (in Objective 12) [19] and in the New Urban Agenda (in paragraphs 71–74) [1] as a general model of development able to produce benefits in social and natural systems while generating new economic wealth. This stimulates an indefinite extension of the lifetime of resources and their use values and promotes cooperation circuits between the different actors.

As the WHO highlighted, the concept of the circular economy offers “an avenue to sustainable growth, good health and decent jobs, while protecting the environment and its natural resources” [3].

Focusing on the European framework, various documents by the European Commission promote a “greener” and, at the same time, “more social” Europe. The two concepts, however, are dealt with in separate strategic documents, leading to thinking about the need for a trade-off between economic growth, social growth and green growth.

The circular economy model, not intended in a limited sense (i.e., closely related to waste management or the use of renewable energy sources) and therefore widening its field of action, can instead help to reduce (to a minimum) the trade-off between environmental health, community health and the “health” of the economy.

In this perspective, the European Commission adopted in 2015 a first package to support the EU’s transition to a circular economy, including legislative proposals to stimulate the European path towards this new model [30]. This is an essential contribution to the EU’s efforts to develop a “sustainable, low-carbon, resource-efficient and competitive economy”. The objective of this package is to stimulate economic growth, making it more sustainable and competitive in the long term. It considers the circular economy as a means to contribute to innovation, growth and job creation [30].

In March 2019, the European Commission published a report on the implementation of the Action Plan for the circular economy adopted in 2015 [31]. The report presents the main results of the implementation of the Action Plan and outlines the open challenges for the implementation of the circular model. This document reports some results of the 54 actions (implemented or in progress) foreseen in the 2015 Action Plan. From 2012 to 2016, for example, there was a 6% increase in the number of workers employed in the circular economy (four million workers in 2016).

As the document highlights, the circular model has also opened up new job opportunities, generated new business models and developed new markets, both inside and outside the EU. In 2016, circular activities such as repair, reuse or recycling generated almost EUR 147 billion of added value, while investments amounted to about EUR 17.5 billion.

As can be seen from international documents on the theme of the circular economy and especially from some good practices of the circularisation of processes at different scales, where the implementation of circular processes has produced benefits, the circular economy offers a great opportunity to make our country more sustainable and, at the same time, increase urban productivity: both economic, and environmental and social productivity. There are several cities that are moving in this direction linked to the circular economy as a development model.

Some of these cities explicitly call themselves “circular cities” and are elaborating reports in which they define and systematise their action plans for the transition to this new model of city. In Europe, the circular city model is more widespread than in Italy: London, Amsterdam, Rotterdam, Brussels and Paris are just some examples [5].

These cities recognise the importance of organising the city system in analogy with natural systems and are undertaking a series of strategic actions aimed at transforming the processes that characterise cities from linear to circular. These actions concern different sectors, from construction to agro-food, textiles etc. [5]. However, the closing of loops should not only refer to technical issues (as emerge from most good practices for circular cities), but should refer to a systemic change in the city, its organisation, its economy, its community and its governance [5,32].

In particular, it concerns the converting of linear processes into circular ones, establishing flows (referring to people, waste etc.) and closing the cycles that are at the basis of the urban metabolism, the engine of the city’s functioning and its economy [33,34].

The circular city is able to “hold together”, at the same time, the objective of ecological/environmental sustainability with the goal of social justice, that is, the reduction of social inequalities. In other words, it aims at the systemic/holistic management of the dichotomy between environmental issues and social issues, to guarantee the social wellbeing and quality of life of all its inhabitants.

In 2018, the WHO highlighted the relationship between the circular economy and health, recognising that human health is significantly influenced by circular economy initiatives that are beyond the health sector.

As highlighted in the concrete experiences of circular city implementation [33,35–38] and research about this issue [5,39,40], this development model is able to produce multidimensional benefits in economic, social and environmental terms. However, it being a rather new phenomenon, appropriate tools to demonstrate the multidimensional benefits of the circular economy, in order to convince policy-makers, communities and companies that investing in a circular economy is convenient, are still to be investigated.

5. Implementation Tools for Circular Economy

5.1. Urban Planning to Conserve, Restore and Regenerate Natural Capital

Implementation tools play a key role in the implementation of the economy and circular city models.

All circular processes and synergies can be implemented in the space of the city through urban planning that represents an institutional tool able to transform the organisation of the city from linear to circular. Local urban regeneration projects have to be characterised by the ability to be instrumental in the realisation of the circular model. In particular, they have to be able to reduce economic, environmental and social costs, thus improving the current overall situation.

Moreover, since each choice in urban planning can have impacts (both positive and negative) on the health and wellbeing of the community, urban planning can be one of the institutional tools through which to promote and safeguard health (individual and collective). It is a useful tool for building liveable and healthy cities [41].

Among the “actionables” for implementing the prescriptions of the WHO Manifesto for a healthy recovery from COVID-19 and thus for a healthier, fairer and greener world, there is an “actionable” explicitly referred to cities: “Build healthy, liveable cities” [42].

Indeed, most of the “actionables” can be promoted and implemented in the cities through urban planning. They cover different sectors and fields ranging from energy, to water, to health care, to air quality, to chemicals, to housing, to food systems etc. [42].

The first “actionable”, which is “Protect and preserve the source of human health: Nature”, highlights the value of nature and its role in preserving human health.

An effective way to face the crisis is to take action to conserve and safeguard at least 50% of the Earth’s surface as intact natural ecosystems, in combination with energy transition measures [43].

Furthermore, there are “actionables” referring to the social dimensions, recognising their role for human health. Social inclusiveness and cohesion are encouraged in a people-oriented approach. The Manifesto encourages creating more socially inclusive places and spaces through spatial planning and aiming to “develop a common vision for social cohesion and health equity by adopting a people-centred “right to health” framework that includes the right to access, use and transform urban environments”. It highlights the capacity of urban planning to also produce impacts in social dimensions, encouraging relationships and triggering inclusive processes.

Cities today are densely populated and congested with traffic (especially historic and port cities). Intervening in the transport sector, encouraging the use of public transport, bicycles or other “clean” means of transport, rather than traditional private cars, is certainly an effective way to reduce air pollution (but also the number of road injuries) and the resulting negative health impacts. Many major cities around the world (such as Paris, London and Milan) have included the pedestrianisation of

many roads and the extension of cycle paths among the measures taken in response to the crisis due to COVID-19 [16].

As the pandemic due to COVID-19 is also highlighting, a close relationship among social, natural and economic systems exists. Each system is interdependent on the other.

Urban planning is a tool through which to promote strategies and actions able to keep the social, economic and environmental dimensions together in a systemic logic.

The COVID-19 pandemic has confirmed how “people and nature are interlinked” and how human activities, producing negative impacts on nature, contribute to increasing the spread of diseases and the risk of future pandemics. Although it is not always possible to predict (and therefore prevent) these diseases, we can reduce their occurrence by taking care of our relationship with nature [44].

It is necessary to “renew” “humanity’s broken relationship with nature” [44]. Urban planning can contribute to bridging the divide between natural and man-made capitals. Bridging this divide means not only the conservation of nature, but also the multiplication of these natural areas, which are decreasing considerably over time.

Nature is in a phase of global decline at an unprecedented rate in human history. “The health of ecosystems on which we and all other species depend is deteriorating more rapidly than ever. We are eroding the very foundations of our economies, livelihoods, food security, health and quality of life worldwide”.

We are very close to the breaking point, but we are still in time to intervene for a “transformative change” [45]. The WWF Report suggests several actions in different fields. For urban areas, it suggests actions and strategies ranging from the promotion of nature-based solutions, to increasing access to urban services and a healthy urban environment for low-income communities, improving access to green spaces, and sustainable production and consumption and ecological connectivity within urban spaces, particularly with native species [45].

As suggested by the WWF, a “One Health” approach is needed, “linking the health of humans, animals and our shared environment” [44]. Furthermore, a “New Deal for Nature and People, that puts nature on the path of recovery for the benefit of all people and the planet, with three goals: protect and restore natural habitats; safeguard the diversity of life; halve the footprint of production and consumption” is necessary [44].

As said before, nature needs to be conserved and “multiplied”. Through urban planning, nature can be conserved, safeguarded and brought back to the cities, for example, through nature-based projects. Nature-based solutions, recognised in the Pact of Amsterdam [46] among the priorities of the circular economy, can be defined as “actions to protect, sustainably manage, and restore natural or modify ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human wellbeing and biodiversity benefits” [47]. In addition to the above definition, they can be considered actions inspired by—or supported by—nature [5].

Nature-based solutions play an important role in the development of the city, as they can provide ecosystem services, thus producing benefits (i.e., the regulation of micro-climates and water treatment) [48–50].

The integration of the concept of the circular economy with the concept of nature-based solutions can increase the benefits for urban areas [5]. Many studies highlight the health benefits of green spaces in urban areas (e.g., a reduction in depression and cardiovascular problems) [51–54] emphasise the co-benefits produced by green areas in the urban environment (e.g., a reduction in pollution, improvement of the micro-climate and increase in real estate values) [54,55].

Urban planning can promote an increase in (or prevent the loss of) the amount of green areas, encouraging the use of vegetation in urban areas (i.e., street trees, green roofs and facades); planting trees in private domestic gardens, along the streets and in urban parks; the building of green walls and roofs to reduce temperatures in cities; and maintaining existing green infrastructure.

The issue of the reorganisation of the city is also dealt with in some points among the six chapters foreseen by the Italian Government Task Force for post-COVID recovery in the “Italy 2020–2022

Recovery Initiatives” [56]. Among the various issues, reference is made to the need to increase and preserve greenery and the need to reduce soil consumption and the consequent hydrogeological disruption. In particular, the idea is that any investment involving new construction will be allowed only if there is no possibility of the recovery and regeneration of already built-up areas [56].

5.2. Evaluation Tools for New Governance

The evaluation tools play a key role in urban planning. Here, the focus is on tools for evaluating the effectiveness and efficiency of circular cities, that is, for assessing the positive and negative impacts produced by the implementation of this development model. To this end, it is necessary to integrate traditional evaluation tools (born and used in the linear economy field) and evaluation tools characterised by a matrix linked to the circular economy model.

The evaluation of the circular city should be characterised by a dynamic and iterative process from evaluation to monitoring and to adaptation with different feedback cycles over time. The monitoring phase should be continuous, as the city is constantly evolving, in order to understand if it is moving in the right direction, so as to modify strategies and actions if the results are not as expected. The discipline of evaluations helps not only to compare the alternatives already given, but also to produce new solutions aiming at a positive sum game in which all subjects benefit [57].

This evaluation framework of the circular city includes different dimensions: economic, financial, environmental, social and cultural ones. It has to be dynamic, considering that the city is a “living system” changing over time due to economic, social and environmental factors, and to be able to capture all the multidimensional impacts in the short, medium and long term.

To date, there is no officially recognised evaluation framework for circular cities, and some studies show that the indicators used to assess the effectiveness of this model mainly refer to specific sectors, such as the waste and energy sector, leaving out some aspects that are fundamental to the success of the circular city [32].

In 2018, the European Commission [58] identified an initial framework for monitoring the circular economy by identifying a series of indicators divided into four categories: production and consumption, waste management, secondary raw materials, and competitiveness and innovation. These indicators certainly represent a starting point, but not a sufficient framework for monitoring the complex framework of the circular economy involving different sectors, different actors and different “flows” and dimensions.

The only more detailed and specific official evaluation tool adopted by the European Commission (in collaboration with several stakeholders, including several producers, associations and organisations) within the circular economy is the Level(s) tool. Indeed, it refers only to the construction sector. The latter is one of the sectors that consumes the most resources: it represents half of all the materials extracted, half of total energy consumption, one third of water consumption and one third of waste production [59]. It is therefore a key objective for the European Commission’s policies on sustainability and the circular economy.

As highlighted by the WHO [3,60] and the analyses of circular cities, the focus on the benefits produced by the circular economy is mainly focused on sustainable production and consumption processes, while the implications for health are limited. Instead, health considerations in circular economy processes should be promoted, also in relation to the achievement of SDGs.

The assessment of the impacts of circular economy projects on health represents an added value to the decision-making process, considering that human health is significantly influenced by policies and actions in many fields (including those involved in the transition to a circular economy) that go beyond the health sector and influence health through different pathways [60]. Health conditions represent a fundamental aspect in the circular model of the city because they reduce costs that, in the vision of human-centred development, are linked to morbidity, malaise etc.

In this regard, the WHO recently published a report on the relationship between the circular economy and health, highlighting how a circular economy can produce both direct and indirect health

benefits [3]. However, it also highlights the need not to neglect some aspects of the circular model that could produce negative health impacts, such as the negative impacts produced by processes using hazardous materials [3]. As already underlined, the WHO also points out that human health is also influenced by actions and policies that go beyond the health sector and identifies some impacts of circular economy implementation on health [3].

Furthermore, in 2019, the WHO published the second report on *Assessing the Health Impacts of Circular Economy*, exploring the relationship between health impacts and wellbeing in the circular economy model, proposing to incorporate the Health Impact Assessment (HIA), Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) into urban planning tools in order to better assess, control and manage transformations [3,60].

Impacts on health and, in particular, the relationship between climate change (to whose reduction the circular model also contributes) and human health are also addressed by the Lancet Countdown.

In 2017 [61], the Lancet Countdown had already pointed out the risks of viral or bacterial diseases related to climate change. This link was then confirmed in the 2018 Report [11].

The 2019 Report by the Lancet Countdown is an important document for monitoring the relationships between climate change and human health. It identifies a monitoring system including 41 indicators. The last Report (2019) confirms what had already been stated in the previous Report [11] about the link between climate change and the diffusion of many diseases. In addition, it highlights that the economic cost of non-timely intervention is greater than that incurred in a timely manner, without, however, the restoration of ex-ante conditions.

The indicators are identified by a multidisciplinary team, highlighting the cross-cutting nature of the health theme, which does not exclusively concern the health sector.

The Lancet Countdown indicators are organised in five main domains: climate change impacts, exposure and vulnerability; adaptation, planning and resilience for health; mitigation actions and health co-benefits; finance and economics; and public and political engagement.

Therefore, they are related to the impacts of climate change on health (first domain), to the actions for reducing them (second domain), to the solutions able to mitigate these impacts (third domain), to the costs concerning the both in terms of the damage caused and the solutions to be adopted (also to achieve the goals of the Paris Agreement) and, finally, to the effectiveness of both public and community participation.

Furthermore, urban planning in a nature-based perspective (discussed in the previous paragraph) stresses the key role of the natural systems as the main urban infrastructure. Thus, nature plays a key role in urban planning, and it poses important issues in the evaluation processes.

In the evaluation processes, all values of nature have to be assessed. First of all, the “intrinsic value” of nature needs to be considered [62–64].

The notion of intrinsic value is linked to the self-regeneration capacity of a system, to its self-organisation capacity, to self-sustainability, and to self-sufficiency, linked to the “glue” or primary value [65]. In the ecological economy, the “intrinsic value” is interpreted as “primary value”, an existing value that is independent of human beings’ existence and its usefulness for them and the social system.

We can assume that the circular economy has the capacity of conserving the “intrinsic value” over time, by strengthening the relations among human beings, communities and ecosystems. The challenge is to assess both the “intrinsic value” of nature and its economic/instrumental value for local communities (ecosystem services—provisioning, regulation and maintenance, and cultural services) [66].

Different focus groups, Delphi procedures, deliberative arenas, and living labs are dialogic-communicative processes that allow verifying if and how the different stakeholders perceive this “intrinsic value”. The opportunity costs associated with nature conservation should be considered in the assessment process, including net costs and benefits, both direct and indirect. The avoided costs

of inaction (e.g., costs due to extreme weather conditions and air pollution) and benefits from the ecosystem services provided by nature should also be included in the evaluation process.

5.2.1. Multidimensional Impacts Due to Climate Change

Climate change is a phenomenon most often associated with the atmosphere. Indeed, it has negative impacts not only on air, but also on soil and water.

Many gases that cause climate change are common environmental pollutants that produce negative impacts on human and environmental health.

The regions near the poles are partly permanently frozen, and the frozen layer (permafrost) contains twice the amount of carbon currently present in the atmosphere. Therefore, if the temperature increases too much, melting this layer would release this carbon from the decomposing biomass in the form of carbon dioxide or methane.

Furthermore, many human activities produce methane emissions, which, once released into the atmosphere, have a life cycle of 12 years. Methane is a greenhouse gas twenty times more powerful than carbon dioxide (www.climatenetwork.net) that contributes to the formation of ground-level ozone, which, in turn, is among the main causes of pollution impacting human and environmental health.

Carbon dioxide is one of the causes of climate change and global warming, but it is not the only one: other atmospheric agents such as ozone, methane and particulate matter also contribute to climate change. In particular, particulate matter is a pollutant that can have both a warming and a cooling effect.

Their “colour” is not the only means by which polluting emissions in the air can affect the climate. The concentrations and compositions of particulate matter may affect cloud formation and thus the distribution of precipitation. Changes in precipitation have negative economic and social impacts (and therefore costs) because, for example, they impact production and therefore food prices.

Additionally, climate change also has negative impacts on local weather conditions, including the frequency of air stagnation and heat waves.

Soil is an important element of climate change, even though it is very often neglected. It constitutes the second greatest carbon sink after the oceans. Depending on the regions, climate change may contribute to the accumulation of carbon in plants and soil due to the growth of vegetation, or an increased release of carbon into the atmosphere. A return to sustainable land use could contribute to climate change mitigation. In addition, the high concentration of carbon dioxide in the atmosphere could accelerate the activity of microbes in the soil and, consequently, the decomposition of organic material, with an even higher release of carbon dioxide.

Soil quality is crucial for many other climate change effects. For example, permeable soils, by storing water and keeping temperatures low, protect us from heat waves. This is particularly important for urban areas, where there are many impermeable surfaces that “close” the soil and can create heat islands.

Climate change is exacerbating the pressure on water. Water bodies (oceans, seas, lakes and rivers) are also affected by climate change, which produces negative impacts ranging from floods and droughts to ocean acidification and rising sea levels [67]. Furthermore, oceans are getting warmer, stormier and more acidic, and this is producing negative impacts on the health of marine ecosystems [18].

Most of the heat produced by warming is stored in the oceans, affecting the temperature of the water and its circulation. In addition, this increase in temperature is melting the polar ice caps, which, as they shrink, reflect less solar energy into space, causing temperature increases.

Water temperature is one of the strongest regulators of marine life. The increase in temperature is therefore causing significant problems and changes under water, such as in the distribution of marine species and vulnerability.

As highlighted above, cities (and in particular, port cities), produce polluting and climate-changing impacts on the atmosphere, soil and water. These impacts in turn cause damage to human health

and wellbeing, which from a human-centred perspective are a priority. These impacts also turn into economic and financial costs, as well as social costs (Figure 1).

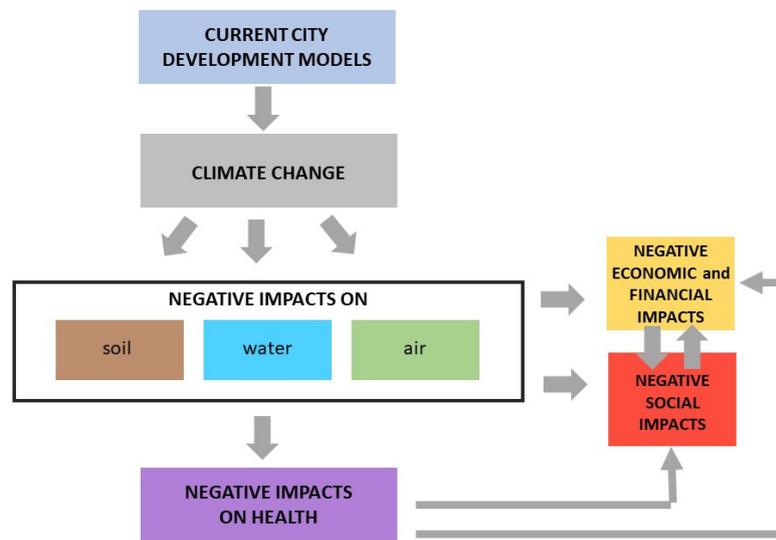


Figure 1. Climate change and related negative impacts.

For example, the heat islands mentioned above, caused by the increase in temperature and the resulting impacts on the soil, reduce the perception of wellbeing. The latter, in turn, causes economic damage (for example, in terms of reduced productivity) and social damage (in terms of increased social conflict).

The increase in diseases due, for example, to the increase in pollutants in the air causes economic and financial damage (in terms of health care expenditure, absences from work and reduced productivity) and social damage (in terms of a reduced perception of safety).

A decrease in the attractiveness of a city, due, for example, to high pollution rates can lead to economic and financial damage related to a reduction in attractiveness for business activities or tourism or even a reduction in real estate values etc.

The alteration of the rainfall regime and an increase in extreme events can, on the one hand, reduce the attractiveness of a place and, on the other hand, reduce economic and financial productivity (in terms of the productivity, for example, of soil).

In addition, extreme weather conditions are also producing negative impacts on water and food services provided to the population. Today's children are facing a future that will be increasingly characterised by problems related to the climate: from less nutritious crops to air pollution, rising temperatures etc.

The economic and financial damage due to pollution and the consequent damage to health is also a cause of reduced quality of life and damage to marginal social groups, increased conflict between rich and poor, and increased social non-inclusion.

The economic stress and the damage caused by natural disasters caused, in 2018, worldwide damage equal to USD 165 billion. According to the World Economic Forum Report, climate-related economic damage could reach 10% of GDP in the United States alone by the end of the century. "Over 200 of the world's largest firms estimated that climate change would cost them a combined total of nearly USD 1 trillion in the case of non-action" [18].

As mentioned above, climate change will have impacts on trade and supply chains, with consequences for prices but also for the workforce: for example, heat stress caused by global warming is predicted to cause productivity losses equal to 80 million full-time jobs in 2030 [18]. Air pollution is, in terms of productivity, already costing the world over USD 5 trillion.

As the above examples show, the damage caused by the pollution of cities is wide ranging and diverse. As the world becomes increasingly urbanised, it is therefore an absolute priority to identify strategies and actions to reduce pollution rates (of air, water and soil) in a perspective of sustainable development.

Considering that the circular economy model is able to reduce negative impacts (producing benefits in economic/financial, social and environmental terms), criteria and indicators related to this model and its impacts should be included in the evaluation framework for city transformation projects and programmes.

5.2.2. Towards Hybrid Evaluation Tools for Assessing the Impacts of Urban Development on Health

The implementation of the circular economy in a human-centred perspective (and thus putting human health at the core of the process) produces multidimensional impacts [5]. Local urban regeneration projects have to be instrumental in the implementation of the circular city model, contributing to reducing economic, environmental and social costs and thus improving the overall productivity of the city.

Therefore, it necessarily requires a hybrid evaluation approach [5] able to include criteria and indicators covering all the multidimensional impacts that can be divided into three categories: economic, social and environmental. This classification makes the assessment effective, allowing capturing all the impacts that a transformation project can produce. Then, these impacts should be brought back to a unique logic, which is transformed (where possible) into economic and financial impacts, in order to compare different resource commitments.

This human-centred approach assumes health and wellbeing as a priority.

In particular, here, the attention is focused on the evaluation of the impacts on health. As also underlined by the WHO, health, defined as “a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity” [68], includes “hard” endpoints (i.e., mortality and morbidity) and “soft” endpoints (i.e., wellbeing and quality of life) and their economic, social and environmental determinants [60].

The state of health of a population is the result of the relationships that are established with the social, cultural and physical environment in which the population lives. Health determinants (Figure 2) are defined as those factors that influence health status and include both natural biological factors (age, gender and ethnicity), and also behaviours and lifestyles, the physical and social environment, and access to health care and services in general, which are often closely interrelated.

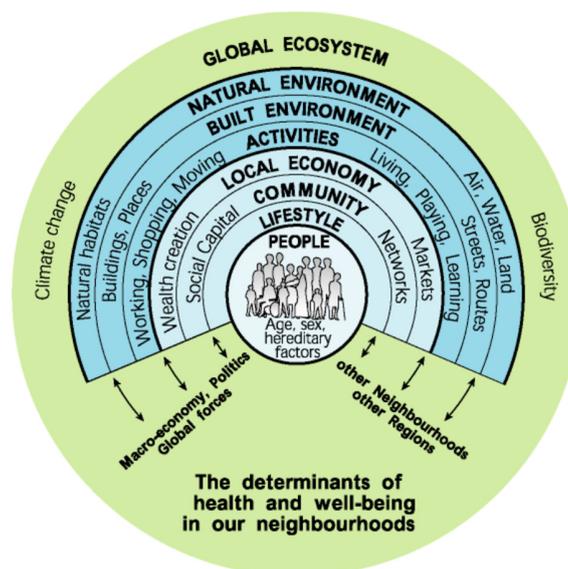


Figure 2. Determinants of health and wellbeing. Source: [60].

Therefore, the evaluation of the impacts on human health includes different aspects related to not only disease and mortality, but also the other determinants that impact it.

The proposal is to hybridise the Health Impact Assessment (HIA) with other impact assessment tools that integrate (also indirectly) health issues. Therefore, it means hybridising the HIA approach with approaches related to Environmental Impact Assessment (EIA), Social Impact Assessment (SIA) and Cost–Benefit Analysis (CBA) and with other methodologies to the extent feasible. In particular, the proposal is to also consider the approach emerging from the model assumed by the Green Deal (that is, the circular economy model) and from the Lancet Countdown study.

The Health Impact Assessment (HIA) is a decision-making support tool for assessing the human health impacts of projects, programmes and plans subject to Environmental Impact Assessment (EIA). Recently, this tool has been increasingly used in the transformation processes of the territory. In 2018, the Italian Ministry of Health set up an “Urban Health” working table with the aim of producing a strategic document to improve urban planning policies from the point of view of health and promote correct lifestyles and health as a common good.

The HIA includes five main steps (screening, scoping, assessment and appraisal, monitoring, and reporting) for evaluating how an intervention on the territory can induce changes, even unintentional, directly and indirectly in the health status of the exposed population. It mainly includes health indicators such as mortality, cancer incidence, respiratory diseases, visits to the general medical practitioner etc. [69].

These indicators closely related to health should be enriched with other indicators related to health determinants. They should be integrated with criteria and indicators linked to environmental, social and economic assessments.

As it concerns environmental assessment, the Environmental Impact Assessment (EIA) provides a reference framework. It is a decision-making support tool aimed at identifying, describing and quantifying the effects that a project produces on the environment. On a wider level, there is the Strategic Environmental Assessment, which aims to assess the impacts of plans and programmes on the natural environment.

The EIA is used to assess a range of impacts, including health and wellbeing impacts. However, in practice, in the EIA, health is considered in terms of diseases and illnesses caused by the pollution of the physical environment (air pollution, noise etc.), but other health determinants or other opportunities to promote health and wellbeing are not included. Therefore, the health issue in the EIA can be “underdeveloped in terms of pathways to outcomes or distribution of health in affected populations” [60].

In relation to social impacts, the SIA provides us with a framework for evaluating impacts on the social system.

The SIA is a tool for the evaluation of the social issues associated with projects and programmes. It is defined as a process of the analysis, monitoring and management of the social consequences (both positive and negative) of plans, projects and programmes [60].

The different definitions of the SIA emphasise the distributive aspects of impacts on different social groups and, in particular, on the most vulnerable ones.

Along with a number of impacts, health impacts are also considered in the SIA. However, the SIA guidelines do not typically require a detailed analysis of the determinants or pathways of specific health impacts [60].

Cost–benefit analysis is an economic analysis that takes into account those social costs and benefits that, directly or indirectly, can also be expressed through monetary values. Among these costs and benefits, there are also health issues, which are not always quantifiable in economic terms.

Furthermore, considering the circular economy model proposed here to address climate change and reduce the costs of urban transformation, the criteria and indicators identified by the WHO about the impacts of circular economy projects on health [3,60] can be included in this evaluation framework.

In the circular economy perspective, the suggestions and recommendations proposed by the European Union in the Green Deal (which assumes the circular economy model as essential for addressing the challenges and competition in the globalised economy) can be interpreted as significant criteria for evaluations in the perspective proposed here.

The above can be integrated with the criteria and indicators proposed by the Lancet Countdown, which consider, as discussed in the previous paragraphs, the close relationships between climate change and health.

These approaches need to be hybridised in order to have an overall assessment of the impacts of urban transformation projects. The “hybrid” evaluation tool is therefore intended to be a tool that integrates the different and multidimensional impacts (from environmental to social-human to economic ones) and helps to identify those combinations of projects characterised by the promotion of the greatest synergies due to their complementarities.

Multi-criteria and multi-group evaluations are example of hybrid tools [70] for the management and the comparison of the positive and negative effects [71–73] to balance and compensate for the different impacts for all stakeholders (public, private, financial, social and civil). This evaluation tool has to be able to overcome the limitations of the current economic approach [74], also “capturing” the relational aspects characterising the circular model.

The multidimensional impacts produced by city development on human health should all be transformed, where it is possible, into economic and financial impacts, in a unifying logic. In this way, by “translating” these impacts into costs, it is possible to compare them with other resource commitments that adopt an economic and financial logic. This is useful as a support to policy-makers in allocating resources between different sectors. By transforming environmental, social and health costs into economic and financial costs, a “common language” is used to compare different investments. These costs, if reduced, “mean” benefits. For example, if we consider that air pollution costs the world more than USD 5 trillion a year due to the decrease in productivity [18], it is “easier” to understand that investing in adaptation and mitigation measures would reduce costs due to pollution.

The effort to save money by neglecting environmental protection, emergency responses, health care systems and social safety systems (and thus not understanding the costs) has proved to be a false economy—and the bill is now being paid several times over [26].

Avoidable environmental and occupational risks are the cause of about a quarter of all deaths worldwide. Investing in healthier environments and environmental regulation is essential to tackle future disasters and offers better returns for society. “For example, every dollar that was invested in strengthening the US Clean Air Act has paid back 30 dollars in benefit to US citizens, through improved air quality and better health” [16].

Alongside expert knowledge, a significant role in helping to understand where to allocate resources is played by common knowledge; that is, the community, through its own needs and interests, expresses the point of view of those who live in (and therefore contribute to transforming) the city.

As recognised by UN-Habitat [28], the contribution of communities in urbanisation processes is often recognised too little. The capacity to engage and mobilise communities to address challenges (such as COVID-19) will contribute to the success of cities [28].

Communities are “innovative, creative, resilient and pro-active” in finding solutions (especially in times of crisis such as the current pandemic crisis), and therefore, their involvement in urban planning processes contributes to making the results more sustainable. The involvement of communities should become mandatory in these processes, as their point of view reflects local culture, values and social capital. This translates into continuous and re-iterative cycles of the co-creation and co-design of solutions [28]. Post-COVID cities will require greater integration and involvement of the community, their needs, ideas and capacities (whose value has been demonstrated during the pandemic) to achieve sustainable urbanisation. To this end, community involvement needs to be further encouraged through policies, financial resources and political will [28].

COVID-19 highlighted the need for cities to be able to respond and adapt quickly to sudden changes (such as those due to the pandemic) through new systems and approaches. The cities that have best managed the potential threats of COVID-19 are those that during the quarantine quickly adapted road and community spaces, that those have been able to create community networks through social media, and those that enhanced online services and non-motorised transport. Communities will therefore play an important role in this period of decline in budgets and financial capacity, helping to redefine the allocation of scarce resources [28].

Through dialogic-communicative processes (such as Delphi procedures, deliberative arenas and living labs), it is possible to promote creativity and engagement for developing interactions and tools and contributing to bringing innovation in policy-making processes [75].

In participatory processes, experimentation and co-designing with different stakeholders is carried out, generally in a long-term logic. The European Union has included participation in decision-making processes through Policy Labs (in Italy, they are active, for example, in Milan, Bologna and Mantua), which are spaces that are for engaging citizens and companies, in a dynamic evaluation process. In these participative labs, evaluation processes are introduced actively involving different actors and stakeholders. They are stimulated to creativity and critical thinking, proposing new ideas, and identifying needs and priorities. In this way, it becomes a co-evaluation process.

Evaluation becomes a process of active participation and self-learning. This makes it possible to overcome, for example, conflicts between the different interests and values at stake.

Participation can help to strengthen the motivations for choosing a (more shared) project alternative by critically interpreting and comparing different points of view. There are no “pre-packaged” solutions; participation helps to guide choices, but this process can also lead to solutions and alternatives that were not foreseen at the beginning of the participation process.

Participation processes today are often emptied of meaning and content because they are more implemented for the acquisition of consensus than oriented towards real listening. Instead, participation has to support the whole decision-making process, with forms and moments that can be different, becoming an integral part of the plan, which is a structural element of the elaboration and verification of its contents.

6. Indicators for Assessing Health/Wellbeing Impacts of Urban Transformations

As highlighted in the previous paragraphs, urban transformation projects are instrumental to the implementation of the circular model. Through planning, we will be able to reduce the environmental, social and economic costs deriving from urbanisation and many different human activities.

Urban planning makes it possible to “translate” the concepts of the circular economy into space and territory. Urban planning (which has both positive and negative impacts on the health and wellbeing of communities) represents one of the institutional tools for promoting and safeguarding health, and building liveable and healthy cities. Evaluation plays a key role in planning processes. This assessment has to include the evaluation of health impacts, an issue that is even more relevant today due to the COVID-19 emergency.

The Istanbul Declaration adopted in 2007 represented an important milestone in the assessment of health and wellbeing, as it reached an initial consensus on the need to measure the progress of society beyond mere economic measures, such as GDP.

Another important step in this direction was the Final Report of the Commission on the Measurement of Economic Performance and Social Progress [76] promoted by the French government, the so-called Stiglitz-Sen-Fitoussi Commission, which encourages the shift of emphasis from the measurement of economic production to the measurement of people’s wellbeing, proposing a multidimensional approach to the concept of wellbeing that also takes into account the subjective evaluation aspects for citizens and considers sustainability indicators, not only environmental, but also economic and social.

The report highlights the need to use both objective and subjective indicators, as the latter, based on citizens' perceptions, allow the acquisition of complementary information that objective indicators alone would not be able to capture.

The starting point here to propose an evaluation framework for the assessment of urban development in the perspective of the circular economy with a focus on human health is represented by the WHO approach, which, after analysing the relationship between the circular economy and health [3], proposed integrating the HIA, SIA, EIA and CBA methods for the evaluation of circular economy projects [60]. Understanding the health impacts is fundamental for the aim to "build healthy and liveable cities". HIA, SIA and EIA mainly refer to impacts in terms of diseases and illnesses, while impacts on determinants are not included.

As also highlighted by the WHO, the assessments of the circular model projects are more focused on production and consumption processes [60], neglecting health impacts, which, to date, are still considered marginal. As underlined in the previous paragraphs, from several studies, there seems to be a strong need to integrate the system of indicators about this issue. The WHO highlights the lack of such indicators. This paper aims to fill this gap by proposing some specific health indicators in a hybrid evaluation framework that includes and integrates HIA, SIA, EIA and CBA. The assessment of the health impacts represents an added value to decision-making processes, given that health is influenced by policies that go beyond this sector.

To this end, it is proposed here to integrate the Equitable and Sustainable Wellbeing (BES) [77,78] tool proposed by the Italian National Institute of Statistics (ISTAT) and some indicators promoted by the Lancet Countdown [11]. These indicators are intended to refer to and include both health impacts in the strict sense and, therefore, in terms of diseases and illness, and in relation to health determinants, and actions and solutions to reduce these impacts.

The BES approach is consistent with this logic that considers wellbeing as a concept going beyond economic wealth ("beyond GDP") and considers the interlinkage among the different dimensions affecting wellbeing, including health.

The ISTAT, assuming the multidimensionality of the concept of wellbeing, identifies 12 domains that represent the different aspects contributing to the quality of life of citizens. They are:

- Health;
- Education and training;
- Work and reconciliation of life time;
- Economic wellbeing;
- Social relations;
- Politics and institutions;
- Security;
- Subjective wellbeing;
- Landscape and cultural heritage;
- The environment;
- Innovation, research and creativity.

The ISTAT has identified a set of indicators for each domain, a total of 130 indicators, which are reviewed each year and integrated and modified to adapt to changing needs, new data sources and methodological advances (last updated 2019). The domains are actually linked to each other.

The BES domains are interlinked and can be largely linked to health determinants. Indeed, health and wellbeing are closely linked: a good state of health contributes to wellbeing, as well as a feeling of wellbeing being able to contribute to a good state of health (and on the contrary, a feeling of malaise can cause illness). Thus, here, some indicators of the other domains can also be considered.

Among the BES domains, first of all, health is considered here. According to the ISTAT, health is a central aspect of life and an indispensable condition for individual wellbeing. It has consequences

that affect all dimensions of the individual's life in its various phases, changing conditions, behaviour, social relations and opportunities.

In particular, the indicators selected by the "health" domain to be included in the evaluation framework for the impacts of circular urban projects on health are:

- The hope of life;
- The physical state index;
- The psychological status index;
- The infant mortality rate;
- The standardised cancer mortality rate;
- The unlimited life expectancy in daily activities at 65 years of age.

In the light of the above, these indicators, which are more closely linked to diseases and illness, should also be integrated with those concerning the other domains, as they are linked to the different determinants of health.

Consistently with the new ecological paradigm, it is significant to also include in the evaluation framework the indicators related to the "environment" domain. In fact, to improve people's current and future wellbeing/health, it is essential to satisfy human needs by promoting activities that do not compromise the conditions and balances of natural ecosystems. Uncontaminated water, air and food are only possible in a "healthy" environmental context. Soil also plays a significant role in the functioning of terrestrial ecosystems.

As highlighted in Section 5.2.1, a "sick" environment produces negative impacts on people's health and wellbeing. Therefore, it is also necessary to consider indicators belonging to this category.

The indicators selected and related to the "environment" domain are:

- The quality of marine coastal waters;
- Urban air quality;
- The availability of urban greenery;
- Contaminated sites;
- Areas of particular naturalistic interest;
- Preoccupation about the loss of biodiversity;
- Material flows (reference to the circular economy);
- CO₂ emissions and other climate-altering gases.

With reference to the remaining ten domains of the BES, some indicators have been selected to be included in the framework for assessing the impacts of the circular transformations of cities on human health. These indicators refer to the domains related to health determinants and to those that are more related to urban transformation projects in terms of the circular economy.

In particular, they are:

- The employment rate (referring to the domain "work and reconciliation of life time");
- The average available income per capita (referring to the domain "economic wellbeing");
- Social participation (referring to the domain "social relations");
- The presence of elements of degradation in the area where people live (referring to the domain "security");
- Satisfaction of own life (referring to the subjective domain "wellbeing");
- The density of historical greenery (referring to the domain "landscape and cultural heritage");
- Innovation in the production system (referring to the domain "innovation, research and creativity");
- Beds in residential social-health and social-health-care facilities (referring to the domain "quality of services").

The relationship between climate change (whose reduction is also achieved by circular economy projects as highlighted in the previous paragraphs) and health is also highlighted by the Lancet Countdown [11]. The 2019 report by the Lancet Countdown on health and climate change, as illustrated in the previous paragraphs, identifies 41 indicators across five categories that are significant in the development of this assessment framework [11].

Thus, starting from this set of 41 indicators, the indicators that are most linked to urban transformation projects in the perspective of the circular economy have been selected (with reference to the indicators that circular cities are using today to evaluate the transition towards this new development model [5]).

The selected indicators are the following:

- Health and exposure to warming (with reference to the first domain related to the impacts of climate change on health);
- A change in labour capacity (with reference to the first domain related to the impacts of climate change on health);
- Global health trends in climate-sensitive diseases (with reference to the first domain related to the impacts of climate change on health);
- Food security and undernutrition (with reference to the first domain related to the impacts of climate change on health);
- National adaptation plans for health (with reference to the actions for reducing the above impacts);
- National assessments of climate change impacts, vulnerability and adaptation for health (with reference to the actions for reducing the above impacts);
- Adaptation delivery and implementation (with reference to the actions for reducing the above impacts);
- The detection of, preparedness for and response to health emergencies (with reference to the actions for reducing the above impacts);
- Spending on adaptation for health and health-related activities (with reference to the actions for reducing the above impacts);
- The carbon intensity of the energy system (with reference to the solutions able to mitigate the impacts);
- Exposure to air pollution in cities (with reference to the solutions able to mitigate the impacts);
- Premature mortality from ambient air pollution by sector (with reference to the solutions able to mitigate the impacts);
- Sustainable and healthy transport (with reference to the solutions able to mitigate the impacts);
- Mitigation in the health-care sector (with reference to the solutions able to mitigate the impacts);
- Economic losses due to climate-related extreme events (with reference to the costs concerning the damage caused);
- The economic costs of air pollution (with reference to the costs concerning the damage caused);
- Investing in a low-carbon economy (with reference to the costs concerning the solutions to be adopted);
- Investment in new coal capacity (with reference to the costs concerning the solutions to be adopted);
- Investments in low-carbon energy and energy efficiency (with reference to the costs concerning the solutions to be adopted);
- Individual engagement in health and climate change (with reference to the effectiveness of community participation);
- Engagement in health and climate change in the UN (with reference to the effectiveness of public participation).

The set of indicators proposed here starting from the BES approach and the Lancet Countdown indicators (selected in coherence with the indicators of circular cities) is intended to represent a first step forward in filling the gap concerning the weak inclusion of health impact assessments in the evaluation of urban transformation projects, with particular reference to projects related to the circular economy model.

Furthermore, the need emerges to “translate”, as far as possible, these impacts into costs in order to compare different project alternatives and thus support administrations in allocating financial resources between different sectors.

7. Conclusions

In order to improve human health and wellbeing, a series of initiatives should therefore be undertaken in different sectors. Post-COVID recovery plans need to go beyond the health sector, that is, seeking to reduce the risk of disease at the source by reducing the impacts of human activities on the environment.

Economics are the product of human activities, which in turn are based on the natural environment (sources of water, clean air etc.). The negative impacts of human activities are undermining these services. “We do not need to choose between life and livelihood, or between health and economy. It is a false choice. On the contrary, the pandemic reminds us that health and economy are inseparable” [17]. As also recognised in the concept of the wellbeing economy, “the economy is embedded in society and nature. It must be understood and managed as an integrated, interdependent system” [79].

There is a growing awareness that sectoral laws for the transposition of European air quality directives are no longer sufficient. However, there is a need for an integrated policy involving the different sectors at different levels of responsibility.

We need actions based on an inclusive and multidisciplinary approach involving different actors and stakeholders, from competent authorities to planners, health professionals and citizens. Moreover, there is a need for coordination between institutions to coordinate approaches and avoid the moving of pollutants from one populated area to another [10].

In this framework, the health sector certainly plays a key role. It could also promote changes in lifestyles to make them more beneficial to health and the environmental system.

Urban planning represents a tool that can support “sewing up” the broken relationship between human beings and nature, which is characterising the age of Anthropocene. In this perspective, efforts have to be intensified both to preserve and to multiply natural areas.

This has repercussions for the evaluation process, which has to be able to capture all the values of the natural resource and identify the net costs and benefits associated with nature conservation and safeguarding.

Furthermore, at the local territorial level, for example, planning strategies and policies in the energy and transport sector that promote measures to improve air quality and mitigate climate change should be encouraged.

In urban areas, characterised by high resident population densities and high levels of pollution (especially in historical and port cities), for example, it is necessary to strengthen institutional policies aimed at promoting sustainable mobility through adequate urban planning, improve walkability and accessibility to public transport and provide collective transport, forbid the entry of highly polluting vehicles into populated areas, and increase green areas [10].

In addition, it might be worthwhile to introduce “rewarding” measures (i.e., in terms of incentives or tax deductions) for both local authorities and private individuals who take measures to reduce pollution.

This paper is also intended to provide “food for thought” and a stimulus to include health impact assessment in city policies. In Italy, although it was encouraged by several instruments, including the 2014–2018 PNP (Section 3.3), which stresses the importance of knowledge and effective tools (including the HIA) for the assessment of health impacts in decision-making processes, this tool has still only been adopted by a few cities, all in northern Italy. This lack needs to be addressed, especially today, when

the health emergency due to COVID-19 calls attention to the need to re-establish a balance between natural and artificial ecosystems, that is, between the autopoietic functioning of natural ecosystems and man-made ecosystems. In this perspective, today, a new balance has to be found between the two ecosystems, which, to date, has proved to be very fragile.

The assessment of the health impacts of pollution should become mandatory and an integral part of the design of all interventions, at any scale (national, local etc.). Impact assessment studies highlighting health and environmental benefits should support policies for mitigation and adaptation measures.

It is important to underline that the analysis of the health benefits and health cost savings resulting from the implementation of mitigation and adaptation policies can contribute to the reduction of public spending and promote and protect the health of citizens. Integrated policies to reduce negative health impacts and reduce climate change can achieve benefits substantially greater than the costs of implementing them.

Moreover, institutional policies could encourage the adoption and implementation of the circular economy model as a development model (at both the micro- and macro-scales) that can reduce costs and produce benefits on multiple dimensions.

In this framework, as highlighted in the previous paragraphs, hybrid evaluation tools are needed to capture the multidimensional impacts and related links of the implementation of the circular model. It is necessary to hybridise the different approaches in order to capture the net benefits of interventions, while also recognising the importance of the integration of expert knowledge and common knowledge. The value of communities can be strategically incorporated into decision-making processes to better inform the responses to COVID-19, also making a significant contribution to the achievement of the SDGs, in particular, the SDG no. 11.

Moreover, since work represents the way in which human beings relate to society, that is, the “hinge” between the economic and social dimensions, it is a key element of the human-centred approach. Thus, this aspect has to be considered in the evaluation process.

Among the investments in essential services required by the General Director in the Manifesto, there is explicit reference to investments in safe and resilient workplaces for all “scaling up coverage with essential interventions and basic occupational health services of all workers for primary prevention of occupational and work-related diseases and injuries and promote healthier and safer workplaces” [16]. Furthermore, in this period of health emergency, characterised by smart working, the role of individual households in providing a favourable place to work and study at home is also important.

As the WHO also highlights, there are still a series of difficulties in translating the evidence relating to the link between the circular economy and health issues into estimates of aggregate impacts, in quantitative or monetary terms. In addition, there are still some gaps to be filled regarding the health implications of the circular model. This represents a fertile perspective for research.

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