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FRESH
thinking for a new era in environmental health and well-being

Foresighted Reasoning on Environmental Stressors and Health (FRESH)

Background to the FRESH concept

A good environment is essential for human health and quality of life. Today, environmental factors continue to affect our lives, but the scope of environmental health challenges and opportunities is shifting. The environments in which we live, learn, work, play and socialise impacts on human health. Recognition of this concept has led to important public health policies in the European Union over recent decades.

Traditional environmental health challenges, relating to contaminated water, air and land and to unhealthy housing conditions, still dominate the environment, health and well-being (EHWB) agenda in parts of Europe. More cross-cutting and integrated approaches are necessary to tackle 21st century public health challenges.

FRESH chose to focus on the interplay between three key contemporary trends – urban, demographic and ecological transitions

These health challenges derive from multiple drivers including ecosystems degradation and resource depletion, the obesity epidemic, an ageing population, climate change, and persistent social inequalities in health.

The foundations on which public health is built are continually shifting in response to large-scale societal and global transitions. Changes in demography, food and energy acquisition, economic activity and in cultural norms and governance, as well as advances in science and technology, interact to affect population health and well-being (Rayner and Lang, 2013).

Such changes profoundly influence the state of the environment, and the nature of human exposure to it. Accordingly, they create the dynamic context to which those who research, monitor and control the environment in the interests of health and well-being must respond.

Many EHWB questions and challenges have emerged in the 21st Century from these transitions. For example, advances in science and technology, a search for more and cheaper energy and a huge expansion in the production of synthetic chemicals have focussed attention on issues such as nano-particles, fracking and exposure to chemicals in industrial, commercial and domestic contexts.

While all these issues are part of any modern EHWB agenda, the project on Foresighted Reasoning on Environmental Stressors and Health (FRESH), was not built around these issue-specific challenges. Rather, FRESH investigated the frameworks and evidence base for undertaking integrated assessments of EHWB.

In exploring the power and potential of a narrative approach in EHWB, FRESH chose to focus on the interplay between three key contemporary trends – an urban transition, a demographic transition and, perhaps most concerning of all, an ecological transition.

The FRESH project also sought to reflect a modern inclusive definition of health, as a resource for life which embracing positive notions of well-being.

Through this, we present a rich contemporary understanding of the interconnectedness of human health and environmental quality.

Environmental health in transition

The field of environment and health is in a transitional phase. In the past, environmental health problems have often been successfully addressed by controlling a single source of pollutant or exposure. Today's environmental health problems are often more complex. Not only do we face the challenge of how to analyse exposure to multiple and cumulative sources, but the traditional, predominantly hazard-focused and compartmentalised approach to environment and health is simply insufficient to address today's complex interconnected and interdependent issues.

Another difficulty emerges from the fact that, increasingly, health outcomes may be remote, either in time or place, from environmental causes. EHWB problems are complex, large-scale, and difficult to control. In addition, the full impacts of these problems often only occur after a prolonged period of time.

Moreover, they are not stand-alone problems, but embedded in a much wider societal context. The causes and effects trickle between the different spatial scale levels: from the local to the global (e.g. use of a contaminated product in the food industry which subsequently spreads throughout the food-chain); and from the global to the local (e.g. global climate change affects local weather patterns and agricultural production).

An integrated approach is needed to assess the relationships between environmental factors and human health in a broader spatial, socio-economic and cultural context, extending well beyond individual toxic or infectious threats. From this broader perspective, we should consider the value and benefits offered by the environment through the provision of ecosystem services, as well as the negative impacts of environmental degradation on human health and well-being. A more inclusive framing of environmental health issues is needed to link human health and quality of life considerations to major policy agendas. The current challenge lies in how to embrace this complexity in policymaking to provide a better and more egalitarian delivery of health and well-being.

Growing recognition of the complexity of environmental health issues has stimulated the search for more integrated approaches to policy. This requires new ways of thinking and operation; ways that are broad in scope, more inclusive in content and more collaborative in nature. Such approaches inevitably challenge the science and consultative processes on which policy-makers rely for evidence.

If assessments are to be valid, they must be designed to reflect the real-world system under investigation and to satisfy the different stakeholders involved.

One means of addressing these challenges is to develop a clear conceptual framework of the system concerned; one that both defines the issue under consideration and sets out the underpinning principles on which the assessment will be based.

Framing environment, health and well-being issues

After the Second World War, the World Health Organisation (WHO, 1948) proposed an innovative definition of health as a state of complete physical, mental and social well-being, rather than just the absence of disease. In the light of recent scientific and societal developments, we see a need for a more dynamic view of health: being healthy means the ability to adapt, to be resilient and to maintain a balance in life (Huber et al, 2011). According to Huber, the ideal of 'complete well-being' of the WHO unintendedly promotes unnecessary medicalization.

More attention in health policies on the individual ability to adapt does not mean that recovery from diseases is no longer important. Instead, it creates room for the circumstances that influence a person's resilience and daily functioning.

A key aspect of a green economy is that it seeks equilibrium between three topics, ecosystems, the economy and social and human capital.

Thus, interventions outside the traditional public health domain, such as adaptating dwellings or urban settings and facilitating mobility, are also seen as promoting health. This leads to a more dynamic definition of health: 'healthy living', including positive health impacts.

Well-being is often seen as the key ingredient of a person's quality of life and includes both objective (for example income, jobs, health, education, environmental quality, and participation in social and political processes) and subjective ingredients (for example happiness and satisfaction) (OECD, 2013). As a result, well-being is embedded in social concerns as well as being linked to environmental health. It is a broad concept and involves not only the possibility for an individual to choose to his or her liking, but can also be understood as a set of substantive freedoms or capabilities, where the core focus is on what an individual is able to do.

These broader perspectives informed the scope of the European Environment Agency's (EEA) Environmental Indicator Report (EEA, 2013) and working groups such as the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz, 2008). They are also reflected in the European Union's Europe 2020 strategy, which emphasises the importance of creating mutual goals between economic and environmental domains.

These mutual goals can be seen as consistent with a shift towards a green economy. A green economy supports economic growth in a way that accounts for resource constraints and environmental boundaries. A key aspect of a green economy is that it seeks equilibrium between three topics: the ecosystem as a whole (ensuring ecosystem health and resilience), the economy (producing capital and improving resource efficiency) and social and human capital (enhancing social equity and fairness in the sharing of burdens).

In the context of well-being, health and sustainability, two factors play an important role. The first one is the need to place well-being and health in an ecosystem perspective (Reis & Morris, et al, 2013). In order to model the links between natural capital (ecosystem services) and human well-being, greater understanding is needed of the relationship between the different types of ecosystem services (e.g. provisioning, regulating and cultural) and human well-being.

An added complication is that this review of human well-being is no longer confined to the 'aggregated' public health point of view but also includes the more individual level of freedom of choice and action approach; the opportunity for individuals to pursue their own individual goals. Effectively, this means that individuals should be heard and their individual wants respected where possible, but at the same time, the overall objectives set by society should be met. To accomplish this, individuals should at least have equal access to natural resources though environmental equity.

The second factor relates to the necessity to consid-

er economic aspects when framing any issue in this area, since there is a strong connection between basic resources and economy.

An important question is how to improve resource efficiency in relation to the produced capital. There should also be a good representation of the relationships between economic aspects and human health and well-being. The more traditional indicators in this area - the Gross Domestic Product (GDP) or the Gross National Product (GNP) are often poor predictors for human health and well-being. They fail to connect economic growth to improvement in well-being, since they do not address whether there is an equitable and fair share (of burdens) from an economic perspective. It is because of this, that there is a need for a more appropriate and relevant set of indicators to supplement or replace GDP.

When considering well-being and health in relation to the environment, it means that individuals should not only live in a clean, safe and healthy environment but should also have the opportunity to live, act and move around in a health-promoting environment. Health inequalities are the result of widespread and systematic social and economic inequalities and are a huge burden for society. Living in a deprived neighbourhood increases the chances of living in an area with poor environmental conditions and exposure to social and environmental characteristics that increase health risks (Marmot, 2010).

Regular use of good quality natural environments improves health and well-being for everyone, including many who are suffering from ill health. However, there are clear inequalities in access and use of natural environments. A recent review in the United Kingdom recommends improving the quality of green spaces and making them available across the social gradient (Allen & Balfour, 2014). Expanding and improving green spaces close to where people live is one of the ways to promote healthy cites and healthy people. In practice, this means that there should be equal and sufficient access to 'green and blue areas' such as natural environments, forests and lakes.

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Conceptual frameworks in EHWB

The 'socio-ecological complexity' of EHWB implies a requirement to take a much broader perspective on conceptual frameworks for environment and health if positive outcomes are to be achieved. With the recognition of the important influence of economic and social aspects on human health and well-being, there is a need to reinvent our approach. Currently, we are unaware of an integrated model that reflects the interactions between all the relevant factors for human health and well-being, taking into account social, economic and cultural trends.

In the field of environmental health, two of the most widely adopted frameworks are the DPSIR (Driving forces-Pressures-State-Impact-Response), used for environmental reporting and assessment in the EU by the European Environment Agency, and the similar DPSEEA (Driving forces through Pressures and environmental States to Exposures, health Effects and Actions) framework (Corvalan et al., 1996; Kjellstrom and Corvalan, 1995) used by WHO.

DPSEEA framework represens four key steps, which should be used for any assessment: issue framing, design, execution and appraisal.

The modified DPSEEA framework (or mDPSEEA) (Morris et al., 2006) further expands the environment and health perspective by recognising that the social and behavioural contexts may determine both exposure and the health impacts of exposure and that this context is also a target for policy and action. In introducing mDPSEEA, the authors recognise its potential to represent relationships between 'good' environments (such as green and natural spaces) and positive effects on health and well-being. mDPSEEA is suited to framing relationships between the proximal (near in time and space) physical and social environment and health. It was used successfully to support Good Places Better Health[1], a major environmental health policy initiative in Scotland.

A framework that reflects the existence of a greater level of complexity, and acknowledges that good governance is an important ingredient, is the framework for integrated environment and health impact assessment of systemic risks (Briggs, 2008). This framework recognises the broad range of questions decision makers face. It is best described as representing four key steps, which should be used for any assessment: issue framing, design, execution and appraisal (www.integrated-assessment.eu).

The ecosystem perspective on human health has further been advanced through the concept of Ecological Public Health (EPH). The core notion of EPH is that public health thinking needs modernisation around ecological principles, recognising that human (social) ecology is inextricably linked to natural ecology and in direct dynamic interaction with it (Rayner and Lang, 2012). A recently articulated model which seeks to integrate considerations of ecosystem health, human health and well-being is the 'ecosystems enriched DPSEEA' (eDPSEEA) model (Reis S, Morris G et al., 2013) (see Figure 1).

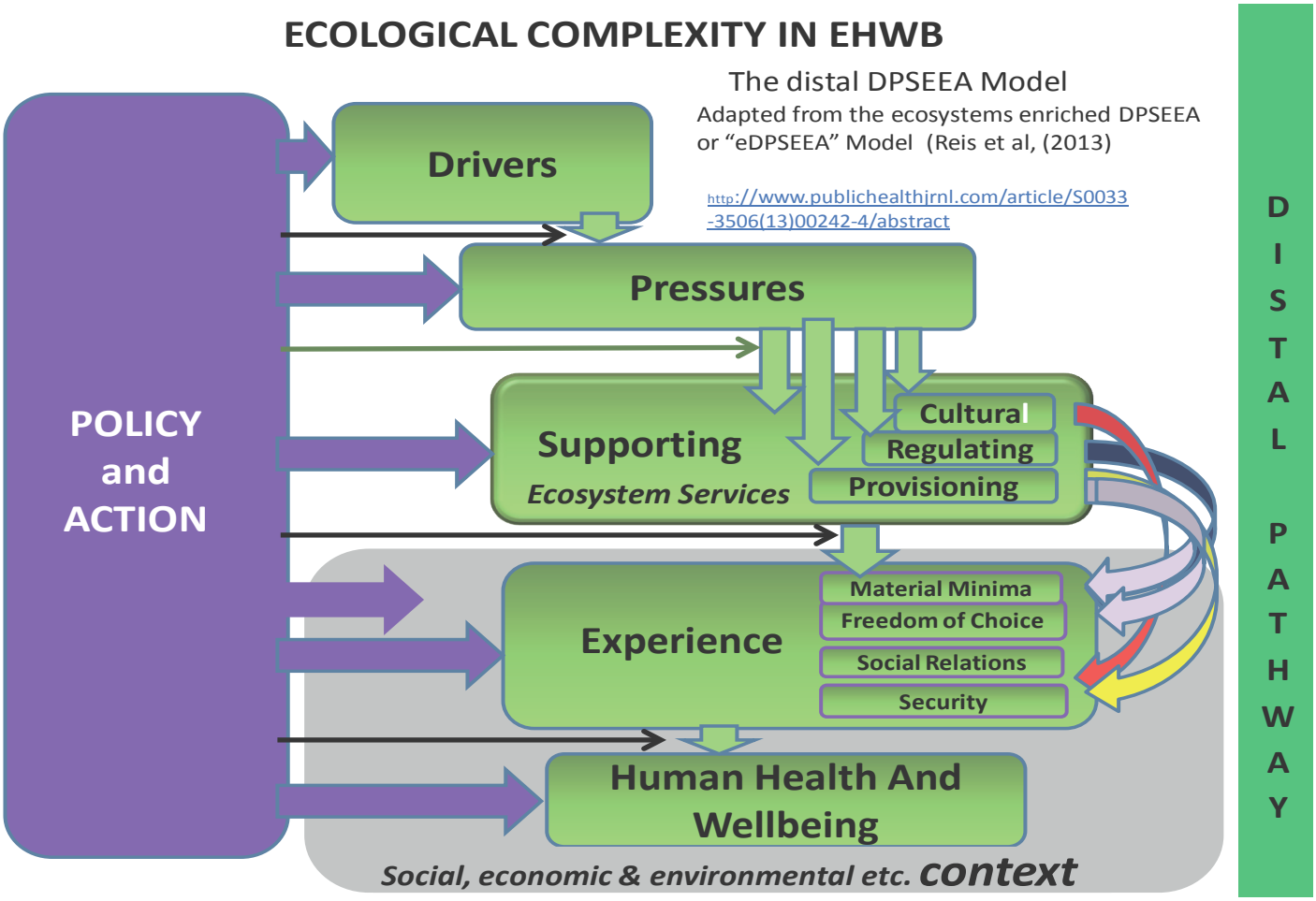
The model shows that high level drivers may impact health and well-being through their impact on ecosystems, often in remote locations. The distal (d) DPSEEA model builds on the eDPSEEA/mDPSEEA models described above to better reflect the health and well-being implications of ecosystems change. In doing so, it exploits the valuable insights of the Millennium Ecosystem Assessment[2] (MA, 2005) regarding the relationship between human health and well-being, properly functioning ecosystems and our use of natural resources.

Conceptual frameworks are useful tools in the process of integrated environmental health impact assessments. They can help to: stimulate thinking outside the channels within which different experts from different disciplines usually work; facilitate involvement of stakeholders; make assumptions explicit; provide a framework for data analysis, generate testable predictions and projections; explore the effects of interventions; identify data gaps or weak links; and provide a context for interpretation of results (Joffe and Mindell, 2006).

[1] http://www.scotland.gov.uk/Topics/Health/Healthy-Living/Good-Places-Better-Health

[2] The Millennium Ecosystem Assessment (MA) is a major assessment of the effects of human activity on the environment

Figure 1. The distal DPSEEA Model



The concept of risk governance has raised the awareness of the need to integrate knowledge from different disciplines and involve stakeholders in all phases of assessment. This process has confronted risk assessors and policy-makers with a new challenge: how to order their thoughts and conduct debates with stakeholders, in an organised and efficient way, and in the face of huge complexity and ambiguity.

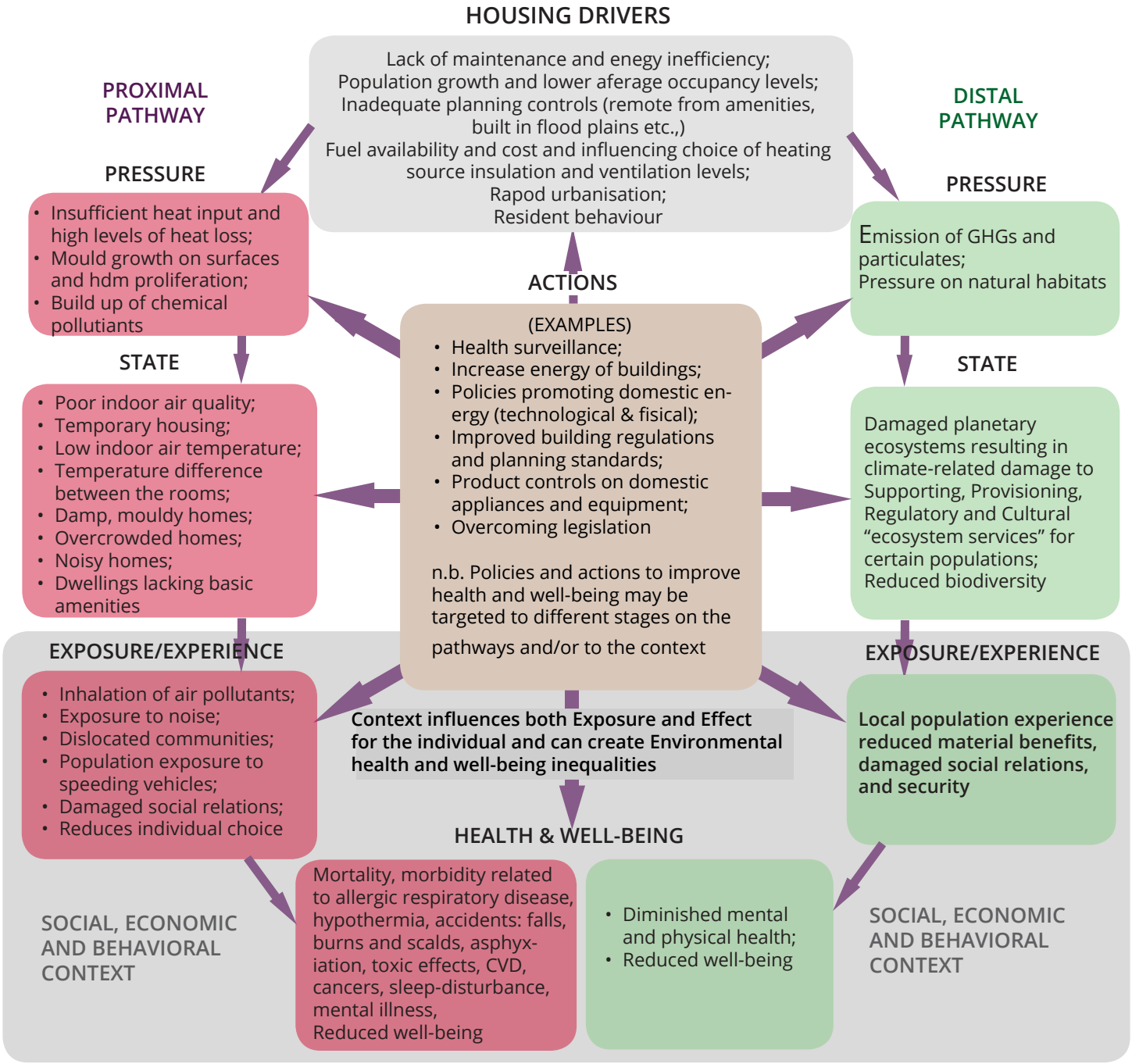
Conceptual frameworks are an important tool in this respect, but if they are to be applied effectively then the current gaps in understanding need to be addressed.

Assessment of EHWB indicators in a wider context

Complex multifaceted challenges with complex interacting causes require a range of indicators, which raises awareness of the interactions and health impacts of policies and actions, as well as unintended side-effects.

The FRESH project proposes a set of indicators which allows the quantification of the health impacts and policy actions of so-called 'environmental stressors' through proximal (nearby in space or time) or more distal routes (via ecosystem provisions). In case of healthy housing for example, the dDPSEEA framework was used to identify proximal indicators e.g. incidence of legionellosis[3]) and for more distal routes e.g. share of renewable energy. We also propose indicators, which may reveal socio-economic inequalities (e.g. energy poverty) and indicators combining health, environment and socio-economic dimensions (e.g. ratio of private homes by energy use and age of the buildings) (see figure 2).

Figure 2. Application of the dDPSEEA model to housing



n.b. Global economic social and ecosystem connectivity means the distal pathway can impact on the proximal pathway in health relevant ways and vice versa

[3] a bacterial disease which may cause pneumonia, often spread via a water source

FRESH also assessed the availability of indicators and data for the EHWB domain in the urban context. In addition, we evaluated the availability of indicators and data describing the EHWB impacts of resource use. We focused on the thematic areas in the recent EEA Environmental Indicator Report 2013: food safety, water safety, energy efficiency of buildings and quality of housing (EEA, 2013).

The mDPSEEA and dDPSEEA models can be populated for specific issues and can be used as a framework in workshops with stakeholders to configure a set of assessment indicators which reflect the social and ecological complexity of EHWB. The methodology used by FRESH to select these indicators can easily be expanded to other indicators, risk factors and target populations. The proposed indicators should be tested with regard to data comparability across countries. Prioritisation of the indicators could be undertaken on the basis of the challenges for health and well-being and the associated knowledge needs identified in the European Environment - State and Outlook 2015 (EEA, 2015).

The use of international databases is highly recommended, keeping in mind that the majority of indicators are available in international databases. However, several special indicators (e.g. cardiovascular mortality of the elderly, homes affected by mould, result of insulation programmes, energy efficiency and insulation of houses) should be retrieved from national databases and from national surveys. When national databases are used, the most recent census data are recommended.

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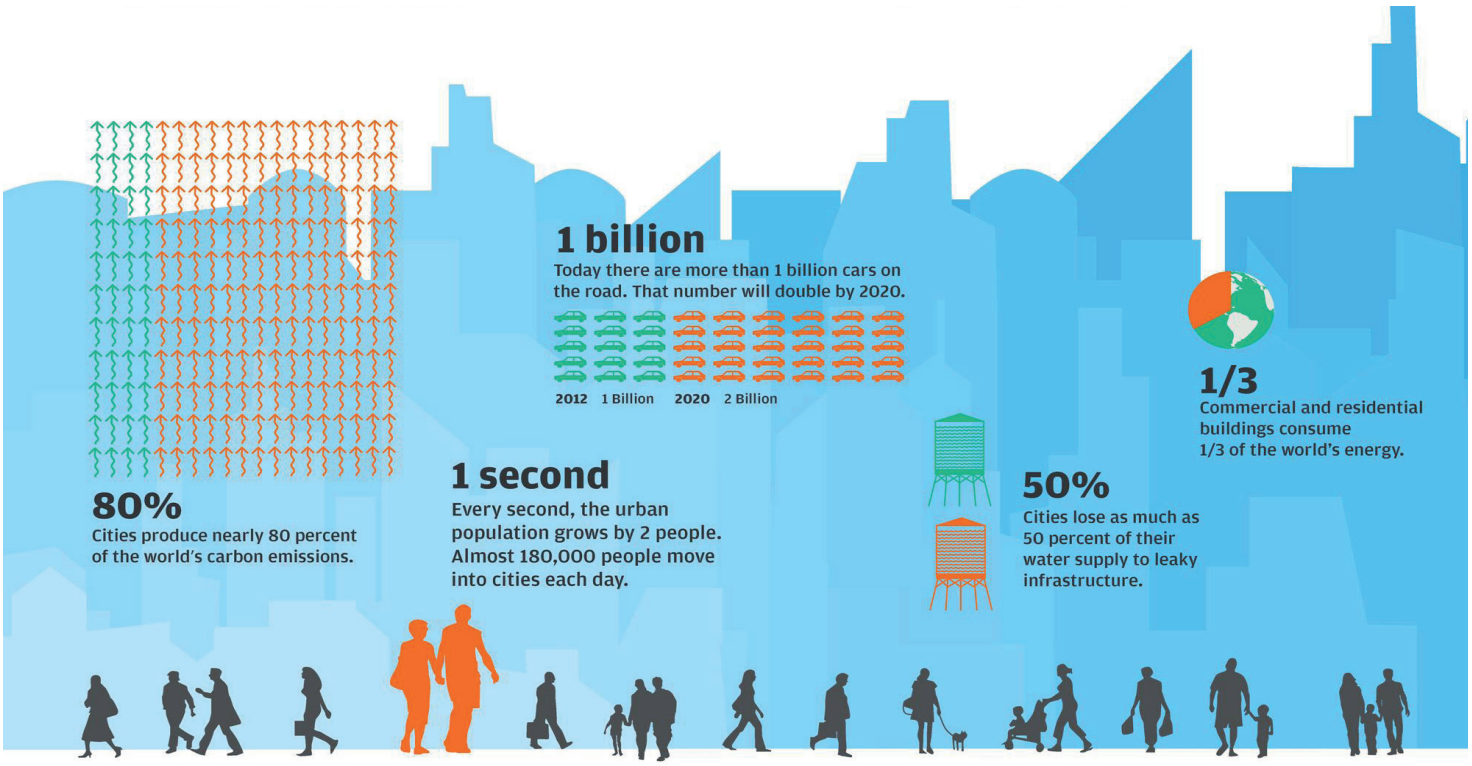
A narrative on societal transitions and EHWB

The use of a narrative helps in describing possible emergent trends and complex issues. Narratives are an additional tool to reach out to experts and policy-makers, and enable interactions and measures that impact our environment to be examined in a more descriptive way. FRESH developed a narrative on the interplay of three key contemporary transitions impacting at the societal/global level – an urban transition, a demographic transition and, perhaps most important of all, an ecological transition.

This subject is especially topical given the ongoing urbanisation process and the rapidly ageing population throughout Europe. These developments present multiple challenges for the economy, society and our way of life. The environment we create in our towns and cities is critical to society's capacity to cope with such changes and to secure well-being for citizens. The narrative is available at www.eea.europa.eu/ehwb

In 2050, almost 76% of the European population will live in cities (urban transition). Urbanisation significantly changes how people live their lives, the ways in which they behave and what they consume. For many, cities provide unprecedented access to employment, education, social mobility and good housing and other goods and services, all to the benefit of their health and well-being. Yet, for others city living can mean high living costs, social isolation, fear of crime and a polluted community and home environment - in short, a cocktail of disadvantage which undermines health and well-being. Unsurprisingly then, poor health and inequality in health and well-being are frequently concentrated in the urban environment.

Having reduced birth rate and death rate, the European population is now ageing rapidly (demographic transition). This will affect the economic position of (elderly) population and their well-being,



Source: IBM 2012

which is one of the strong drivers for a redesign of our built environment and infrastructure. This transition to a predominantly elderly population urges us to provide age-friendly environments providing opportunity for safe physical recreation and relaxation as well as social contacts. Urban green spaces can improve the health of all members of the community, directly and indirectly. Re-vitalising existing green areas and developing new ones is an opportunity that can be part of an infrastructure to support traffic-free active travel, sustainable urban drainage, and maintain local biodiversity.

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Conclusions

Environmental health and well-being (EHWB) depends on the interconnections between important societal, economic and demographic transitions. Effective governance in the domain of EHWB relies on the awareness of these complex interactions and the trade-offs involved.

This can be achieved by introducing more stakeholder involvement, informing cross cutting analysis and synthesis, and reflecting on implications. In translating evidence into policy information and action, different approaches could be integrated, such as the use of conceptual frameworks as a communication and issue-framing tool, indicators and case studies to describe the state of the art combined with more descriptive or personal stories (e.g. 'narrative').

FRESH recommends a set of indicators which can be used to assess the human health and well-being impacts arising from e.g. the use of environmental resources. The use of the mDPSEEA and dDPSEEA models can allow hidden associations to emerge, identify policies that offer co-benefits and identify unintended consequences whih are damaging to health for more than one policy area.

A set of indicators is proposed describing socio-economic inequalities, policy implementation, short- and long-term health impacts, and integrated indicators describing interrelationships between policy and, socio-economic situation. Data for those indicators are generally available from international or national data sources.

By using this set of indicators the association of human health, well-being and the environment can be better understood, more clearly communicated, and trends identified. The implementation of the indicator system in the future environment and health reporting would aid better understanding of the green economy framework, and the range of aligned policy initiatives needed to address challenges.

Recommendations

FRESH recommends that the reporting and assessment of environment and health should:

- Use and make explicit a conceptual model for framing the environment health and well-being challenge and develop indicators. In combination, the mDPSEEA and dDPSEEA models offer the most appropriate framing tools at this juncture.
- Use a suite of indicators that reflect the health and well-being impacts of both proximal and distal pathways and encompass the interests of different policy domains. These indicators should be used in tandem with more traditional environmental indicators to provide an expression of environment and health trends with reference to the conceptual framework.
- Use a narrative dialogue format, focussed on a few emergent trends from the indicators, to explain the 'environment and health story' in an accessible manner.
- Use case studies to make the narrative more realistic. Use case studies that illustrate the particular integrative components that are emerging from the indicators and that illustrate environmental solutions as well as the health impact.

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Other FRESH outputs

Policy evaluation

Visions for the future include better air quality and less noise because of low carbon technologies, better resource efficiency and modern efficient mobility. We recommend that the individual measures taken to achieve a competitive and resource efficient and low carbon economy should also consider negative effects on human health.

See more in the leaflet '**Environment and health in policy-making'.**

Value of human bio-monitoring data

We are exposed to a complex mixture of chemicals in our daily lives. Human biomonitoring data allows health practitioners to evaluate the exposure of the general population to chemicals over time. Using these datasets, we can identify hotspots of exposure linked to poor environmental quality, as well as groups of individuals with specific vulnerabilities associated with their age, health or behavioural patterns.

See more in the leaflet '**Why monitor the presence of chemicals in humans?'**

The project on Foresighted Reasoning on Environmental Stressors and Health (FRESH) investigated the frameworks and evidence base for undertaking integrated assessments of environmental health and well-being (EHWB).

FRESH was completed in three phases from 2013 to 2014. In FRESH 1 emphasis was placed on exploring the power and potential of a narrative approach, whilst FRESH 2 and 3 explored how to draw evidence from a wider social, cultural and ecological context in to assessments on EHWB. Working methods included surveys to collect information on data-availability, bio-monitoring studies and case-studies from environment and health networks[4], organisation of knowledge gathering workshops and analysis of the literature and international databases.

Key outputs of FRESH included:

- a proposal for an overarching conceptual approach for framing environment, health and well-being issues and developing integrated assessments;
- a narrative on societal transitions and EHWB in an urban environment;
- a proposal for a suite of EHWB indicators in a wider context;
- an overview of policy evaluations and case studies in the field of EHWB;
- an assessment of the value of human bio-monitoring data.

This brochure summarises the main approach and conclusions of the FRESH-projects. Leaflets and reports describing the work in more detail are available on www.eea.europa.eu/ehwb

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[4] European Environment Information and Observation Network (EIONET) and ERANET Environment and Health (ERA-ENVHEALTH)