WBGU

German Advisory Council on Global Change

Summary

Humanity on the move:
Unlocking the transformative power of cities

A contribution to Habitat III 2016

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Summary

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The Transitory Century

What kind of homes should people live in? Where can they settle? How close may their neighbours encroach on them?

These questions are as old as our civilization, but in the 21st century they are being asked in a new way. Because this century is characterized by a *contradiction dynamic* that eclipses much of our previous experience of social change: rapidly growing populations in many developing countries versus shrinking populations in some industrialized countries; the enrichment of tiny elites versus the ongoing economic marginalization of the majority; guarded luxury real estate surrounded by squalid, poor neighbourhoods in many megacities; improved access to basic supplies and services for billions of Earth dwellers, while at the same time their long-term life-support systems are being destroyed by resource looting, climate change and environmental pollution.

Theoretically, the globalized economy generates unprecedented possibilities for prosperity for each and every one of us, yet only a minority of the world's population has the prerequisites, the skill and, in particular, the luck to take advantage of these opportunities. The global precariat still comprises over 700 million people living on less than US$ 2 a day (Cruz et al., 2015). Furthermore, over 4 billion people have to get by on less than US$ 10 a day (Kochhar, 2015). At the same time, the number of billionaires is growing at breathtaking speed. As a result, in the late modern age humanity is fanning out into countless factions, spread apart by the ultra centrifuge of accelerated 'progress', which is still being driven by the massive use of fossil fuels and is becoming more and more dominated by electronic information technology.

Nothing stands still on our planet any more, and above all, hardly anyone stays in the same place. In the Europe of the 19th century, many people who first saw the light of the world in their parents' home were also laid to rest there. Today, however, anyone who grows up in a residential block, hut or villa is highly unlikely to die there. He or she will move many times during their lifetime – from house to house, from countryside to city, from village to metropolis, from home country to neighbouring country, from continent to continent. Places of residence, workplaces, holiday destinations and retirement homes are increasingly becoming stations on the road from cradle to grave, and even these episodic lodgings only serve as points of reference for the hyper-mobile individual, who is constantly commuting, travelling, roving, fleeing. These relocations of humanity are driven by the pursuit of happiness and self-fulfilment, by human curiosity, by the efficiency logic of global value chains, or by the harsh laws of poverty, violence and social disintegration. A *civilization of accelerated movement* has emerged from the culture of immobility.

Highly diverse pull and push factors are at work, as well as strong centrifugal and centripetal forces. In the course of thousands of years, such forces have brought people together and dispersed them again, created and concentrated settlements and caused them to fray, triggered, steered, inhibited and finally stopped migrations by individuals or entire peoples. In certain historical phases, the different forces push in the same direction; in others they are in conflict with each other. In the latter case, 'trapped communities' (Foresight, 2011) can emerge, i.e. groups of people whose will to migrate is politically, economically or ecologically blocked.

One decisive contributory influence behind the emergence of today's modern period, with its extremely rapid settlement dynamics, was what happened in the 17th to 19th centuries, initially in England, Scotland and Wales. Particularly during the Enclosure Movement, there was an extensive privatization and restructuring of rural areas, which led to a dramatic increase in agricultural production. The resultant population growth created not least an army of young, displaced workers, who headed for the expanding cities of the Industrial Revolution from the late 18th century onwards (WBGU, 2011).

This development turned the historical, demographic relationship between city and countryside on its head: in 1600 about 80% of the British population were still living in the country; in 1900, by contrast, about 80%

were city residents. The population growth was accommodated by both a denser settlement of the urban cores and the planned extension and design of the suburbs (workers' settlements, social housing, garden colonies, etc.).

This process ran its course in a similar way in all classic industrialized countries, but in some cases resulted in intolerable humanitarian conditions, so that after the 1870s – and even more so after the First World War – architects, economists, moral philosophers and politicians began to think intensively about how these conditions might be improved. Among other things, the vision of the 'functional segregation' of urban residential, working and recreational areas was concisely laid down in the Athens Charter, which was the result of a Mediterranean cruise organized in the summer of 1933 by the avant-garde urban planners association Congrès Internationaux d'Architecture Moderne (CIAM) and dominated by Le Corbusier's powerful personality. The idea was to replace the overcrowded historical cities by settlements based on a modular system (unités d'habitations) that expanded linearly or concentrically into the surrounding countryside.

The Charter's ideas were bold, but naive and often lacking a 'human scale'. This was shown when the basic idea was implemented in many cities in the post-war period, but often in a modified or distorted form. In this context, a special pair of factors was of great importance in Europe: first, the large-scale destruction of old city districts in the Second World War, and second, the triumph of the automobile, particularly as a result of the availability of cheap oil for geostrategic reasons from the 1950s onwards. Post-war Germany in particular, where virtually all the major cities had been bombed to rubble, was very open to visions of 'modernism' and developed it further to fit into the misguided perspective of the 'car-friendly city'. After 1960 there was a strong development towards urban sprawl, both in the USA and in the entire western world, which put functional segregation into practice at enormous environmental cost, though largely in ways that were very different from those dreamt of by the CIAM protagonists. The resulting mixed structures of grown, planned and economically opportune neighbourhoods were not yet influenced, let alone characterized, by the guiding concept of sustainability.

However, in the last decades of the 20th century, and especially after the fall of the Berlin Wall, this guiding concept gained outstanding importance in public discourse in the highly developed industrialized countries. This led not least to a discussion on problematic aspects of the contemporary design of urban and rural spaces – from landscape destruction to the acceleration of climate change by greenhouse-gas emissions in the construction and transport sectors. In addition, planners, architects and cultural scientists agreed that the spatial reintegration of the various urban services – from accommodation to active participation in policy-making processes – was urgently required for the recovery of identity and quality of life. Today, these two largely parallel movements are united in the general call for a renewed *densification and limitation* of city areas.

This would suggest that the Athens Charter has now been rejected, although the challenges of settlements in the 21st century are much too complex to draw any final conclusions on urban development. First, there is so-called globalization, i.e. the conquest of the entire planet by a highly networked, market-economy-based production-consumption system, which is kept going and further accelerated by the intensive use of fossil energy sources. However, the course of this development is asynchronous; countries like China are rapidly catching up with the western industrialized countries, while countries in central Africa are currently only just preparing to leave the pre-modern stage. Accordingly, some regions of the world are today re-enacting different phases of European and American urban history, even if these are only touched upon and greatly speeded up. In this respect, strong centring and suburbanization forces are at work world-wide, resulting not only in primary and secondary densification processes, but also in different kinds of functional segregation. The only difference is that everything is taking place on a scale that dwarfs the historical models, as illustrated by such examples as Mexico City, Lagos and Manila on the one hand, and Brasilia, Islamabad and Songdo on the other. In modern reality, everything that is described using the generic term 'urbanization' is a fragmented, hectic, time-delayed pulsating of the global urban fabric – with a basic tendency towards expansion. For, overall, the world's population is still growing at a dramatic rate.

One can either helplessly take note of this development or try to exert a positive influence on it, even try to shape it. However, anyone who concentrates solely on 'densification' will fall short. To do a better job, it is necessary to understand 21st-century settlement dynamics in its entirety, while reducing its complexity to a level that can be analysed and developed into a strategy. This is precisely what the WBGU has set out to do in its flagship report. Accordingly, it introduces a three-level analysis which distinguishes between the fundamental *forces, forms* and *values* of the overall system (Fig. 1).

Let us begin with the forms, meaning the large archetypal patterns of today's urban reality. The WBGU identifies the following as basic forms: (1) the *historically grown, 'mature' city,* (2) publicly or privately

planned urbanization (most of which today is rapidly expanding), and (3) the *informal settlement,* whose variants range from precarious shelters for refugees to illegally built villas for oligarchs and nomenklatura. It goes without saying that there are countless nuances and transitions within these basic patterns; moreover, as a rule, the three archetypes – similar to the aggregate states of a substance – appear together within an urban municipality and mix to form heterogeneous structures. Luxury neighbourhoods and slums can often be found in immediate proximity, sometimes only separated by rough concrete walls.

But what are the forces that create the basic patterns and their mixtures? Among the many active factors, the WBGU identifies the great 'master builders of the city', namely (1) *time,* (2) *power* and (3) *hardship* as fundamental forces. Initially, this is a metaphorical way of describing urban complexity, but it does offer significant heuristic potential. Of course, each category of master builders can be broken down into various types – for example 'time' into maturing, decay, acceleration or rupture; 'power' into actor groups like the state, elites, investors, revolutionary innovators or civil-society networks; and 'hardship' into hunger, violence, overpopulation or displacement. When a settlement entity and its rural hinterland are evolving, redeveloping and declining, there are usually constellations of actors at work with alternating common and conflicting interests.

The cities of the past were the cradles of human culture, the forums of political discourse, the engines of scientific and economic progress, the venues of social integration. Can these achievements be repeated in the transitory 21st century with its tumultuous urbanization dynamics?

Again the WBGU concentrates on three qualities of human settlements which deserve and require special efforts, namely (1) *Eigenart* (a German word meaning 'character'), i.e. the unmistakeable individual manifestations of the physical and cultural living environments created by urban societies, (2) *inclusion,* i.e. enabling citizens to use and further develop their city as equals, and (3) *sustaining of the natural life-support systems,* i.e. forming and operating the urban substance in harmony with local, regional and global ecological guard rails. The WBGU regards these qualities as urban basic values and goals which fit together to form a 'normative compass'.

This is the outline of the three-level approach that structures the report and provides the basis for systems analyses and intervention options. This can be exemplified by Figure 1. Power and hardship can, for example, expedite the massive construction of soulless, planned cities that are possibly more resource-efficient than

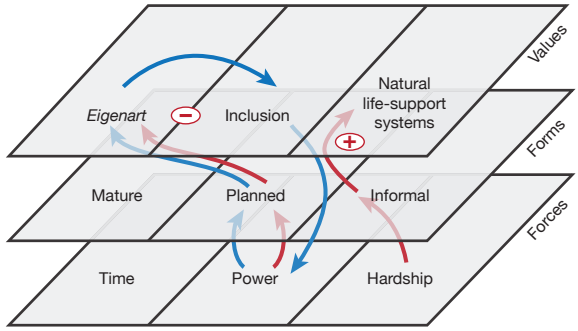

Figure 1
Schematic diagram showing dominant global settlement patterns (forms), their drivers (forces) and challenges in relation to the WBGU's 'normative compass' (values).
Source: WBGU

historical city districts. On the other hand, a distinct sense of togetherness and uniqueness can rarely develop in functional, quickly built new cities that are designed on the drawing board. If, however, state control is weakened by external circumstances (such as the collapse of communism in central and eastern Europe after 1989), this can also open up opportunities for citizens to 're-conquer' the urban space, which strengthens the efficacy of civil society and with it the *Eigenart* of the respective city. The corresponding double causal network is characterized in the illustration by red/blue arrows and the +/- signs. The importance of feedback is also highlighted in this way. Proactive urban policy could use this systems perspective for orientation in order to recognize and implement effective measures for enhancing the desired qualities.

The WBGU's systems analysis also shows that there are no universal templates for the transformation towards sustainability in the highly diverse urban societies of, for example, Copenhagen, Mumbai, Kigali and Guangzhou. But, at the same time, predictable global systemic risks and regional problem centres – which should be of great importance, for example, for decision-makers in the field of international cooperation – can develop from the sum of local urbanization processes. Global settlement dynamics over the next three decades are therefore likely to influence the decision on whether critical planetary guard rails can be observed.

The poorer half of the soon-to-be 9-10 billion people on Earth are living in informal settlements, but also in mature cities, in developing countries and emerging economies, and their quality of life is massively impaired by local environmental degradation. Social exclusion and inequality, as well as the related local, national and transnational potential for instability, are on the increase in many urban formations and in very many societies. In the cities of Asia, and to a lesser

extent in Africa, the approx. 2 billion people who will rise to the global middle classes by 2030/2040 will demand inclusion rights and could thus become engines of urban modernization. However, where these rights are not granted to them, there is a risk of political upheavals. This report examines potential ways in which these emerging undesirable developments of the global urbanization surge can be prevented as far as possible.

The WBGU's preferred way of shaping people's settlement areas *progressively as well as consistently* can already be clearly seen in the 2007 'Leipzig Charter'. The Leipzig Charter is more than a negative response to the long-discredited Athens Charter – it formulates a bright, guiding concept for the renaissance of the European city in the spirit of integration. In essence, the postulates of the Charter – i.e. "the city must be attractive"; "get the people on board"; "good governance in the city"; "climate-change mitigation is also an urban task" – precisely target the WBGU's demands for *Eigenart*, inclusion and the sustaining of natural life-support systems. However, in the WBGU's opinion the Leipzig Charter does not go far enough in at least two respects.

First, the corresponding discussions concentrate on the European city, which is largely already the product of the above-mentioned, centuries-old dynamics and where informal settlements play a marginal role in every respect. However, the future of urban civilization – indeed our entire civilization – will be decided on the *global stage* and in particular in the societies of the developing countries and emerging economies, where the majority of people currently relocating are to be found. In this respect, the Leipzig Charter must be reformulated on a global scale. How can humanity find again a guiding concept of urbanity that also corresponds to the cultural diversity of city drafts, i.e. that does not feel euro-centric but nevertheless discreetly shows the achievements of occidental cities?

Second, planetary crises – such as global warming, the scarcity of resources, social disparity and displacement – demand much faster and more profound interventions by public and private decision-makers than those proposed by the Leipzig Charter. This is why the *transformation* of modernity in its existential crisis is at the top of the global agenda. And only if the most important urban centres can marshal the strength for this transformation can it succeed worldwide. In this respect, the Leipzig Charter should be updated into a social contract for the comprehensive renewal of the global settlement system.

These are crucial and very explicit recommendations which the WBGU would like to advocate to city planners, architects, mayors and ministerial officials, but also to the national governments that make decisions on the proactive options open to cities and the directions they might take. In its report, however, the WBGU goes further and almost implicitly brings a notion into play which could help overcome the contemporary contradictions of the urban discourse: this refers to the vision of *polycentric integration*. In order to be able to understand this vision, we must return to the opposing forces of urban formation that were discussed at the beginning.

There is no doubt that, today, metropolises like London, Shanghai or Johannesburg are powerful attractors that draw resources from the broad hinterland, generate a considerable rural exodus, and expand with a growing number of suburbs and satellite settlements. The periphery, or 'urban fringe', becomes the decisive growth zone, while the centres are more often than not economically 'segregated' – and demographically and culturally depleted as a result. It is evident that there are limits to this growth – humanitarian, structural and ecological. Otherwise it would be conceivable that by the end of the 21st century there might only be about a hundred 'super cities' remaining, embedded in the global wasteland of the devalued rural areas, competing with each other for capital, talent and luxury.

But this is neither desirable nor realistic. Strong forces – such as the rapid digitization of society and the substitution of fossil fuels by renewable energy – can in fact counteract the megatrend of continuous agglomeration. A city like Hong Kong, with its enormous collection of skyscrapers, comes close to being a caricature of the 'modernistic' ideal of urbanization. Yet this structure is only viable if it constantly sucks in oil and metals, food and fibres from all over the world, digests it all on the spot, and disposes of it as metabolic residues in the surrounding area. It is impossible to imagine a less sustainable urban perspective. However, electronic communications and renewable energy from the sun, wind, waves and biomass can and should bring *space* back into the urban equation.

In order not to fall into the trap of 'functional segregation' again, and to make it possible to implement the urban qualities *Eigenart*, inclusion, and sustaining of the natural life-support systems, the ever deepening urban-rural gap must be further reduced and space created for a comprehensive polycentric perspective. This means, in a sentence, the creation of numerous networked cores of all sizes, where the generic services of the city can be combined in critical density. The polycentric renaissance of the Ruhr area is probably the best example here, but there are also many other regions and districts where this leitmotif is already operating – e.g. Emilia Romagna in Italy, the San Francisco Bay Area in the USA, Randstad in the Nether-

lands, the Pearl River Delta (Guangzhou) in China or the metropolitan region of Lima and Callao in Peru.

In its report, the WBGU not least submits this perspective for discussion by compiling a series of arguments and references. Two important aspects should be mentioned at this point. A more profound look into cultural history reveals that polycentric structures of settlement, the economy and governance have successfully advanced extraordinary creativity and productivity in some societies. Outstanding historical illustrations include Greek antiquity, which thrived in the Polis network and spanned the entire Mediterranean region and parts of the Orient, and the Renaissance, born in the cities of northern and central Italy, which pointed the way to modernity from the 14th century onwards. Also significant in this context was the multinuclear organization of the Holy Roman Empire of the German Nation before and especially after the Thirty Years War, where numerous small states and free cities became epicentres of progress. In an historic moment, when the ability of nation states to control and convince is on the wane, it might be useful to recall this 'post-Westphalian' perspective – where cities were the central places of human organization and quality of life.

Furthermore, an analysis of the present day puts the polycentric vision to a test that is related to specific crises of today. Also Germany, whose fateful 'shrinkage' and 'ageing' already seemed inevitable, has recently been directly confronted with the challenges arising from the growing influx of migrants from the Middle East and Africa. If we do not want to advocate the partitioning off of national territories in disregard of human rights (e.g. Article 16a(1) of the Basic Law, the German constitution: "Persons persecuted on political grounds shall have the right of asylum") and humanitarian principles, we must give serious consideration to sustainable concepts for receiving and integrating millions of refugees. Initial observations and analyses suggest that – whenever they have a choice – migrants try to settle mainly in and around major cities, a fact that applies both to the migrants' countries of origin (e.g. Syria or Ethiopia) and to the host countries (e.g. Germany or Sweden). However, there are many indications that a polycentric urban organization could significantly increase a society's capabilities to absorb and integrate refugees and job-seekers. This should not least be a priority research topic.

Content

Summary

1. The century of the cities

The 21st century will be the century of the cities. Urban areas are becoming the central organizational form for almost all human societies. The global urban population could increase from just under 4 billion today to 6.5 billion people by 2050 – and urban infrastructures will grow with it. About two-thirds of humanity will then have their homes in cities. The force of the urbanization surge will primarily affect developing countries and emerging economies in Asia and Africa. Almost 90% of urban-population growth up to 2050 is expected on these two continents (UN DESA, 2014). Nearly three quarters of the global urban population will then be living there (UN DESA, 2015). The urbanization surge in the coming decades, and the character of the *'world cities society'* will thus not be driven and shaped by OECD societies – but these developments will have a huge impact on global and also on western societies.

Humanity is on the move. This manifests itself in demographic growth within cities, as a result of the influx of people from the countryside to the city and from small and medium-sized towns to the metropolises; of migration both between poor countries and between poor and rich countries; and of social advancement from shantytowns to middle-class neighbourhoods. This relocation of humanity could become the process of social change that has the most powerful impact in the 21st century. The problems experienced in coping with the sharp increase in the numbers of refugees in Germany and Europe in 2015/2016 show that rapid demographic changes and a fast influx of people into the cities pose enormous challenges even for wealthy countries. Public debates focus on the question of how quality of life, integration and social peace can be maintained and how, at the same time, ecologically sustainable urban development can succeed under conditions created by a rapid influx of people. Conditions in developing countries and emerging economies are considerably more difficult, however. Furthermore, both the absolute figures and the growth rates are usually significantly higher than in Germany and Europe, so that national and societal limits are reached faster there.

Urbanization has a formative effect on the world economy and society, on people's quality of life, on the future of democracy, as well as on the global consumption of resources and energy – and thus on the future of the Earth as a whole. Cities offer many opportunities for cultural, social and economic development, and for improving resource and energy efficiency. But urbanization must be actively managed in order to counter the following risks: in developing countries and emerging economies, one third of the urban population do not have access to adequate housing; in sub-Saharan Africa, this figure is even higher at almost two thirds. In 2012 more than 850 million people were living in slums (UN DESA, 2015) without adequate access to vital infrastructures. How can the number of slum dwellers be prevented from doubling or even tripling? In sub-Saharan Africa, two-thirds of all new city-dwellers currently move into informal settlements or slums, and half of them are expected to remain there in the long term. According to UN forecasts, Africa's population could rise to a total of 4.4 billion people by 2100 (UN DESA, 2015). If the current urbanization trends were to continue in Africa, and, for example, 80% of the people in Africa were to live in cities by 2100 – and 60% of these in slums – this would mean about 2 billion people having to live in degrading city districts. Such a development must be prevented for reasons of social responsibility, but also from the perspective of security policy, since the massive social exclusion of people always carries with it the potential of societal destabilization.

A fundamental change of perspective is needed here, one that does not fight the symptoms but focuses on what causes the emergence of informal settlements with inadequate housing. In addition, what can be done to ensure that quality of life increases in cities, and people can make the most of their potential? What are the characteristics of cities worth living in? Cities and urban societies are responsible for the overwhelming majority of all worldwide resource consumption and

greenhouse-gas emissions. How can the global urbanization surge be harnessed to ensure that efforts to improve quality of life are decoupled from environmental pollution – and that natural life-support systems are safeguarded? To achieve this, existing guiding concepts and strategies must be adapted (or new ones invented), developed and implemented. In view of the expected massive extension of the urban infrastructure, the challenge from the outset lies in avoiding path dependencies. If the new districts and cities were built according to the resource- and emissions-intensive models used in the last two centuries, global society would find itself in conflict with the planetary guard rails in the course of the 21st century. In other words, the spread of conventional urbanization on a global scale must be stopped. In this report, the WBGU describes transformation pathways to a sustainable form of urbanization.

Sustainable urbanization has become internationally established as a field of action for policy-makers. The topic is currently attracting a lot of attention because of the United Nations Conference on Housing and Sustainable Urban Development (Habitat III), prepared by the UN Human Settlements Programme (UN-Habitat), which is to be held in October 2016. The WBGU report looks at urbanization in the 21st century and its effects on human civilization, the diversity of the cities, the quality of life of the people, and the Earth system. The WBGU proposes a normative compass that could give orientation to urbanization in the coming decades. It also develops ideas on a polycentric urban development that tries to avoid, on the one hand, the disadvantages of a galloping densification of cities and difficult-to-govern megacities, and, on the other, the high social, environmental and cultural costs of a split between emptying rural spaces and growing, often overburdened urban agglomerations.

Urbanization and the Great Transformation

The WBGU has already examined the topic of urbanization in the context of the 'Great Transformation' towards sustainability, which it analysed in its 2011 flagship report (WBGU, 2011). The present report focuses on applying the Great Transformation towards sustainability to urban areas. It suggests that they should play a decisive role in the 'century of the cities' – as key drivers of the transformation towards sustainability. WBGU's intention is to clarify where challenges and opportunities lie and to point out the areas where fundamental modifications and system changes are required. This is achieved by looking at three levels together: *First*, the WBGU examines the transformation at the micro-level by looking at example cities, urban stakeholder groups and city dwellers. *Second*, the WBGU studies urbanization at the meso-level in exemplary transformative action fields, i.e. areas of urban development where the WBGU sees the greatest potential leverage effects for the urban transformation towards sustainability. *Third,* the WBGU identifies urbanization at the macro-level as one of the core trends of global change which triggers massive changes in global society, the world economy and the Earth system.

Cities and their populations are thus drivers of global environmental change, while at the same time being affected by it. In this context, mitigation of climate change is one of the greatest challenges of the transformation: unabated climate change would jeopardize humankind's life-support systems. The extensive analyses conducted by the IPCC reveal the specific impact on cities. Many urban areas are situated in low-lying coastal zones, where there are particularly serious hazards – e.g. as a result of a combination of sea-level rise, the subsidence of land masses caused by the weight of buildings and groundwater depletion, storm events and flooding. Other risks are associated with the urban heat island effect, droughts and water scarcity. In order to achieve the target agreed at the UN climate conference in Paris in 2015 of holding the increase of global average temperature to well below 2 °C above pre-industrial levels, fossil CO_2 emissions should be completely stopped by 2070 – or correspondingly earlier if the more ambitious limitation of the increase to 1.5 °C is to be achieved. Consequently, the energy system in every city must also be decarbonized by that date. For this to happen, the dominance of the system of fossil-energy use must soon be overcome. Furthermore, both the mobility sector and systems for heating and cooling buildings will also have to get by without fossil CO_2 emissions in the future. There are encouraging signs that the international community is moving closer to this decisive turnaround. The public discourse on anthropogenic climate change has shifted significantly in just a few years and is now broadly anchored in society. The 2015 Paris Agreement is exemplary for the worldwide consensus on the need to mitigate anthropogenic climate change. Cities are the biggest consumers of energy and will thus play a key role in the implementation of the agreement.

This report also focuses on other planetary guard rails in addition to climate protection, e.g. the protection of soils and biodiversity (WBGU, 2014), as well as the requirements of local environmental protection, such as improving air quality or handling waste. The urban transformation towards sustainability requires fundamental changes in land-use, energy and transport

systems, in the management of materials and material flows, in urban settlement policies, and in the structural-spatial design of cities.

The progress of the Great Transformation will depend substantially on the decisions that will be taken in cities over the next few years and decades. There is a need for a paradigm shift away from incremental approaches that are essentially driven by short-term requirements, towards transformative changes with a strategic, long-term view of humanity's natural life-support systems and the creation of a form of urbanity that sustainably promotes human quality of life. In this context, it is not so important to look to the future from today's perspective, which usually makes the path already being followed look inevitable; rather, one should look back to the present from a desirable future: what paths should be followed and what dead-ends should be avoided today to make this sustainable future possible?

With this change of perspective, the WBGU places people, their quality of life, their capabilities and options for action, as well as their long-term future prospects, at the centre of its reflections on cities. There is a certain tradition in the idea that development concepts and strategies should be geared to people and their quality of life – and not only to growth prospects. Almost three decades ago, the United Nations Children's Emergency Fund (UNICEF, 1987) and the UN Economic Commission for Latin America and the Caribbean (UN CEPAL, 1996) were already calling for an economic "adjustment with a human face" in their criticism of the one-sidedly neoliberal structural-adjustment programmes of the World Bank and the International Monetary Fund. Securing a minimum of supplies and services (e.g. access to adequate housing, food, health, education) for all should be seen as a target system of development. This orientation can also be found in the documents of the Habitat II Conference (Istanbul Declaration and Habitat Agenda, 1996), as well as in the Millennium Development Goals (MDGs) adopted in 2000. In the last few years, it has become clear that even when these minimum standards are met, significant sections of the population often do not participate at all, or not enough, in the process of economic and societal development. Poverty reduction does not guarantee that all people are equal before the law and will not suffer discrimination. So the aim must also be to reduce the considerable social and economic inequalities and to prevent the social, political and cultural marginalization and exclusion of – in some cases sizeable – sections of the population in urban societies. The Sustainable Development Goals (SDGs) internationally agreed in 2015 lay down a framework for this, particularly SDG no. 10: "Reduce inequality within and among countries" and SDG no. 11: "Make cities and human settlements inclusive, safe, resilient and sustainable".

Against this background, the WBGU, with its people-oriented view of urbanization, advocates a comprehensive concept of quality of life and prosperity which goes beyond minimum targets of substantive inclusion: e.g. overcoming absolute poverty and ensuring appropriate housing. It also contains comprehensive political and economic inclusion, i. e. the belief that the urban population should be enabled to take an active part in urban development. The WBGU's concept also aims to take into account essential preconditions for human quality of life, such as self-efficacy, identity, solidarity, a sense of belonging, trust and social networks. On the one hand, reversing the trends of growing inequality in people's living conditions and development opportunities, and realizing the transition from exclusion to inclusion are prerequisites and goals for human development; on the other hand, this is the only way in which risks for the stability of urban societies, nation states and ultimately also the global community of states can be contained. The current implosions and explosions of a rising number of societies in countries of north and sub-Saharan Africa, which are characterized by high levels of exclusion, are a warning signal to the international community that should not be overlooked.

The WBGU has developed a 'normative compass' to help shaping the massive changes in the 'century of cities' in a people-oriented way. This compass comprises three dimensions:

- *First,* sustaining natural life-support systems by complying with planetary guard rails and protecting the local environment.
- *Second*, ensuring substantive, political and economic inclusion for the city dwellers.
- *Third,* the WBGU draws attention to the socio-cultural and spatial diversity of cities and urban societies, as well as the resulting plurality of urban transformation pathways: every city must seek 'its own way' to a sustainable future. This *Eigenart* (a German word meaning 'character') is not only hugely important for creating urban quality of life and identity, it is also an indispensable resource in the sense of developing each city's specific potential for creativity and innovation. With the dimension of *Eigenart*, the WBGU is introducing a new category into the sustainability discussion.

The WBGU advocates paying greater attention to polycentric approaches to urban development. The concentration of the population in one or a few central locations and urban agglomerations, which can be observed in many regions of the world, coupled with simultaneous economic, social, political and cultural marginalization and discrimination against rural and

small-town areas, leads to (mega-)cities 'sucking in' more and more people, resources and capital at the expense of their surrounding areas. The influence of cities, which will expand on a global scale by the middle of the century, now extends from the direct hinterland to remote regions. Brenner et al. (2013) have described this reach of the urban demand for resources as 'planetary urbanization'.

Not infrequently, deserted, unattractive rural regions are left behind, while rapidly growing (mega-)cities emerge – especially in developing countries and emerging economies – with overtaxed infrastructures, overburdened municipal administrations, hostile-to-life settlement structures and socio-economically polarized urban societies. Thailand is an example. More than 80% of Thailand's urban population live in the capital Bangkok (World Bank, 2015: 114). The WBGU recommends a change of direction. Polycentric approaches could make cities more attractive, avoid the disadvantages of excessive urban concentration and densification, and, at the same time, mobilize the advantages of decentralized settlement patterns. The conventional dichotomy between migration into and away from cities, and between the concentration and dispersion of settlement structures, is overcome by an approach which, instead of clearly separating 'city' from 'country' and 'centre' from 'periphery', systematically focuses on networking between poles of settlement and on the spaces in-between which connect small and large cities and rural areas.

Polycentric urban development is, for example, an EU policy framework and focuses on bridge-building between agglomeration and deconcentration, not on their polarization. By strengthening small and medium-sized towns and networking them with larger cities, it combines the advantages of agglomeration and decentralization.

Such a hybrid settlement strategy that emphasizes polycentric approaches is relevant for a number of dimensions in urban development.

- With *polycentric spatial structures* better use can be made of resources if water, food and energy no longer have to be transported over long distances into the few centres. Decentralized provision of renewable energies and digital networking can support the advantages of polycentric spatial structures.
- *Polycentric settlement structures and polycentric cities* promote the formation of cultural identity. They combine a diversity of urban societies with manageable settlement patterns and neighbourhoods, can restrict trends towards segregation, and open up spaces for connectivity and innovation.
- *Polycentric urban structures* increase the absorptive capacity and resilience of urban societies vis-à-vis shocks (such as climate-induced extreme events or waves of immigration).
- *Polycentric decision-making and polycentric governance structures* in cities promote the participation opportunities of local civil society and collaborative governance.
- Cities should furthermore be embedded in a *polycentric responsibility architecture*. Giving cities and their civil societies more creative freedom within their nation states to shape their development pathways (vertical embedding of the cities plus local scope for shaping and planning) and enabling them to network horizontally leads to the development of a governance and responsibility architecture that is tiered locally, nationally and globally. Here, responsibilities should be distributed among different, mutually (semi-)independent nodes over different levels of governance. This polycentric governance approach creates coordinating mechanisms and reflexivities that highlight the relative independence of cities (but also of nations), and a simultaneously high level of interdependence between them (Messner, 1997; Stichweh, 2004; Ostrom, 2010).

Diversity of the cities: challenge and opportunity

This report highlights the diversity of cities, urban societies and the related plurality of transformation pathways towards sustainability. Cities like Copenhagen are pursuing an ambitious road towards sustainability that is characterized by a linkage between economic dynamics and social inclusion, resource-protection management and mitigation of climate change. By contrast, cities like Cairo, Mumbai, Kigali and Guangzhou are confronted by very different challenges and starting conditions (e.g. a lack of established, substantive inclusion), making it much more difficult to take forward a form of urban development that is geared towards people and planetary guard rails. Sustainability is a universal target system; the ways of getting there will be many and varied.

The current diversity of cities and their actors, which has grown historically, is a decisive feature of global urbanization. On this basis, the WBGU attempts to develop an aggregated, synthetic approach by analysing the dominant dynamics of urban settlement and their drivers. For all the diversity, three essential 'master builders' can be identified among the different drivers of urban development: *power*, *hardship* and *time*. The influence of these three factors becomes clear by looking at three urban settlement patterns which the WBGU considers to be key – *newly planned*, *informal* and *mature* urban structures.

The *power* factor is decisive for the construction of many newly planned cities and city districts (e.g. in China and India). In a short period of time and on a large scale, settlements are planned and built top-down. In informal settlements, poverty, inadequate housing and inhumane living conditions are often the main problems: *hardship* is often the driver and characteristic feature of this settlement pattern. Historically grown, mature cities have often developed over centuries. They have a grown stock of buildings and urban infrastructures; these have created path dependencies that are difficult to reverse. In mature cities and city districts, *time*, therefore, was and is a key factor of urban development. All three constellations (*newly planned, informal* and *mature*) are essential for urban transformation.

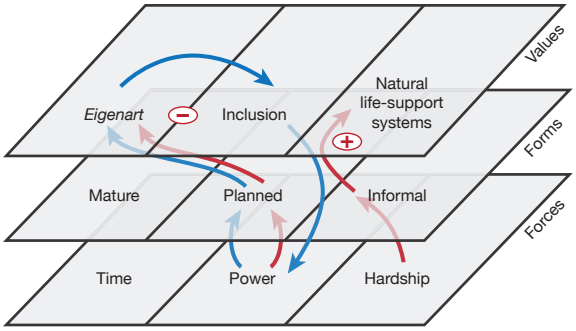

Figure 1
Schematic diagram showing dominant global settlement patterns (forms), their drivers (forces) and challenges in relation to the WBGU's 'normative compass' (values). Three settlement patterns are particularly dominant in the global urbanization process: *first:* the historically grown, mature city or city-district pattern with a solid building stock, established infrastructure and a largely consolidated governance; *second:* the planned, often rapidly expanding, recent urbanization processes; and *third:* the informal settlements. Significant drivers (forces) of urbanization processes are time, power and hardship. The *time* factor takes into account the fact that evolutionary change, acceleration, regressions after major upheavals, and asynchronicity (e.g. of natural and cultural history) exert a strong influence on urban patterns. *Power* describes constellations in which the development process is enforced even against the wishes of others. *Need* in the sense of scarcity, danger or suffering shapes urban patterns by exclusion, for example as a result of poverty, oppression, crises or conflicts. The challenge for all settlement patterns lies in aligning their development with basic normative values. To this purpose the WBGU proposes a 'normative compass'. It is made up of three elements: (1) *Eigenart* (a German word meaning 'character'), i.e. the socio-cultural and spatial diversity of the cities, (2) *inclusion*, i.e. universal minimum standards for substantive, political and economic inclusion, and (3) *sustaining of the natural life-support systems*, i.e. forming and operating the urban substance in harmony with the planetary guard rails and the solution of the local environmental problems. The blue and the red arrows illustrate possible urbanization dynamics, feedback effects and points of intervention.
Source: WBGU

These thoughts are condensed into a three-level systems analysis that links the main drivers and forces of urbanization, their forms and archetypes, and the WBGU's normative compass (Fig. 1).

The momentum of urbanization and its impacts are so massive that we must face up to this trend. In view of the existing cognitive, technical, economic and institutional path dependencies, a policy of business as usual – i.e. an unstructured, quasi-automatic urbanization – would lead to a non-sustainable 'world cities society'. It is likely that there will be about 2.5 billion more city dwellers by the middle of this century (UN DESA, 2014). At present, more than 850 million people live in inadequate housing without access to basic supplies and services. This number could increase by 1 to 2 billion by 2050 if no significant countermeasures are taken (UN DESA, 2013). This would mean up to 1.5 billion more people moving into new, rapidly planned and built city districts that will probably offer few opportunities to participate in their design. Developing *Eigenart* (i.e. 'character') in these new cities, which are being built at such breakneck speed, amounts to trying to square the circle.

This is not consistent with the normative requirements postulated by the WBGU: these people are being denied essential aspects of the quality of life. The considerable challenges involved here must be tackled by the international community, the nation states, the cities and their inhabitants. In this report the WBGU concentrates primarily on how the foreseeable dynamic can be managed with a view to people's quality of life. The decisions on the direction in which urbanization will develop will be taken over the next few decades. The WBGU is convinced that this represents a window of opportunity to lay the foundations for a development towards sustainability. However, this window could soon close again, so there is little time available for shaping or redirecting the urbanization process appropriately.

The WBGU's analysis supports the hypothesis that urbanization can be compatible with the Great Transformation towards sustainability, provided that courageous measures are taken at all levels. Referring to its report 'A Social Contract for Sustainability' (WBGU, 2011), the WBGU fleshes out the idea of a 'social contract for the urban transformation towards sustainability' and formulates the elements of such a social contract in the present report. It should be mirrored worldwide and at different levels of governance in the form of written charters. The United Nations Conference on Housing and Sustainable Urban Development, 'Habitat III', to be held in 2016, offers an opportunity to launch the negotiation process for such a charter at the global

level. Urban societies, too, should discuss and agree common visions of the transformation process in a participatory manner, with each city codifying its vision in its own charter for urban transformation. Similar charters can also be useful at the regional and national level in order to place the new relationship between the cities and the nation states on a new footing. Only if cities and urban societies are sufficiently empowered can they make use of the opportunities for sustainability and successfully follow the urban transformation pathways. The success or failure of the Great Transformation will be decided in the cities.

2. Demands on the urban transformation

In September 2015, a new course was set for environmental and development policies in the coming decades. The international community agreed 17 new Sustainable Development Goals (SDGs) geared to the transformation of the world towards sustainability. Many of the SDGs are relevant to the shaping of urbanization, and one of these goals relates directly to cities. SDG no. 11 states: "Make cities and human settlements inclusive, safe, resilient and sustainable". Similarly, it will not be possible to achieve the objectives of the Paris Agreement of December 2015 – which relate to the mitigation of climate change, adaptation and resilience to climate change, and the consistency of finance flows with a pathway towards low greenhouse-gas emissions and climate-resilient development – without fundamental changes in the cities. The 2016 Habitat-III conference in Ecuador aims to flesh out these target systems and to develop a New Urban Agenda, a political strategy for the next two decades.

In the WBGU's view, an urban transformation towards sustainability that is oriented towards quality of life and human prosperity must be based on the following demands.

Demands on infrastructure

In the past, infrastructure development has failed to keep pace with the breakneck urbanization process. More than 850 million city residents live in inadequate housing. In cities around the world, approx. 750 million people have no access to adequate sanitation, and 150 million no access to clean drinking water (WWAP, 2015). In the low-income countries, about a third of city residents have no access to electricity and around three quarters lack access to modern energy sources for cooking (IEA and World Bank, 2015). Providing these people with access to an adequate basic infrastructure will, in itself, be a major challenge.

In addition, new homes and urban infrastructure will have to be built at great speed for approx. 2.5 billion new city dwellers by the middle of the century (UN DESA, 2014). By 2050, the urban population alone will be larger than the current total world population. This will lead to considerable challenges for the construction sector, since roughly the same amount of infrastructure will be added in the next three decades as has been built since the beginning of industrialization. In addition, most of the existing infrastructure will have to be renewed in the same period. About 85% of the demand for new housing is expected in emerging economies, of which about 50% will be in China (McKinsey, 2011). The great challenge will be to make the right decisions now to ensure that this massive surge of urbanization follows the principles of sustainability.

The construction of this urban infrastructure will have a huge impact on resource consumption, greenhouse-gas emissions and the pressure on ecosystems, and will exert a massive influence on people's quality of life in the future. This accelerated infrastructure revolution will thus trigger disruptive global change. The time window up to 2050 opens up leeway to create sustainable cities for the 21st and 22nd centuries. However, there is a great risk that the newly emerging, long-lasting infrastructures will be largely modelled on the methods of past centuries, thus leading to undesirable and irreversible path dependencies. For example, if the expansion of infrastructure has a CO_2 footprint that is similar to that of the current infrastructure of cement, steel and aluminium in industrialized countries, the construction of new infrastructures in developing countries and emerging economies alone could lead to 350 Gt of CO_2 emissions (Müller et al., 2013). This already corresponds to around a third of the total available CO_2 budget, if climate change is be limited to less than 2 °C, and more than three quarters of the budget if the temperature increase is to be limited to 1.5 °C. Other impacting factors are the further expansion of the infrastructure in industrialized countries, as well as the future emissions that are determined by this infrastructure. That would perpetuate resource-intensive and high-carbon urbanization processes in the coming years and decades.

The new SDGs, as well as the targets of the Paris Agreement, would be missed by a large margin and the climate-protection guard rail breached. For this reason, a departure from many conventional infrastructure patterns will be necessary. The accelerated reinvention of the cities is therefore a global challenge that cannot be met with incremental improvements, but requires transformative strategies with a leapfrogging effect. Whether this reinvention will succeed, will depend

partly on international cooperation (e.g. technology transfers or a greater focus on the topic of cities at the United Nations) and on the amount of autonomy that the nation states grant to the cities, but also and decisively on the actions of the urban societies themselves. The urban transformation towards sustainability will succeed or fail in the cities.

It becomes clear that transformative measures are needed that affect the form of cities, their materials, their operation and their functions. For example, low-carbon building materials are needed for the new cities and city districts, since steel, cement and concrete are drivers of global warming. In China alone, more cement was used in the three years from 2008 to 2010 than in the entire 20th century in the USA (Smil, 2014:91). Similarly, the designs and technology of buildings must also change, because a large proportion of global greenhouse-gas emissions are produced by systems for cooling and heating buildings. Furthermore, completely new patterns of urban infrastructures are needed, for example in the mobility sector, where the aim should be a change from a car-oriented city to a people-oriented city.

The transformation in the cities implies complex challenges, since the infrastructures for electricity, heating and cooling, water supply and sanitation, waste management, mobility and buildings must be transformed within a few decades and meet the requirements of urban quality of life. In view of the diversity of cities, there will be no universal concepts for this rapid change of course.

The demands on transformative urban governance are correspondingly high because the necessary fundamental changes will face blocking mechanisms, not only as a result of technical path dependencies, but also from static, long-established constellations of stakeholders and a lack of financial and institutional capacity. Over the next three decades, either the course could be set for a sustainable form of urbanization, or a cascade of erroneous – possibly irreversible – decisions might be set in motion that will lead humanity into a crisis of civilization.

Demands on urban quality of life

The process of the urban transformation is not only about urban design and infrastructure development within the planetary guard rails, but also about how adequate housing can be secured for over 850 million people who are currently living in slums and, furthermore, how urban quality of life can be improved for people. The question thus relates to the good life of people in the 'world cities society' in the 21st century. In addition to the challenges of creating jobs in cities, there are two fundamental questions.

First: How must cities be designed for people to feel at ease and be able to develop their potential? For some time now, the awareness has been growing that quality of life does not only depend on a society's gross domestic product and individual incomes. People need access to important services like education, health and housing. But quality of life and subjective well-being in cities must be seen in a more comprehensive way. What do people-oriented cities look like, and are there any universal standards? How do architecture, the design of spaces, squares, buildings and infrastructures, as well as building materials, impact on people's quality of life? How do urban design, social networks, identification, 'a sense of home' and people's scope for shaping their city interact? If people generate their quality of life primarily in their immediate living space, then the urbanization surge up to 2050 is a great opportunity to develop cities in a people-oriented way. But there is also a great risk of taking erroneous decisions that are difficult to correct. Quality of life in the 'world cities society' will therefore crucially depend on which decisions are taken worldwide on urbanization policies and strategies.

Second: How can people influence dynamic urbanization processes or participate in them, when many urban areas are passing through profound changes or are being built completely from scratch in a short period of time? People-oriented cities develop primarily if citizens can participate in their design. Two current trends that give cause for concern can be observed. On the one hand, the influence of large-scale real-estate investors in the metropolises of many industrialized countries and emerging economies is so dominant that a people-oriented, sustainable urban development and a good quality of life are no longer given sufficient consideration by local governments and other decision makers responsible. Despite a certain amount of participation of citizens in planning processes, public protests against urban development projects are on the increase (e.g. Gezi Park in Istanbul; large-scale construction projects relating to the FIFA World Cup in Brazil; 'Stuttgart 21' project in Germany). On the other hand, at the other end of the spectrum of development, in 2012 there were more than 850 million people who had to fend for themselves. They live in informal, often degrading settlements, and their number could more than double by 2050. In both cases, the issue is whether and how people can be appropriately involved in the shaping of urban development. From the perspective of a people-oriented, sustainable urban development in the sense of the WBGU's 'normative compass', even the most ambitious programmes on energy and resource efficiency are no substitute for giving people

opportunities to participate in designing their immediate living environment.

Demands on environmental protection

Cities should be environmentally friendly and offer people a healthy living space. This makes environmental protection in the cities one of the most important requirements with regard to quality of life and the prosperity of the urban population – and therefore also for the urban transformation.

- Indoor and outdoor *air pollution* is the biggest environmental health risk: it is blamed for approx. 7 million premature deaths per year worldwide, most of them in cities (WHO Europe, 2015: viii). In China, air pollution is one of the main causes of death; Indian metropolises are also severely affected. Even in industrialized countries where there has been a lot of investment in air quality, urban air-pollution thresholds are regularly exceeded. A total of about 600,000 premature deaths were caused by air pollution in Europe in 2010 (WHO Europe, 2015: viii). Worldwide, the number of premature deaths from outdoor air pollution could even double by 2050 (Lelieveld et al., 2015).
- Very many cities are already affected by *water scarcity and water pollution*: around half of all cities with more than 100,000 inhabitants worldwide are located in water-scarce basins (Richter et al., 2013). Water scarcity can be expected to get much worse as a result of climate change and the growth of these cities (e.g. Lima due to its dependence on glacier water, Mexico City and Lahore because of dwindling ground-water reserves). Water pollution is a typical problem of urban agglomerations, especially in developing countries and emerging economies, where water resources in urban areas are contaminated by untreated sewage. It is particularly risky if untreated industrial wastewater is added to urban sewage.
- *Waste disposal* is predominantly a problem of cities. Compared to other country groups, the cities in industrialized countries generate the most waste per capita, but the growth rates are declining. However, the quantities are increasing rapidly in developing countries and above all emerging economies. The quantities of waste could double worldwide by 2025 (Hoornweg et al., 2013). Many urban areas have no organized waste collection and disposal, which has a seriously negative effect on public health. About 70% of municipal waste, some of which is hazardous, ends up on landfill sites, which often contaminate surface water, ground water or soils and emit greenhouse gases (ISWA, 2012:5). Decentralized waste incineration using inadequate technology exacerbates air pollution.

The requirements go far beyond local urban environment protection, because cities also contribute to global environmental problems which threaten the natural life-support systems in the long term and in complex causal relationships. Huge opencast-mining landscapes, the clearing of primary forests for palm-oil plantations and livestock, mountains of electronic waste in Africa and Asia, plastic vortices in the oceans, huge maize and soya monocultures, and last, but not least, climate change are mainly caused by consumption in the cities. This is where demand for resources is concentrated. Cities are the hubs of global material flows simultaneously for the construction industry, for consumer goods and for agricultural and forestry products.

The related systemic long-distance effects or ecological footprints increase steeply with the level of development and urbanization and should therefore be taken into consideration in urban environment strategies from the outset. Urban areas also play a key role when it comes to the mitigation of climate change, because they are responsible for about 70% of global energy use and global, energy-related CO_2 emissions (Seto et al., 2014). The future of the world's climate will be decided in the cities.

At the same time, people in cities are affected by climate change. Many of the risks that arise as a result of anthropogenic global warming – e.g. more frequent, stronger or longer-lasting extreme events (extreme precipitation, heat waves, droughts, storm surges), sea-level rise and melting glaciers – have an impact on cities. This will have profound effects on a wide range of urban functions, infrastructures and services; the corresponding adaptation challenges and associated costs will be considerable.

3. A normative compass for the transformation towards a sustainable 'world cities society'

The WBGU has developed a 'normative compass' to provide orientation for societal action in the light of the above requirements (Fig. 2). It describes the constraints within which cities' development pathways towards a people-oriented form of urbanization should be realized, and which, if breached, would put sustainable development at risk.

The key message of the present report is that the transformation can be achieved by a combination of three dimensions:

- *Sustain natural life-support systems*: all cities should pursue development pathways that take account of

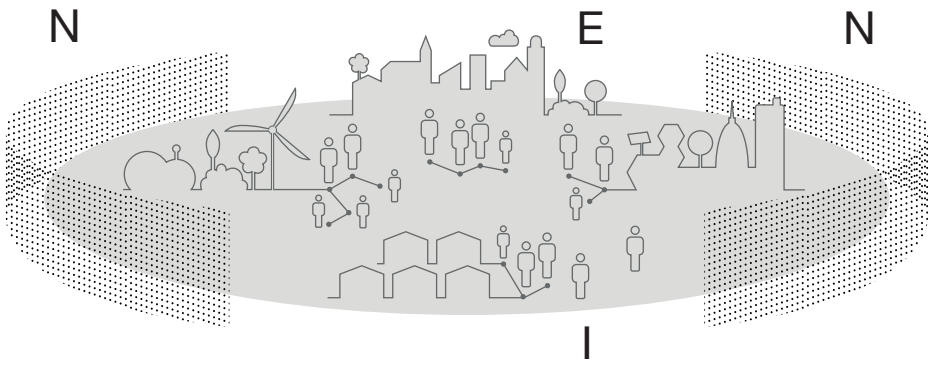

Figure 2
Normative compass for the transformation towards sustainability. The transformation of the cities towards sustainability can be achieved by an interaction and balance between the following three dimensions:
- 'Sustaining of the natural life-support systems' (N): All cities and urban societies should pursue development pathways that take the planetary guard rails into account and solve local environmental problems.
- 'Inclusion' (I): Universal minimum standards for substantive, political and economic inclusion should be met in all urban societies.
- '*Eigenart*' (E): With the dimension of *Eigenart* (a German word meaning 'character'), the WBGU on the one hand recognizes the socio-cultural and spatial diversity of cities and urban societies (descriptive *Eigenart*). On the other hand, *Eigenart* is a target or orientation dimension of urban transformations (normative *Eigenart*); it emphasizes that conditions should be created in urban living environments which ensure (a) that people can develop self-efficacy in the spatial structures and can feel and create urban quality of life for themselves; (b) that local identity and social cohesion can develop; and (c) that there is a strengthening of the potential for social and economic creativity and innovation that is generated via local interactions (connectivity) between actors from different spheres of society.

Source: WBGU; diagram: Wernerwerke, Berlin

the planetary guard rails relating to global environmental change and solve local environmental problems to ensure sustainable urban development and the protection of the natural life-support systems. This involves, for example, meeting the 2 °C climate-protection guard rail and combating health-damaging air pollution; further examples include ending land and soil degradation and stopping the loss of phosphorus, an essential resource for agriculture.

- *Ensure inclusion:* universal minimum standards for substantive, political and economic inclusion should be met in all cities and by all cities. The aim here is to give all people access to human safety and development, enabling them to evolve and implement their individual and collective ways of living. In this sense, inclusion is simultaneously a means and an end. Substantive, political and economic inclusion mirrors many human rights that have already been internationally codified or discussed. Furthermore, such inclusion is based on the idea that people need corresponding opportunities to realize and implement these rights. *Substantive inclusion* lays the foundations: access e.g. to food, clean drinking water, sanitation, healthcare and education is the essential minimum standard for securing basic human needs. *Economic inclusion* entails, in particular, access to the labour and real-estate markets. When people are made the main focus, they must be granted electoral rights – as well as procedural rights of information and involvement – in order to achieve *political inclusion* and a right to judicial control. This ensures that any violation of these rights can be sanctioned.
- *Promote 'Eigenart':* with the dimension of *Eigenart* (a German word meaning 'character'), the WBGU is introducing a new category into the sustainability discussion. According to the WBGU's normative concept, the first two dimensions – sustaining the natural life-support systems and ensuring inclusion – open up a framework for a wide variety of transformation pathways. Within this framework, every urban society can and must pursue its individual course towards a sustainable future. On the one hand, *Eigenart* comprises all that is typical of each particular city. This can be described on the basis of its socio-spatial and constructed environment, its socio-cultural characteristics and local urban practices (descriptive *Eigenart*). On the other hand, *Eigenart* is a target or orientation dimension of urban transformations: it emphasizes that socio-cultural

diversity in and of cities, their urban form, and the autonomy of city residents are key components of people-oriented urban transformation in the creation of urban quality of life and identity (normative *Eigenart*). In this normative connotation of *Eigenart*, people are seen as actors who use their inclusion rights and thus design their cities in different and specific ways in order to realize quality of life. *Eigenart* thus enables and equips people to develop self-efficacy and to shape urban societies and urban spaces, in order to develop quality of life, trust, identity and a sense of belonging – and to design cities, infrastructures and spaces in a way that supports this. In the WBGU's view, two essential principles must be guaranteed to enable people and urban societies to develop *Eigenart* – and thus quality of life and sustainability: (1) the recognition of creative autonomy, i.e. that the residents themselves should shape and appropriate urban spaces, and (2) the recognition of difference, i.e. the recognition of the Diversity of Cultural Expressions (UNESCO, 1997) and the individual opportunity to appropriate cultural identities. The introduction of the concept of *Eigenart* draws attention to the spatial-social prerequisites for the appropriation of space, and thus for the creation of urban quality of life, social cohesion and local identity. It also makes it possible to take account of the diversity of cities and their transformation pathways. The spotlight is thus directed at the many and varied forms, designs and cultural manifestations of urban areas. The focus is also on the specific potential for social and economic creativity and innovation which develops as a result of local interactions (connectivity) between stakeholders from different societal spheres. Furthermore, the WBGU regards diversity in and of cities as an important resource for the urban transformation towards sustainability.

Cities should take their orientation from universal sustainability and inclusion goals, but keep their *Eigenart*. Universal inclusion rights, as described above, are a necessary prerequisite for people and urban societies to draft and manage their own development pathways – universal inclusion rights and the *Eigenart* of the cities are mutually dependent and generate interactions.

Complying with planetary ecological guard rails and ensuring substantive, political and economic inclusion represent global minimum standards for the 21st century's civilizatory project for humankind. As concepts, *'sustainable development'* and *'inclusion'* each contain a dialectical principle. In the case of sustainable development, the principle is the need to find a balance between conservation on the one hand, and, on the other, the facilitation of development, which historically is associated with 'growth', i.e. with 'having more and consuming more'. In the case of inclusion, it is the balance between the collective idea of 'sharing' and that of individual 'having' that needs to be found. Against this background, *Eigenart* becomes both a normative orientation and a source of innovative strength for a humanity on the move. The German word *Eigenart* (which means 'character', or more literally 'own way' or 'own type/kind') is itself characterized by the dialectic of *Eigen* ('own', i.e. individual, new, different, distinctive) and *Art* ('way' or 'type/kind'), as an expression of class, community, group, generalizability.

Sustainable, future-oriented societal development and quality of life can only evolve if these dialectics and tensions are balanced out in situations of dynamic equilibrium. Concepts of society that aim to overcome this dialectical complexity and the seemingly paradoxical contradictions of societal development – as expressed in the terms 'sustainable development', 'inclusion' and *'Eigenart'* – by propagating narrow-minded imperatives for unlimited growth or the primacy of the 'individual' or 'society'/'community' – are destined to fail. This applies to the radical capitalist concepts of the 'shareholder society' and to Milton Friedman's view that there are no societies, but only individuals; it also applies to community protagonists of right-wing, left-wing, and sometimes even religious provenance, where the rights of individuals are made subordinate to the 'greater whole'. The urban transformation towards sustainability can only succeed if transformation pathways are developed which balance out the ambiguity, dialectic and tensions expressed in the terms 'sustainable development', 'inclusion' and *'Eigenart'*.

Based on the interaction between the dimensions of sustaining the natural life-support systems, inclusion and *Eigenart*, the WBGU provides a compass for dealing with fundamental upheavals in the century of urbanization (Fig. 2). With its normative compass for sustainable urban development, the WBGU tries to take the global diversity of cities into account.

Solidarity-based quality of life: transformation at the micro-level

The WBGU bases its normative compass on an extended understanding of quality of life and prosperity. This states that it is not enough to decouple environmental consumption and environmental destruction from the material/economic prosperity which can be achieved quickly and is characterized by such factors as growth, employment and infrastructure development ('decoupling of the first order'). Rather, quality of life and the definition of prosperity should also be at least partially

decoupled from economic growth and monetary prosperity ('decoupling of the second order'). The starting point is an extended definition of quality of life and prosperity that goes beyond materially/economically 'objective' factors and also includes 'subjective' factors such as self-efficacy, identity, solidarity, a sense of belonging, trust and social networks, which simultaneously comprise the social capital of a society: the glue that holds societies together. Research shows that the more pronounced social capital and social cohesion are in a country (or in a city) and the smaller the social inequalities, the higher is people's average satisfaction with life and the less crime and violence, disease, anxiety and social mistrust, and hence risks to societal stability can be found.

Such an extended understanding of prosperity and quality of life should – in a similar way to the understanding of sustainability – be oriented towards the principles of intra- and intergenerational justice. An understanding of quality of life that is oriented towards the normative compass would, according to this definition, not only be oriented towards one's own needs and those of one's immediate environment (e.g. family), but also, in a broader sense, towards 'solidarity', i.e. taking into account the needs of currently living and future generations to the greatest extent possible. Accordingly, highly consumer-oriented and resource-wasting lifestyles that are harmful to the natural life-support systems would have to be changed, but also the kind of lifestyles which restrict the inclusion of other people, communities and societies in the present and in the future.

For this, the WBGU has developed the concept of 'solidarity-based quality of life', which means two things: a definition of quality of life that is oriented towards the principle of solidarity; and a quality of life that is made possible by solidarity and supportive communities. Solidarity-based quality of life focuses on the individual definitions of quality of life, which are developed in such a way that the prerequisites for the quality of life of other people (local and global, intra- and intergenerational) are not impaired. The Kantian principle of the categorical imperative thus becomes the basis of the WBGU's understanding of prosperity and quality of life, which takes on board global and intergenerational principles of fairness.

4. The WBGU's approach on the urban transformation

Over the last four decades, sustainable urbanization has become internationally established as an action field for policy-makers. Accordingly, there has been an increase in the number of global, international reports on this topic, some of which are published regularly. Despite different approaches and priorities, the way in which the problems are described in these reports is largely similar. However, marked differences become apparent when it comes to the perspective on solving the problems. Many studies concentrate on technical analyses of the infrastructure, moving on to discuss investment requirements and issues of economic policy. A different approach is taken by reports that concentrate primarily on issues of governance or on an integrated combination with a sectoral issue (e.g. UCLG, 2013; World Bank, 2013; UN-Habitat, 2011; Corfee-Morlot et al., 2009), or are explicitly actor-oriented (e.g. Revi and Rosenzweig, 2013; UKAID and DFID, 2012; UN-Habitat, 2009). The latter concentrate mainly on strengthening the actors and on making them less vulnerable, for example in the field of disaster preparedness. Most of the reports give only marginal consideration to such issues as quality of life in the city, participation and justice, appropriation of public spaces, the socio-cultural identity and efficacy of the city residents, and the feedback effects of such challenges on sustainability issues. Participation by affected population groups and civil-society initiatives is usually described only as an additional option and not as their being consulted as equals on planning and implementation processes. In the WBGU's view, what is primarily lacking is the coherent embedding of the subject into a long-term strategic urban transformation concept that emphasizes the scale and urgency of the change, and the systematic derivation of action fields that pursue a transformative goal. It is against the background of this analysis that the WBGU develops its approach on the urban transformation towards sustainability.

Transformative action fields

In this report, the WBGU pursues a systemically integrated approach and dispenses with a narrow thematic focus. It begins by identifying exemplary *transformative action fields*, i.e. areas of urban development where the WBGU sees the biggest potential leverage effects for the urban transformation towards sustainability. First, there are five fields that are already being broadly discussed internationally, but which, against the background of the transformation, the WBGU places into a new context in relation to time horizons and scale: (1) decarbonization, energy and mitigation of climate change, (2) mobility and transport, (3) urban form, (4) adaptation to climate change, and (5) poverty reduction and socio-economic disparities. Second, it makes recommendations on three further transformative

action fields that are examined in detail in this report and which, in the WBGU's view, are given too little attention internationally. These are (1) urban land use, (2) materials and material flows, and (3) urban health.

The choice of transformative action fields was made with a view to their importance for and effect on the transformation, their quantitative and systemic relevance, their urgency, their potential to prevent path dependencies, and maximum co-benefits. The challenge was to suggest the breadth of the subject – i.e. the city and urbanization – with a small number of transformative action fields, while avoiding anything that would narrow the perspective.

The WBGU uses the transformative action fields to outline approaches as to how cities can find development pathways that are in line with the normative compass. They cannot be considered in isolation; rather, they must be seen as part of a systemic development because they are so strongly interconnected. The close interconnection of the transformative action fields offers considerable potential for exploiting synergies and jointly pursuing different objectives by making systemic changes. One special opportunity lies in measures that have both short-term and long-term benefits. The most prominent example is the fight against air pollution. The transformative action fields are explained in greater detail in section 6, 'Core recommendations'.

The diversity of cities and transformation pathways

In its 2011 report 'A Social Contract for Sustainability', the WBGU developed universal pathways to sustainability, focusing in particular on energy systems. Cities, too, should take their orientation from universal social and environmental goals, like those agreed by the Rio Conventions (CBD, UNFCCC, UNCCD) or summarized in the SDGs. However, the transformations in the cities will not be able to follow a universal pathway because they are too diverse.

The great urbanization surge and the construction of new settlements for 2.5 billion people by 2050 will take place above all in Asia and Africa, while the issue in the western industrialized countries and Latin America will be the transformation of existing cities. The urbanization thrust in Asia and Africa is of paramount global importance. Compliance with the planetary guard rails, the prosperity and quality of life of many people, and thus also stability and security in world society will depend on whether this can be achieved in a sustainable way. At the same time, it is crucial from the Asian and African perspective that wealthy OECD urban societies accelerate the transformation towards sustainability. Only in this way will it be possible to comply with those planetary guard rails, which, if breached, would hit vulnerable population groups in the developing countries and emerging economies particularly hard, because the 'world cities society' is, after all, a system of communicating tubes.

This report describes the diversity of cities and possible transformation pathways – against the background of the normative compass – on the basis of eight cities chosen as examples from different regions of the world (Box 1). This illustrates how historical developments and resultant path dependencies each create specific prerequisites and solution options for the urban transformation towards sustainability in the context of the complex interplay of historical, cultural, socio-economic and ecological contexts of origin. This can only succeed if this great diversity is taken seriously and time is not wasted searching for 'blueprints' or 'silver bullets'. Different transformation pathways to urban sustainability that are geared to the respective problems of the cities and their specific options will have to be found.

Urban designers: agents of urban transformation

The WBGU subsequently turns its attention to 'good practices' and 'change agents' within cities. The aim is to show that, at the local level, numerous approaches to transformative strategies based on the respective conditions, resources and *Eigenart* already exist. Their protagonists, the 'urban designers', try out building blocks and options; in this way they help develop new guiding principles or visions that can provide orientation for societal change. Being aware of analogous activities taking place in other cities can help them create and promote an understanding of transformative approaches. In this context, knowledge and collaboration are the framework in which good practices and change agents operate within the transformative action fields.

In its report, the WBGU presents a number of relevant examples. In view of the enormous diversity of cities and urban societies, it does not claim to be representative or complete in terms of regional distribution or thematic coverage. Taken together, these examples show that many top-down and bottom-up initiatives exist, which have taken action in the sense of a transformation agenda and have to some extent integrated this agenda. These initiatives require recognition and support both at various levels and from other stakeholders and initiatives – not only to obtain a globally based feeling of self-efficacy, but also to make it easier, through practical networking and cooperation, for

Box 1

Example cities

Mumbai: transformation of a colonial metropolis into a globally networked megacity

In view of its need to catch up in its urban development and expectations of its future growth, the main transformation challenges faced by Mumbai lie in the provision of adequate housing and basic services, and in reducing socio-economic disparities. Up to now, the population's environmental footprint has been small by global comparison; nevertheless, the city should give a higher priority in urban planning to reducing resource use and emissions. Even when faced with multiple problems, important local resources, such as civil-society engagement and innovativeness, are available for a transformation.

Cairo: metropolis between an authoritarian state and weak governance

Greater Cairo has changed dramatically. The modestly sized city of the 1950s has developed into a metropolitan region characterized by a dualism of informal/unplanned settlements and newly planned desert cities. In the meantime, however, the first signs of a changed, integrated understanding of urbanism have begun to emerge. For example, the government supported the first Egyptian Urban Forum, and the state has also taken initial steps towards an energy transformation. However, these developments are being seriously threatened by inclusion deficits. At present, the Egyptian government grants few political freedoms, and the Cairo local government is regarded as inefficient and corrupt. Only if the inclusion of the population can be greatly scaled up, and existing rudiments of progressive urban-development strategies are further developed, can the transformation towards sustainability also succeed in Cairo.

Copenhagen: a people-oriented pioneer of sustainable urban planning

Apart from its globally renowned local and global initiatives on environmental sustainability, Copenhagen is also characterized by its people-oriented urban planning and design. Political inclusion and diversity are actively promoted by the local government. At the same time, this example shows that, despite ambitious courses of action in all three dimensions of the WBGU's normative compass, there is still a long way to go to succeed in the Great Transformation towards sustainability. This applies especially to achieving complete decarbonization without recourse to compensation mechanisms.

Guangzhou: opening-up policy, globalization and migration-driven mega-urbanization in the 'factory of the world'

Guangzhou in China's Pearl River Delta, the 'factory of the world', stands for numerous Chinese megacities that have experienced a profound upheaval in the space of three decades. In the course of the politically induced policy of opening up to a market-oriented economy, they have been strategically and specifically redesigned into global focal points of foreign direct investment. Global centres of industry and services, high-density megacities and centres of internal migration have developed out of core regions of intensive agriculture. Important objectives along the road to a transformation towards sustainability include the preservation of the urban cultural heritage, improved social coherence, greater participation of all societal groups, and the solution of environmental problems.

The Ruhr area: the post-industrial metropolis – long-term viability thanks to a polycentric concept

The Ruhr area is the largest urban agglomeration in Germany. It is characterized by a polycentric structure and the remains of contaminated industrial sites left behind by a mature infrastructure now greatly in need of redevelopment. However, with the help of an emerging metropolitan governance that makes the most of the hitherto underused benefits of polycentrism, a model region could develop to follow the coal and steel industry.

Kigali: post-conflict city in sub-Saharan Africa

Kigali reveals the complex problems of rapid informal urbanization. Despite the terrible initial conditions after the 1994 genocide, the city's development has been peaceful and more economically sound than comparable cities. The transformation towards a knowledge-based economy controlled by the national government is dependent on development-aid funds, and political inclusion remains dependent on the support of the authoritarian government. Although this has prevented a renewed outbreak of ethnic violence, it remains questionable whether a transformation towards sustainability can be achieved without an open civil society.

Novi Beograd: 20th century socialist planned city district

Novi Beograd, built in the 1950s, is a top-down, planned city district that is partly made up of socialist elements and partly follows Le Corbusier's concept of functionality. Characterized by residential towers and extensive green areas, Novi Beograd served as a residential town for a rapidly growing population. The spaciousness of the area makes a polycentric, sustainable design of the area possible. However, existing patronage-based structures could restrict inclusion and participation in the future shaping of the city.

São Paulo: the fragmented metropolis

In terms of its socio-economic and spatial development dynamics, its socio-spatial structures and urbane living conditions, São Paulo is a deeply fragmented metropolitan region with marked socio-spatial segregation tendencies. Yet São Paulo has both the planning capacity and (albeit certainly insufficient) financial capacity to tackle these problems and initiate independent developments in the direction of the transformation process.

others to learn from them, and to boost their usefulness and value for urban design.

Urban settlement patterns and solution spaces

Building on the notion of diversity as a decisive characteristic of urban form and as the indispensable basis for urban transformation, the WBGU takes an aggregated, synthetic look at the dominant settlement dynamics (Fig. 1). In this context, urban diversity forms three dominant patterns: *newly planned* or yet-to-be-planned cities or city districts, which are built according to traditional top-down master planning within a narrow time frame; *informal* settlements, where inadequate housing and living conditions are often the rule and have been (or are still being) built bottom-up with minimal or no state control; and existing, *mature* urban areas with a fixed stock of buildings and established infrastructures, served by a largely consolidated system of governance. These three patterns frequently exist within the same city in numerous variations and combinations side by side and at the same time. However, each city can be characterized more by the one or the other pattern.

For all the diversity, urban settlement dynamics are essentially determined by three central drivers or, metaphorically speaking, 'master builders': *power* (law, money, domination), *hardship* (poverty, exclusion, weak actors) and *time* (slow growth of cities, accelerated growth of cities, path dependencies, ruptures). For all three settlement patterns (newly planned, informal, mature) the interplay of power, hardship and time is of the essence.

The *power* factor is essential in the construction of newly planned cities and city districts. In this way (in some cases very large) settlements can emerge top-down in a short time (e.g. in China). Here, one of the most important aims is securing substantive inclusion, especially in the field of large-scale new residential construction. Another challenge and great opportunity in newly planned settlements lies above all in integrating all dimensions of sustainability into the objectives from the outset, making use of both technical and societal innovations and thus preventing path dependencies that are difficult to change. Especially suitable for this are modular and transitory building patterns that are adaptable and flexible, e.g. can react to new technical possibilities or climate-change-related adaptation requirements. The potential for leapfrogging in urban development is particularly high in the case of this settlement pattern. Furthermore, an effective change of course in the transformative action fields is initially easier, provided that the planning is geared to it. Even so, there seem to be few successful examples of quickly planned and fast-growing 'drawing-board cities'. The political inclusion and involvement of citizens, local ties, social cohesion, reversibility of urban developments, and not least the dimension of *Eigenart* (character) are often lost. This raises the question of how additional prerequisites can be created in the planning of new cities and city districts which make the inclusion of the urban population possible and promote the development of *Eigenart*.

In informal settlements, poverty, inadequate housing and degrading living conditions are often the dominant problems: *hardship* is the driver and main characteristic of this settlement pattern. The lack of substantive and economic inclusion involves risks for the inhabitants' livelihoods and health, and prevents them from making the most of their opportunities to develop and participate. However, in addition to informal city districts where decay and violence dominate, there are also positive examples of informal settlements where the failure of public actors is partly offset by the creative self-organization of the inhabitants, and where the emergence of alternative district developments can be observed. Slum clearance and displacement are by no means adequate solutions. People living in informal settlements have usually contributed little to the causes of environmental changes, but are severely affected by their impact and risks. The challenge in both existing and future informal settlements lies above all in the creation of adequate living conditions with sustainable prospects. This ultimately also implies a strengthening of public institutions and corresponding investment. Informal settlements as a whole should be more closely integrated into overall city development and urban governance.

In mature cities and city districts, which have often grown over centuries, *time* is a key factor of development. The building stock, which has grown over a long period of time, and the urban infrastructure, which not least reflects the *Eigenart* of the communities and city districts, should be developed in such a way that they meet modern requirements in terms of environmental protection and mitigation of climate change, and not only do not diminish, but benefit inclusion. Here, too, transformative changes must be initiated, in particular to reduce urban energy and resource consumption. To achieve this, cities can initially have recourse to long-established governance structures, although these may also represent an obstacle to transformation, since rigid stakeholder constellations and institutional path dependencies may make it difficult to incorporate future interests. In this context, urban renewal must not rely solely on the support of economic stakeholders, but also secure the active participation of the population.

Shaping all three patterns is essential for the urban transformation, especially as the number of people in informal and new settlements could increase by about 2.5 billion. These dynamics are enormous challenges and simultaneously offer an important opportunity for the urban transformation towards sustainability.

Urbanization surge up to 2050 – six development risks of global change

Seen through the lens of the WBGU's compass, the sum and cumulation of urbanization dynamics in the three urban configurations lead to six global system and development risks which are of great importance, especially for decision-makers in international cooperation (Table 1). In the following list, N stands for sustaining the natural life-support systems, I for inclusion and E for *Eigenart* (character):

- $N_{Earth\ system}$: Development within the planetary guard rails
  Whether the planetary guard rails can be complied with will be decided in the mature cities as well as in the fast-growing new city districts of Asia and Africa. Only if low-carbon cities are built there can dangerous global environmental change and an associated global threat to prosperity be prevented.
- N_{local}: Local environmental conditions as a key condition for urban quality of life
  Good local environmental conditions (e.g. access to clean water and sanitation, adequate air quality and waste management) are prerequisites for human quality of life. In particular, the quality of life of 2-3 billion people who might be living in informal settlements by 2050 thus depends on effective local environmental policies.
- $I_{substantive;\ economic}$: Substantive inclusion and socio-economic dimensions
  Socio-economic inequalities and exclusion dynamics that threaten the quality of life and stability of urban societies are on the increase in all urban configurations. This applies equally to Paris, Los Angeles, Cairo, Goma and Rio de Janeiro. The 2-3 billion people who might be living in informal settlements by 2050 are particularly threatened by these trends. These local exclusion dynamics can also set refugees in motion and pose an international security risk.
- $I_{political}$: Political inclusion and participation as a prerequisite and goal for quality of life
  It will hardly be possible to realize political inclusion for the 2-3 billion people who might be living in precarious, informal settlements by 2050. These urban communities are dominated by hardship, often also by violence, sometimes by admirable self-organization as a reaction to the absence of basic public services. In the newly emerging, planned settlements, especially in Asia but also in Africa, new middle classes will demand political inclusion. Where this is not granted, there is a danger of political instability – corresponding dynamics in Turkey, Tunisia, Egypt and also China point to these interrelations.
- $E_{dependent/inclusion}$: *Eigenart* as a dimension of urban quality of life and a resource of sustainability transformation – dependent on opportunities for inclusion
  The development of *Eigenart* as a condition for quality of life and a resource of sustainability transformation is dependent on the existing opportunities for inclusion. In the mature and newly planned cities and city districts, *Eigenart* is undermined by social and political inequalities, in the informal settlements by sheer hardship and precarious inclusion opportunities. As a result, *Eigenart* is threatened for over half of the world's population.
- $E_{dependent/time;\ hardship}$: *Eigenart* in informal and newly planned cities – squaring the circle?
  Eigenart in the sense of creative, participatory urban development is very difficult to realize for the 1–2 billion people who will have moved into newly planned cities and city districts in Asia and Africa by 2050, because of the speed of the urban development and the usually prevailing top-down planning. *Eigenart* will hardly be able to develop in informal settlements where hardship – and more often than not violence – rules, where hardly any public institutions function, and where an additional 1–2 billion people might be living in precarious housing conditions by 2050.

Transformative urban governance

The urban transformation towards sustainability must be shaped. The concept of transformative urban governance developed by the WBGU consists primarily of a novel distribution of responsibility, principles, procedures and material criteria in order to successfully shape the transformation process in cities. The WBGU understands urban governance as acts of state and non-state actors and institutions with the aim of organizing the local affairs of a city and its urban society. The WBGU speaks of transformative urban governance when it comes to organizational and procedural structures and decision-making criteria based on the WBGU's normative compass, which aims at a comprehensive transformation of cities towards sustainability. Transformative urban governance must set dynamics of fundamental change in motion to cope with the impact and

Table 1
Urbanization surge up to 2050 – development risks of global change.
The table shows key risks of the global urbanization surge that is expected up to 2050. According to the WBGU's assessment, this urbanization surge will be characterized by three dominant settlement patterns: (1) mature cities or city districts, (2) newly planned cities or city districts, and (3) informal settlements. The three dimensions of the normative compass developed by the WBGU – sustaining of natural life-support systems (N), inclusion (I) and *Eigenart*, a German word meaning 'character', (E) – are used to estimate the risk dimension of each settlement pattern.
Source: WBGU

		Mature cities or city districts	Newly planned cities or city districts	Informal settlements
Natural life-support systems	N Earth system	1	1	
	N local			2
Inclusion	I substantive; economic	3b	3b	3a
	I political		4b	4a
Eigenart	E dependent/inclusion	5b	5b	5a
	E dependent/time; hardship		6	6

1 Whether the planetary guard rails, especially the 2°C guard rail for climate protection, can be observed will be decided in the mature cities or city districts and in the fast-growing planned new cities and city districts of Asia and Africa.
2 The well-being of the 2-3 billion people who might be living in informal settlements in 2050 is threatened by often precarious local environmental conditions (access to water, air quality, sanitation).
3a Socio-economic disparities and exclusion dynamics threaten the quality of life of the 2-3 billion people who might be living in informal settlements in 2050. Local exclusion dynamics could also trigger flows of refugees.
3b Socio-economic disparities are increasing in all urban configurations.
4a It will hardly be possible to implement political inclusion for the 2-3 billion people who might be living in precarious, informal settlements in 2050.
4b In the newly emerging, planned settlements of Asia, but also in Africa, several hundred million people will be joining the global middle classes and will demand political inclusion. Political instability threatens where this is not granted.
5a The development of *Eigenart,* as a prerequisite of quality of life and a resource of sustainability transformations, depends on the existence of prerequisites for inclusion. For the 2-3 billion people who might be living in informal settlements in 2050, precarious inclusion opportunities would undermine their chances of developing *Eigenart*.
5b *Eigenart* is being undermined by social and political inequalities in many mature and newly planned cities or city districts.
6 *Eigenart,* in the sense of urban development shaped by citizens, will hardly be feasible for the 1-2 billion people who will have relocated to newly planned cities and city districts in Asia and Africa by 2050, due to the speed of urban construction and the prevailing top-down planning. *Eigenart* will hardly be able to find expression in informal settlements, where hardship and often violence rule, where hardly any public institutions function, and an additional 1-2 billion people could be living in precarious living conditions by 2050.

speed of the global urbanization process.

Because conditions in cities differ so much, it is impossible to develop blueprints that could be implemented everywhere. A core element of transformative urban governance is therefore that nation states recognize that cities are subjects of rights and obligations under constitutional law, grant them a right to self-government, and give them the necessary room for manoeuvre and financial leeway to be responsible for their own local transformation pathways. The distribution of responsibilities and tasks under this multi-level system of governance should be based on the subsidiarity principle, according to which a responsibility prerogative lies with the smaller unit depending on its capability. Furthermore, consultation processes should be established between local, regional and national levels to ensure that urban concerns are incorporated into national decision-making processes.

Even in cities where the local government has the necessary decision-making powers and financial resources, these are often not enough to successfully manage the transformation. In order to develop innovative approaches, implement and enforce future and present interests, and create legitimacy for the transformation process, a second core element of transformative urban governance is needed: to involve the inhabitants of a city through collaborative governance and to empower them to influence the transformation process. To this purpose, arenas for public discourse should be strengthened and spaces for experimentation created. Ultimately, a transformation in cities can only develop if they have sufficient financial resources at their disposal. This requires both guaranteeing solid basic funding by means of government transfer payments, and giving cities greater opportunities to generate their own revenue. In addition, incentives must be created to use private capital for the transformation. International financial institutions should develop coordinated and coherent approaches to provide cities with financial support.

Global governance structures should be modernized so that cities' transformative potential can also be used globally: cities should be given the right to participate and speak at relevant international forums. Cities should also be given an opportunity to develop 'urban foreign policies' in order to promote the international involvement of cities in transnational city networks.

If cities and urban societies take on more responsibility for the urban transformation process, a polycentric responsibility architecture develops. The structure here is not exclusively hierarchical; rather, responsibilities are also distributed horizontally over several levels of the governance system.

5. Elements of a social contract for the urban transformation

The Great Transformation towards a sustainable society requires a cross-generational orientation framework to ensure harmonious coexistence among nearly 9 billion people. The WBGU speaks in this context of a 'new global social contract for a low-carbon and sustainable global economic system' (WBGU, 2011). In such an imagined agreement, individuals and civil-society groups, governments and the international community, businesses and academia pledge to jointly take on responsibility for the transition to a sustainable economic and social order.

For the worldwide urbanization dynamic, too, the WBGU recommends agreeing a global consensus on urban quality of life while simultaneously sustaining humanity's natural life-support systems. Elements of such an agreement have already been developed on the international stage. The course has been largely set with the adoption of the SDGs and the Paris Agreement of 2015. The Habitat III world conference, to be held in October 2016, offers an opportunity to make further progress with this global consensus and to operationalize it at city level.

Against this background it is possible to define the idea of a global social contract more precisely, and to formulate it in detail as a 'social contract for the urban transformation'. The prerequisite for such a social contract is that urban societies visualize a thrust of urbanization up to 2050 involving the six development risks of global change discussed above. The social contract itself would be virtual in the sense of a societal agreement on the urban transformation. However, it should be mirrored worldwide and at different levels of governance in the form of fully formulated charters.

The three key elements of such a contract, as listed in Table 2, are

- a polycentric responsibility architecture,
- transformative action fields in cities,
- consideration of the WBGU's normative compass.

Habitat III offers a chance to launch the negotiation process for a charter at the global level that reflects this social contract. In such a document, the states should stipulate the perspective of the transformation of the cities towards sustainability as a guiding concept, in order to offer the cities orientation for designing their specific transformation pathways. Urban societies, too, should make use of the opportunity to negotiate, in a participatory manner, a shared vision of the transformation process in their city, with each formulating its own charter. Similar charters can also be useful at the regional level (e.g. in the EU).

Table 2
Three key elements of a social contract for the urban transformation towards sustainability.
Source: WBGU

Key elements of a social contract for the urban transformation
Polycentric responsibility architecture › Recognize cities in the constitution › Grant the right to self-government in shaping local affairs › Distribute decision-making powers according to the subsidiarity principle › Secure funding › Strengthen institutional and personnel capacity, establish effective planning structures › Consult cities in national decision-making processes and in international negotiations › Enable urban societies to influence the transformation process › Agree charters for the urban transformation at the local, national, regional and global level
Transformative action fields in cities ***Internationally discussed fields*** › Decarbonization, energy and mitigation of climate change › Mobility and transport › Urban form › Adaptation to climate change › Poverty reduction and socio-economic disparities ***Focal points: fields that are given too little attention internationally*** › Urban land use › Materials and material flows › Urban health
Normative compass › Sustaining natural life-support systems › Ensuring inclusion › Promoting *Eigenart*

The idea of such charters for the urban transformation relates to a series of existing political statements and agendas that have been adopted at different levels by governmental and city alliances, mayors and non-governmental organizations. However, the existing declarations do not sufficiently address the challenges of an urban transformation towards sustainability in the global society. One prominent example is the Leipzig Charter on Sustainable European Cities of 2007, which focuses on integrated urban development policy and disadvantaged city districts, though not for the global but for the European level and without an explicitly transformative perspective. The experience that has already been made in negotiating such documents can be drawn upon in the formulation of the charters for urban transformation.

In the WBGU's view, the negotiations on the social contract for the urban transformation and its operationalization in the form of charters should not only take into account the normative compass, the transformative action fields and the polycentric responsibility architecture (i.e. the core elements of the contract), as well as the six development risks of global urban change, it should also consider the following prerequisites for the ability of urban societies to transform, which have been developed in the present report.

Prerequisites for the ability of urban societies to transform

A paradigm shift must take place in cities in the space of a few years – away from incremental approaches and towards transformative changes – in order to sustain humanity's natural life-support systems and people's quality of life in the long term. The perspective used here is to look back to today from a desirable future. How can each urban society find a transformation pathway for itself that makes this sustainable future possible? To achieve this, the diversity of the cities and the potential of their actors must be taken seriously and used. Against this background, the WBGU identifies the following prerequisites for the transformation capability of urban societies:

› *Recognize and strengthen cities as key arenas of the transformation:* Key elements of the transformation are decided in cities (e.g. infrastructure development: energy, water and sanitation, waste management, mobility), and in many transformative action fields, integrative solutions can be found at city level that use synergies between local development and global challenges. One prerequisite for the above-mentioned polycentric responsibility architecture is therefore to give cities sufficient local decision-making authority and, in addition, to

enable them to play their role as players in international cooperation.

- *Re-establish public authority over shaping and planning urban areas:* The public sector should be strengthened. Authority over shaping and planning in the cities should be restored to the public sector where it is in the hands of other actors (e.g. strong investors, violent organizations). A weak local government also makes cities susceptible to corruption. The WBGU proposes a financial, institutional and political strengthening of the cities, so that they can take on more responsibility for urban development and infrastructure.
- *Cities should assume responsibility for their own transformation pathways:* Cities should increasingly take on responsibility both locally and globally for the Great Transformation towards sustainability. In this way they can become 'real-world laboratories' for their own transformative solutions, for which there are no generally valid blueprints. The specific process of designing the transformation pathway should be a joint search process involving local stakeholders. The diversity of transformation pathways offers opportunities for innovation and for learning processes between cities. Forums for the exchange of information already exist (e.g. ICLEI, C40, Compact of Mayors).
- *Create arenas for public discourse and experimentation; allow and encourage the inclusion of the urban population:* Transformation requires dialogue, joint learning processes and conflict management. Urban societies must agree on the objectives of their transformation and their long-term future, for example in the form of their own charters for the urban transformation. The prerequisite is the establishment of urban arenas for public discourse in which civil-society stakeholders, non-governmental organizations, the private sector and scientists can discuss and negotiate with the urban administration – in public, transparently and on an equal footing. Spaces for experimentation to create innovations in the field of urban design are essential for producing a wide variety of ideas and innovative solution approaches. This form of citizen inclusion simultaneously boosts the legitimacy of local governments. Urban societies should create suitable framework conditions (e.g. funding structures) and promote the skills needed to take action.
- *Use the normative compass to find integrative solutions to conflicts of objectives:* In the search for solutions to conflicts of objectives, an integrative approach should be pursued when designing urban development processes on the basis of the normative compass. In view of the complex challenges and time pressure from transformation, integrated, holistic, systemic solutions are required from the outset. Co-benefits should be exploited, because a sectoral approach or a sequential way of tackling individual objectives can trigger considerable conflicts of objectives. The aspect of *Eigenart* must not be neglected either; for example, identity-generating landmarks and parks should be preserved and social cohesion strengthened as an important resilience factor.
- *Inclusive growth – remove socio-economic disparities:* A key condition for the ability of cities to transform is the reduction of socio-economic disparities that have a negative impact on social cohesion, stability and security in urban societies. Cities can invoke SDG no. 10 "Reduce inequality within and among countries" and make their contribution, for example, to supplying housing, access to education, health services and public transport. In addition, all the inhabitants of a city, regardless of their income, should have a comparable chance to shape the development of a city.
- *Improve cities' adaptability to rapid changes:* The transformation of cities towards sustainability is a long-term process in which fundamental changes are made in the direction of urban development. The solution approaches are many and varied and depend on local conditions. Non-sustainable development pathways and associated path dependencies must be avoided by leapfrogging certain technological and institutional development stages. Furthermore, cities can be exposed to new dynamics that force them to act under great time pressure and uncertainty, e.g. the impacts of climate change or large refugee movements. Cities and city districts should therefore also be understood as transitory spaces in which structures that are needed today can be created, but must be modifiable over the long term. Thus, in future, architecture, urban development and urban governance must offer a framework that can tolerate and promote changes, additions and extensions. Leapfrogging, modularity, flexibility, adaptability and resilience can therefore be regarded as design features for 'urban development in transition'.
- *Regional planning should promote polycentric urbanization:* If spatial development concentrates on a small number of central locations, this usually exacerbates social disparities and disparities between economic areas. National and regional planning should encourage the emergence of polycentric spatial structures, so that the area is dominated not by one, but by more than one central location. The guiding concept of 'decentralized concentration' is based on this principle; it pursues the goal of avoid-

ing disparities between social and economic areas by promoting decentralized settlement structures and infrastructures and counteracting potential agglomeration disadvantages in growth regions.

- *Strengthen the role of science and education in the urban transformation:* Science and education contribute towards a broader understanding of the urban transformation; they make this knowledge accessible and help identify and implement suitable transformation pathways for the respective city. Inter- and transdisciplinary research is especially suitable for this, because the inclusion of urban stakeholders significantly improves the chances of implementation. In 'real-world laboratories', scientists and stakeholders can jointly acquire knowledge and problem solutions for the urban transformation by trying things out and experimenting.

6. Core recommendations

The WBGU's core recommendations for the urban transformation towards sustainability are presented in the following. The section begins by stating key objectives, as well as the most important measures and approaches, for individual transformative action fields. This is followed by measures and approaches that are particularly relevant for the transformation in terms of transformative governance and financing; each is differentiated according to local, national and global levels of action. These core recommendations are summarized in Tables 3 to 5.

Core recommendations for transformative action fields

Transformative action fields are areas of urban development where the WBGU sees the greatest potential leverage effects for a successful urban transformation towards sustainability. First, there are five fields that are already being discussed internationally, but which, against the background of the transformation, the WBGU places into a new context in relation to time horizons and scale (Table 3). Second, it makes recommendations on three transformative action fields that are examined in detail in this report and which, in the WBGU's view, are given too little attention internationally (focal points in Table 3).

- *Decarbonization, energy and mitigation of climate change – improve urban decision-making skills and strive for zero emissions:* To achieve the urban transformation towards climate compatibility, direct CO_2 emissions in cities must be cut to zero and the demand for energy contained in order to make the global energy transformation towards CO_2-emissions-free energy systems possible. So-called 'grey energy' must also be taken into account, i.e. the energy that is expended directly and indirectly in the construction of buildings and the infrastructure. At the same time, access to energy and infrastructure is yet to be provided to hundreds of millions of present-day – and billions of future – urban dwellers. Cities need to develop the ability to respond systemically to these challenges and to make use of the many existing synergies, e.g. with the health sector.
- *Mobility and transport – overcome the dominance of motorized private traffic:* The objective should be accessible cities where certain locations (workplace, homes, etc.) are close together – pedestrian-friendly cities with safe cycle routes and affordable, low-carbon and good-quality public transport options accessible to all social groups. Transport planning should place cycling, walking and public transport at the centre of urban planning (transit-oriented development).
- *Link urban form to sustainability and adaptability:* Low-carbon urban and city-district planning and development need locally adapted urban planning strategies that observe not only the respective geographical and cultural context, but also technical possibilities of implementation and maintenance. In order to be able to respond better to population dynamics or climate change, flexible concepts in architecture and urban development should also be integrated. This applies particularly to cities in risk-exposed locations. Furthermore, greater flexibility makes it easier to integrate new knowledge and technical innovations into the urban infrastructure.
- *Adapt urban development to climate change:* In order to reduce the risks of climate change for urban societies, strategies should be developed to protect the population (awareness raising, disaster preparedness), to prioritize infrastructure investments, and to integrate the mitigation of climate change and climate adaptation into long-term planning. Adaptation to climate change is an iterative learning process that should be incorporated into urban development as a cross-cutting subject through both incremental and drastic measures (e.g. relocations, withdrawal from formerly populated areas).
- *Reduce poverty and socio-economic disparities in cities:* Local governments should ensure that not only the existing key actors, but also less well-organized, civil-society stakeholders have enough opportunities to help shape urban development and

the improvement of their living conditions. In particular, local governments should make sure that urban poverty groups receive access to basic infrastructure and services. Here, a fundamental change of perspective is necessary that does not combat the symptoms, but focuses on the reasons why inadequate informal settlements develop. Conventional urbanization has mainly directed financial, personnel and creative resources into the development of residential areas for the upper 1-20 % of the world's population. New priorities need to be set here if a situation is to be prevented in which 3 billion people will be living in unacceptable, inhospitable, informal city districts in 2050. Particular priorities include winning over the relevant urban actors – such as local governments, architects, city planners, investors, development banks and civil-society stakeholders – for the tasks of strengthening and developing informal, often precarious city districts, mobilizing extensive public and private financial resources, gearing planners and architects to the needs of transformation, reforming training systems in this direction, and also strengthening the necessary scientific resources in order to improve the quality of life for urban poverty groups.

- *Ensure that land use is oriented towards the common good:* Urban land use is the basis for the development of a city, exercising a decisive influence on its functionality and quality of life. Land use is therefore a decisive transformative action field. In order to avoid negative path dependencies, transformative land-use management should concentrate on key principles wherever possible. These principles include the reduction of land degradation, a low-carbon, environmentally acceptable and socially compatible densification, orientation towards the common good, and a policy of flexibility and adaptability in land use. To make this possible, cities need adequate land tenure systems. There are already many instruments available for controlling land use and strengthening urban land governance. Due to the great diversity of cities and their different (national) legal, cultural and socio-economic conditions, every local government must carefully examine which measures are most suitable. The prerequisites, however, are property rights and urban land tenure systems that are committed to the common good.
- *Promote the sustainable stewardship of materials and material flows:* Cities are hubs in the global flows of materials and resources. The growth of these flows involves a number of undesirable side effects. These include the destruction of natural landscapes, the release of toxic substances, and greenhouse-gas emissions. Furthermore, important resources could become scarce in a few decades if their extraction continues unabated. The transition in this century to a sustainable circular economy that is as complete as possible is therefore a key element of the Great Transformation towards sustainability. Thinking in terms of material flows and life cycles, not only of products but also of (urban) infrastructures and buildings, and paying attention to the impacts of emissions or waste in the spheres of production, transport, consumption, and even waste treatment: these are all prerequisites for a sustainable circular economy. Starting points are the efficient use of resources, reducing material flows, minimizing ecological footprints and closing material cycles. The topics of building materials, phosphorus and electronic scrap are covered as examples of the diversity of the problems involved.
- *Strengthen resources and potential for healthy living in cities:* Depending, for example, on their location, size and level of development, cities harbour specific possibilities and risks in the field of health for the urban population. The WBGU identifies the following key challenges: the increase in non-communicable diseases and the spread of unhealthy lifestyles and habits, the increasing risk of urban epidemics and new infectious diseases, and health disparities in cities. In view of ongoing global urbanization, the promotion of urban health is essential, since this is both a goal and a resource for the urban transformation towards sustainability. In many cities, health-related interventions have hitherto been largely sectoral and pathogenic, i.e. disease focused, in orientation. The WBGU calls instead for a holistic, resource- and process-oriented approach to promoting urban health that places more emphasis on the conditions for a healthy childhood and life in cities. Because of the long-term consequences of factors that are beneficial or detrimental to health (e.g. use of toxic materials, high exposure to emissions in childhood, movement-impeding urban design), the path dependencies are very high here. Their prevention and the promotion of health are therefore essential as components of sustainable urban development. In addition, health promotion is an important cross-cutting subject that can generate a wide range of synergies if processed in a holistic way.

Table 3
Core recommendations for transformative action fields.
Source: WBGU

Goals	Important measures and approaches
Internationally discussed fields	
Decarbonization, energy, and mitigation of climate-change	
› Replace all fossil CO_2 emission sources in cities with emissions-free alternatives by 2070 at the latest › Ensure access to affordable, reliable, sustainable and modern energy for all by 2030 (SDG 7) › Gear urban development towards limiting the demand for energy	› Compile decarbonization roadmaps for all cities › Integrate air-pollution control and mitigation of climate change › Informal settlements: take advantage of the opportunities of renewable systems › In the long term, plan new cities exclusively emissions-free and ensure sustainable management of materials and material flows
Mobility and transport	
› Achieve complete decarbonization of transport systems by 2070 › Implement inclusive urban mobility by 2030 (SDG 11, target 11.2 "Provide … accessible and sustainable transport systems for all") › In the long term, allow only emissions-free mobility in inner cities	› Build and develop mixed residential and working city districts, and always within walking distance of public transport (transit-oriented development) › Make public transport accessible to everyone and roads safer for non-motorized transport (pro-poor transport policies) › Gradually reduce motorized individual transport in inner cities
Urban form	
› Combine sustainability and adaptability in urban development › Create inclusive city districts (people-oriented, climate-compatible) › Provide buildings and spatial structures to create urban quality of life, e.g. easily accessible, safe spaces with niches for different user groups to allow interaction and relaxation	› Develop concepts for flexible and adaptable city districts › Decelerate urbanization surges; polycentric spatial design instead of conventional rural-urban migration › Seek a balance between densification and green/open spaces › Increase incentives for passive energy-saving in city-district development and construction › In new urban areas, implement planning strategies for sustainable city districts
Adaptation to climate change	
› Reduce climate-change risks for urban societies › Adapt urban development to climate change	› Integrate adaptation into urban planning as an iterative learning process: e.g. include scientific findings › Integrate mitigation and adaptation when making long-term infrastructure decisions › Improve skills of vulnerable groups to cope with climate change › Improve local data availability
Poverty reduction and socio-economic disparities	
› Inclusive growth: ensure above-average growth for lower income groups › Reduce poverty and socio-economic disparities in cities › Improve quality of life in informal settlements › Implement the right to adequate housing and secure political inclusion rights › Initiate a paradigm shift: strengthen initiatives for the poorest 40 % of the world's urban societies	› Establish global initiative of UN-Habitat, UNDP, UNEP and World Bank for the additional 1-2 billion people expected to be in inadequate housing › Counteract the growing concentration of property and land ownership › Win over relevant urban actors (e.g. local governments, architects, planners) for efforts to improve the quality of life of urban poverty groups; mobilize comprehensive public and private financial resources › Make the right to adequate housing a core element of bilateral and multilateral development cooperation › Prioritize the poorest 40 % instead of the richest 5 % of the population in urban investment and architectural competitions

Goals	Important measures and approaches
	› Upgrade urbanization to a priority area in the OECD's Development Assistance Committee (OECD-DAC) › Initiate a priority programme 'Adequate Housing for All' at the World Bank, focusing on regional and medium-sized cities › Secure access to basic infrastructure, education and health facilities for all
Focal points: fields that are given too little attention internationally	
Urban land use	
› Ensure that land use is oriented towards the common good › Use land more flexibly (i.a. risk adjustment and precaution) › Minimize land degradation	› Introduce or strengthen social-impact analyses for land-use management › Ensure a transparency and documentation requirement for land ownership and use (reform land law if necessary) › Keep enough urban spaces in public or community hands › Secure right of first refusal or veto right for municipalities for plots of land › Establish locally adapted planning systems › Fight corruption and stem land grabbing › Stem land and property speculation › Consider flexible management models (interim use, shared space, urban commons, etc.)
Materials and material flows	
› Establish as complete a circular economy as possible in this century › Substitute toxic or pollutant substances › Ensure recovery of non-renewable resources Examples: › Replace CO_2-emissions-intensive building materials (e.g. reinforced concrete) with low-carbon alternatives › Stop the loss of phosphorus › Organize sustainable recycling systems for electronic waste	› Promote product durability and reparability (e.g. resource taxation) › Promote responsible management of waste and recycling and stem illegal waste trade (Basel Convention) › Promote modular building and design methods, including making structures easy to dismantle or recycle, above all low-carbon building materials (building regulations) › Manage materials and material flows sustainably in public procurement and works contracts
Urban health	
› Target a global paradigm shift from fighting disease to promoting health by boosting resources and potential for a healthy life in cities › Stabilize health promotion by means of cross-sectoral city planning and development, and by strengthening municipal responsibility for planning › Promote the urban population's health competence and behaviour	› Secure substantive inclusion, improve food security › Design cities in a way that promotes health, focusing on spaces for encounters and activities › Strengthen the self-organization of urban residents; support small-scale health-promoting measures in city districts › Stem urban epidemics and new infectious diseases by promoting the resilience of the population, health education and improved health reporting › Promote health by means of cross-sectoral urban planning (synergies with mitigation of climate change and decarbonization)

Core recommendations for transformative urban governance: stakeholders of urban development

Use the transformative potential of cities at the international level and make urbanization a central theme in international cooperation

Hitherto, cities have hardly played any role in global governance structures, even though they are one of the most important stakeholders, for example, when it comes to avoiding global environmental change. To be able to use the transformative potential of cities, also at the international level, global governance structures should be designed in a way that meets present-day needs and opportunities. This initially means that nation states and international organizations recognize and foster 'urban foreign policy' – i.e. the international engagement of cities – and formulate rules in such a way that this policy is not obstructed (Table 4). Cities and cities networks should be given a right to participate in, and speak at, relevant international negotiations in order to improve exchanges between the different levels. Cities networks should raise their profile by bundling their activities.

In view of the dynamics of urbanization and the associated challenges, it is urgently necessary to reform and expand UN-Habitat. The WBGU discusses different options in this context. While recommending that UN-Habitat should be developed into a UN organization in the medium term, in the short term, the WBGU says, it should be strengthened in line with its programme status by management reforms, a stronger focus on thematic work, policy development, and the creation of a capable scientific department.

In addition, an international scientific panel on sustainable urbanization should be set up. Like climate change or gender, urbanization and sustainable urban development must become cross-cutting issues in all UN and multilateral organizations. The Habitat conferences should also be further developed. In view of the dynamics of urbanization, a 20-year cycle is outdated and should be shortened to 4 years.

In order to accelerate and intensify the global debate on urbanization and transformation, the G20 should take up the subject on a permanent basis. Germany's federal government has a key role to play here, since it will be assuming the G20 Presidency in 2017. It should take this opportunity to put the topic on the agenda. Similarly, the federal government should use its influence and introduce elements of the social contract for the urban transformation towards sustainability developed by the WBGU to boost the status of UN-Habitat and help design the Habitat follow-up process. Furthermore, in view of the key role of cities in the task of dealing with the key challenges of global development (refugees, climate change, limits to growth), the Federal Ministry for Economic Cooperation and Development (BMZ), the Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) and the Ministry of Education and Research (BMBF) should make urbanization a central cornerstone of German development cooperation, international environmental cooperation and international scientific cooperation. German involvement in these areas should be significantly expanded.

Strengthen cities' ability to shape and plan

In order to strengthen the ability of local governments to shape their city's destiny, the principle of subsidiarity should be consistently implemented at the national level and cities given corresponding decision-making powers. Cities should be involved in the decision-making process wherever national decisions are relevant for them. The implementation of the principle of subsidiarity and urban co-determination should be secured by a constitutionally enshrined right to local self-government or self-administration, or the like.

The capacity of local governments should be improved by better training of urban planners and administrative staff – including the integration of environmental and social-scientific methods into the curricula. Appropriate IT and data resources should be developed to make the most of the possibilities offered by digitization. It is also expedient to grant local governments full responsibility for personnel management in the selection of qualified employees and the creation of attractive working conditions.

Furthermore, the fight against corruption should be stepped up and all local stakeholders integrated into anti-corruption strategies. This involves ensuring the transparency, integrity and accountability of administrations, introducing freedom-of-information laws and legal protection for whistle-blowers, and encouraging anti-corruption ethics and compliance programmes in the private sector.

In order to maintain the ability of urban societies to shape the development of their cities, the compatibility of private investments with the common good should be ensured and real-estate speculation restricted. To this purpose, policies are needed that expand social housing, promote alternative forms of ownership (e.g. cooperatives), strengthen rental markets with high standards of tenant protection, and introduce innovative and socially compatible property taxes and real-estate transfer taxes. These national and local measures should be supplemented on a global level by sustainable investment standards to which investors commit themselves.

Table 4
Core recommendations for transformative urban governance.
Source: WBGU

Goals	Important measures and approaches
Global/international level	
› Make use of the transformative potential of cities at the international and transnational level	› Promote 'urban foreign policy' – the transnational engagement of cities › Give cities and cities networks the right to participate in, and speak at, international negotiations › Bundle the activities of city networks and strengthen networks
› Make urbanization and sustainable urban development a central topic in international cooperation	› Pursue UN-Habitat reform: in the short term through management reform by focusing more clearly on content and policy development; create an in-house scientific department › In the medium term, work for an upgrade to a UN organization › Further develop Habitat conferences: shorten Habitat conference cycle to 4 years; New Urban Agenda should contain institutional architecture for implementation › AA, BMUB, BMZ: promote upgrade of UN-Habitat and introduce the elements of the urban social contract into the Habitat III follow-up process › UN, development banks, other multilateral organizations: establish urbanization as a cross-cutting topic › Set up an international scientific panel on urbanization and sustainable urban development › G20: make urbanization and transformation relevant topics – permanently and across the board; Germany's G20 Presidency should put the topic on the agenda in 2017 › BMZ, BMUB, BMBF: make urbanization a central point of development cooperation, environmental cooperation and scientific cooperation
National level	
› Equip cities with the necessary decision-making powers or strengthen these powers	› Consistently enforce the subsidiarity principle › Enact legislation on local self-administration or some other form of constitutional recognition of urban autonomy
› Integrate cities better into national and regional decision-making processes by giving them opportunities for consultation	
› Strengthen capacity of urban administration	› Improve training of city planners and urban administration staff: make environmental and social principles part of training › Give cities autonomy in staff recruitment
› Fight corruption	› Ensure the transparency, integrity and accountability of administrations › Introduce freedom-of-information laws and legal protection for whistle-blowers › Encourage anti-corruption pledges and programmes in the private sector
› Ensure the compatibility of private investment with the common good and restrict real-estate speculation	› Promote social housing › Strengthen rental markets with high standards of tenant protection › Strengthen alternative forms of ownership › Develop and introduce innovative, socially compatible approaches to property taxes and real-estate transfer taxes › Establish sustainable investment standards worldwide
Local level	
› Establish collaborative governance structures and integrate the entire urban population	› Use strong instruments of participation where appropriate
› Strengthen informal settlements and city districts and incorporate them into urban development	› Create affordable housing › Integrate existing, common-law procedures; suppress criminal practices
› Support (transnational) civil-society networks	› Provide financial support › Support capacity building
› Improve connection to global issues	› Institutionalize advocates of global issues

Establish collaborative governance: empower and commit urban societies to shape their own cities

It is not only the normative compass that demands that all sections of the urban society should take part in shaping the transformation process. Without the necessary approval and support of the population, even local governments with comprehensive decision-making powers and sufficient financial resources would fail to meet the challenges of the transformation process.

To achieve this, it is necessary to establish collaborative governance structures. This involves strengthening arenas for public discourse in cities wherever feasible, using instruments of participation, and facilitating participatory processes in local governments. In highly regulated contexts, particularly in mature and in quickly growing, planned cities, it is necessary to create spaces for experimentation and development for trying out different forms of sustainable living. Where such spaces already exist, cities should consider how they can be supported. The transformative effect of civil-society and municipal activities can be reinforced by connecting them with scientific expertise. For this it is expedient to set up transdisciplinary research centres at the urban and regional level.

Especially in cities and city districts in developing countries and emerging economies, urban development takes place in informal urbanization processes, largely independently of governmental or regulatory control. Here it is crucial to raise the profile of informal governance structures that promote the common good and to give them more recognition. It is also important to repress criminal practices. In general more attention must be paid to the rights and needs of the population in informal settlements; they need help to articulate their needs and shape the development of their communities.

Since the efficacy of local civil-society stakeholders increases when they operate in regional, national and especially transnational networks, these networks should be supported. To this purpose, financing programmes that are adapted to the needs of these networks should be launched and capacity-building assistance provided for small organizations, so that they can apply for such funds.

Ombudspersons for global issues should be appointed at the local level to ensure that more consideration is given to – and more information provided on – global issues.

Core recommendations for financing

Many cities lack the financial capacity for the growing number of local tasks and the increase in infrastructure investment needs. In countries characterized by a strong local level, such as Denmark, local governments account for 62% of total public expenditure and 32.9% of GDP. In developing countries like Kenya, for example, the corresponding figures are 1.2% and 0.06% (UCLG and Dexia, 2006). Estimates of financial needs for the modernization, expansion and construction of the infrastructure over the next 15 years lie in the high two-digit trillion range. In order to finance the transformation towards sustainability in cities, the municipal administration and the financial base must be strengthened, private capital for urban infrastructure must be mobilized, and the international financing of development and climate mitigation must be coordinated and geared more towards sustainable urban development (Table 5). In many cities in developing countries and emerging economies, it is initially a matter of building an administration that is capable of acting and getting things done effectively.

Goal 1: Strengthen the municipal administration and the financial basis

Nationally: Transfers by nation states to the local level should guarantee solid basic funding to ensure a minimum standard for the nationwide provision of public services (substantive inclusion). For this, a relative stability of annual allocations must be ensured to make long-term budget planning possible. The WBGU recommends using transfer payments – especially in developing countries and emerging economies – to strengthen the endogenous financial potential of cities. Opportunities of this kind are provided by tying transfer payments to reforms aimed at building new structures, such as efficient financial management systems, land registry offices and administrative capacities for charging for services or determining the market values of land and real estate. In highly developed countries that already have an extensive supply of public services, the distribution keys should support existing development potential.

Consideration should be given to granting easier access to the financial markets for those cities and municipalities that generate regular and comprehensive revenues of their own and can show that they have a successful system of financial management. In order to exclude reckless debt financing, it must be ensured that the borrowed capital is used for investment and not to finance current expenditure.

Locally: Better use should be made of existing financing instruments. This applies in particular to property taxes and real-estate transfer taxes, which represent a dynamic and regular source of income, especially in fast-growing cities. Local governments should use real-estate taxes not only to boost municipal

Table 5
Core recommendations for financing the urban transformation. The measures mentioned must usually be taken up at all three levels and networked.
Source: WBGU

Goals	Important measures and approaches
Global level	
› Coordinate the international financing of development and climate mitigation and gear it more closely to sustainable urban development	› Gear international collaborations to already agreed objectives on sustainable urban development › Direct international financial resources to the municipalities as appropriate › Clarify the rules on accounting with regard to the Green Climate Fund (GCF) to avoid double counting between development and climate financing
› Mobilize private capital for urban infrastructure	› Take local factors into account when linking the financial sector with sustainable development objectives › Have existing criteria and standards reviewed by external evaluators › Develop binding criteria and standards for sustainable investment and extend them by adding city-specific criteria › Introduce a global insurance mechanism for urban infrastructure and further develop innovative financing instruments
National level	
› Strengthen municipal administration and financial base	› Ensure solid financing of cities through adequate transfer payments › Use transfer payments to strengthen the endogenous financing potential and support existing development potential › Consider making it easier for cities to use the financial markets
› Mobilize private capital for urban infrastructure	› Work out a long-term and binding national transformation strategy › Create inclusive financial institutions
Local level	
› Strengthen municipal administration and financial base	› Make better use of the potential of existing financial instruments › Create transparency with respect to municipal revenue and services › Coordinate policies above and beyond local jurisdictions and, wherever possible, harmonize administrative and functional borders
› Mobilize private capital for urban infrastructure	› Develop community forms of financing

revenues, but also to generate a transformative steering effect, for example through progressive tax rates or coupling the tax rate to land use. In order to ensure transparency in relation to the use of the charges levied, the WBGU recommends that cities and municipalities should publicize information on public revenues and expenditures on infrastructure and public services. The pace of urbanization is leading to a change in the spatial expansion of the urban area. This can lead to coordination problems in local task management across municipal borders, as well as in the efficient use of local sources of finance. In order to maximize local revenue potential, cities and municipalities should coordinate their policies above and beyond local jurisdictions and, wherever possible, harmonize administrative and functional borders.

Goal 2: Mobilize private capital for urban infrastructure

Globally: The growing link between the financial policy framework and sustainable development objectives (UNEP and IEH, 2015), and a change in thinking and acting from the short term to the long term are trends that are moving in the right direction. The WBGU recommends paying more attention to local factors in this development and having external evaluators review existing criteria, such as the Green Bond Principles developed by the International Capital Market Association or the Principles of Responsible Investment, which are based on a UN initiative. In the long term, uniform, binding criteria and standards should be developed to generate transparency in relation to the social and environmental compatibility of investment and financial flows. In order to reduce risks to investment in cities, the WBGU recommends the introduction of a global

insurance mechanism for urban infrastructure and the further development of new innovative financing instruments, such as the pooling of urban investment in legally independent companies (special-purpose vehicles) and the placement of bonds or income rights in these companies (e.g. yield cos) on the capital market.

Nationally: The WBGU recommends defining a long-term and binding national transformation strategy in order to improve planning certainty and legal certainty and to lay the foundation for coordination at different administrative levels, as well as with private stakeholders. Local stakeholders should also be involved in the development of the national transformation strategy in order to take into account the diverse local situations and to be able to convert successful measures at the municipal level into a common action framework. In developing countries, the aim must be to develop inclusive financial institutions and to make financial services accessible to poor population groups. The WBGU recommends an increase in funding for these developments, both by international development cooperation and by public and international development banks.

Locally: The participation of the urban population is also pivotal in the financing of sustainable urban development, and existing engagement should be supported. In this context, the WBGU recommends promoting and disseminating community forms of financing, such as energy and housing cooperatives, and examining the potential of crowdsourcing platforms for financing neighbourhood projects.

Goal 3: Gear the financing of international development and climate mitigation more closely to urban development

Globally: The WBGU recommends gearing international cooperation to the already agreed objectives on sustainable urban development, e.g. the priority of 'creating climate-compatible cities' as identified by the Green Climate Fund. This orientation has already been laid down at the international level in the Addis Ababa Action Plan and should be consistently implemented. International financial resources should be directed to municipalities in an order of magnitude adequate to their problems; these resources should be used increasingly for developing and enhancing local administrative capacity. Accounting rules on the financing of development and climate mitigation should be reviewed to avoid double counting.

7. Research on the urban transformation

Since the urban transformation towards sustainability is also a search process, research has a special role to play. Besides basic research, which is indispensable for an elementary increase in knowledge, research can advance transformation processes both by generating the innovations needed for the urban transformation and by contributing to a fundamental understanding of the processes of change. In order to determine the role of research in relation to the transformation, the WBGU returns to the distinction between 'transformation research' and 'transformative research', which it coined in the report 'A Social Contract for Sustainability' (WBGU, 2011). In this context, transformation research refers to the exploration of the factors, mechanisms and causal relationships of the transformation, while transformative research means the kind of research that supports the transformation by means of specific innovations – be they social, economic, technical or of some other kind.

The WBGU is aware that, in addition to the production of transformative knowledge, the aim must also be to anchor this knowledge in society and to make it available for societal transformation processes. Such a perspective extends beyond science and also includes general education processes through which an understanding of the options for action and solution approaches is created. For example, urban real-world laboratories are an important arena for linking transformative research processes with education processes. A comprehensive analysis of transformative education processes in the urban sphere is itself still a research desideratum.

In Germany and elsewhere, urbanization is an intensively researched field. Thus, building blocks already exist which can help answer many research questions on urban transformations. However, from the WBGU's strategic, global and long-term perspective of the sustainability of the urbanization processes, it becomes clear that both further transformation research and further transformative research are required. The WBGU's aim is to identify necessary future focal points of the urban research agenda against the background of its transformation analysis.

To this purpose, the WBGU outlines the key questions of the urban transformation towards sustainability, analyses existing research policies, programmes and institutions, and extrapolates the main elements and orientation guidelines for a new urban research agenda (Table 6).

Table 6
Research on the urban transformation: key issues of content, requirements and basic recommendations.
Source: WBGU

Key issues of content in research for the urban transformation	Requirements regarding transdisciplinary research on the urban transformation	Basic recommendations for further developed research on the urban transformation
Systemic view, if possible considering all three dimensions of the normative compass: › Urban metabolism (e.g. building materials, phosphorus, electronic waste) › Urban form › Inclusion (urban quality of life, inequality) › Urban health › Mobility and transport › Urban land use › Governance (indicators, facilitating an urban 'foreign policy') Cross-cutting issues of research for the urban transformation: › Pool of data available to global transformation research › Meta-reflection on transdisciplinarity and participation › Trade-offs and synergies between the sustaining of the natural life-support systems, inclusion and *Eigenart* in the urban space	› Normative orientation: guiding concept of sustainable urban development in the context of sustaining the natural life-support systems, inclusion and *Eigenart* › Structural principles: orientation of research to societal needs by co-design and co-production of knowledge; solution orientation; reflectivity › Results and effects: generation of sustainable alternatives to existing technologies and social practices by technological, social or governance innovation; development of capacity at the individual and institutional level; structure formation	Coordinate a participatory roadmap process, with the BMBF as the central player: 1. Strengthen basic research on the urban transformation 2. Set up new data infrastructures as a basis for indicator formation and the monitoring of the urban transformation 3. Establish new forms of global agenda-setting processes for urban transformation research 4. Build long-term transdisciplinary research centres at the urban and regional level 5. Press ahead with international capacity development in the research field

Cities and the Great Transformation – an open research programme

To start with, the WBGU identifies key issues of transformative urbanization research along the three dimensions of the normative compass introduced in the report.

Research on the *natural life-support systems* in the context of the urban transformation focuses on the planetary guard rails and local environmental quality in cities, thus providing orientation for sustainable urban development. The mitigation of climate change and adaptation to climate change in cities has increasingly been at the focus of research in recent years. Nevertheless, there is a lack of consistent and comparable data on emissions at the city level. In addition, the WBGU believes that further research is needed in particular into the urban metabolism and the requirements of a complete circular economy.

Research on *inclusion* serves to explore the fundamentals of a people-oriented urban development. One of the key challenges is making research in this field transformative, i.e. actively promoting and internationally networking inclusion processes to make global learning possible. The WBGU is introducing a new concept into the debate – 'solidarity-based quality of life' – which can generate stimuli for transformation research.

Research on *Eigenart* (a German word meaning 'character') emphasizes the focus on the diversity and the specific development dynamics of urban transformation processes, as well as the relationship between quality of life and urban design. The WBGU recommends gearing the study of urban prosperity and urban development more towards urban quality of life. Research on principles and indicators for *Eigenart* plays a special role here, because it has hitherto scarcely been part of common indicator systems. Research should develop a repertoire of categories for *Eigenart* which, while universally valid, are locally grounded and can also be combined in a locally specific way.

A future-proof urban transformation following the logic of the natural life-support systems, inclusion and *Eigenart* makes considerable demands on the governance of cities. Specific research issues on two major thematic constellations follow from this: (1) governance within the cities in informal contexts and (2) governance between cities at the global level. Furthermore, the WBGU sees an urgent need for research to further develop an index on the quality of urban trans-

formative governance.

In addition to the thematically defined constellations, which should be approached from the angle of transformative research, there are fundamental methodological and conceptual cross-cutting issues of transformation research. These include, in particular, reflexive research on the transferability of contextualized findings, on conflicts of objectives that arise from the dimensions of the normative compass, and on methods of urban transformation research. Furthermore, it is essential to achieve a general improvement in the pool of data available to global transformation research. This should include data on urban health, governance, inequality and the urban metabolism – both at the global and national level and at the regional and urban level – as well as data on social groups within cities.

Requirements regarding research for the urban transformation

Effective urban research in the sense of the Great Transformation towards sustainability should not only answer pressing questions of content; it should also be geared towards normative goals and be structurally organized in a way that can have a transformative effect. In its 2011 report 'A Social Contract for Sustainability', the WBGU already formulated general demands on research relating to the transformation; in the present report it has adapted these to the specific context of urban and urbanization research (Table 6). The WBGU's intention with this set of structural criteria is to make suggestions to scientists and research funders on how to make research and research programmes transformative.

These criteria include, in particular, societal relevance and problem orientation, which require inter- and transdisciplinary research that will ideally lead to new systemic and comprehensive solution strategies. Instead of following rigid guidelines, transformative research and research programmes should be reflexive and adapt flexibly to problem situations. In addition, the WBGU advocates testing innovative methods in urbanization research, since trying things out and experimenting play a key role in the shaping of urban transformation.

The urban transformation is a serious and global challenge; accordingly, research should be based on international cooperation and equipped with sufficient resources, both to boost research activities and to implement the findings.

Transformative research aims to effectively support the transformation towards a sustainable, liveable city. In addition to transformative technical or social innovations, research can also strengthen transformative capacity at the individual and institutional levels. Especially with regard to cooperation between scientists from industrialized countries with scientists from developing countries and emerging economies, research cooperation can help strengthen educational, scientific and research structures.

Analysis of programmes and institutions

Sustainable urbanization is a prominent, integral part of many different national programmes and initiatives. For example, Germany's Science Year 2015 was devoted to the City of the Future; the BMBF and the BMUB promote city-related research in their research programmes, and several federal government ministries were involved in the National Platform on the City of the Future. At the regional level, Baden-Württemberg's real-world laboratory programme stands out.

Internationally, too, research on the city is prominently represented on the programmatic agenda. The EU funds research on 'Smart Cities and Communities' in various thematic programmes of Horizon 2020. The global research initiative Future Earth counts cities and urbanization among the key challenges of sustainability; intensive interdisciplinary research is planned in this field up to 2025.

None of the programmes or institutions studied can cover the entire spectrum of demands on transformative city research proposed by the WBGU. Although some programmes and institutions can be rated as exemplary in terms of their transdisciplinary structure (e.g. Academy for Spatial Research and Planning, ARL, or German Institute for Urban Studies, Difu), their innovative methods (e.g. Baden-Württemberg's real-world laboratories) or their participatory agenda process (e.g. the National Platform on the City of the Future), they lack international orientation and networking. Other programmes, by contrast, while internationally oriented, are too narrowly focused on technological development. The EU's Framework Programme for Research and Innovation, Horizon 2020, for example, places a great deal of emphasis on digitization and technology development. This means there is a risk of creating new path dependencies and losing sight of comprehensive sustainability objectives as defined by the normative compass.

The WBGU stresses, however, that several positive approaches are already present in existing institutions and programmes, and sees potential for supplementing these by adding further aspects of sustainable urbanization. For example, the research agenda and research funding of the European Joint Programming Initiative

Urban Europe show how holistic and reflexive research can be structured. The BMBF's Future Megacities research programme and other transdisciplinary BMBF calls for proposals in different areas of sustainability research can also be seen as examples of good practice in the field of systemic transdisciplinary and international research. The WBGU supports such integrated approaches and recommends incorporating not only socio-ecological aspects, but also, on a larger scale, social and cultural aspects into research programmes.

In addition, Future Earth also offers a chance to generate substantive and structural ideas thanks to its international and participative character, and to become an umbrella programme for international research activities. This would make it possible to improve the coordination and networking of research programmes and activities for sustainable urbanization.

Recommendations for a new research agenda on the urban transformation

The WBGU's analysis of ongoing changes in content, processes and institutions leads to five basic recommendations.

- *First:* The WBGU recommends institutionally strengthening basic research for the urban transformation towards sustainability and suggests setting up a separate Max Planck Institute for Urban Transformation as a hub for basic research on the urban transformation. Although today many substantive individual questions of urban transformation research are already being addressed in the research system, and interdisciplinary work on individual questions is proceeding successfully at a high level, understanding urban transformation processes still raises a wide range of basic research issues.
- *Second:* Sustainable urbanization requires the establishment of new data infrastructures for an effective urban transformation within the normative compass. The WBGU recommends setting up suitable data-collecting, monitoring and control structures in order to create social, political and economic indicators on urban transformation based on these data; these structures should relate especially to the transformative action fields identified in the report, such as materials and material flows, mobility and transport, urban health and urban land use. The collection of data could be supported by approaches of citizen science.
- *Third*: In future, agenda setting should be based on experience with participation gained in the context of the National Platform on the City of the Future. Future urbanization research should already get the key actors of the urban transformation involved when conceiving research programmes. In international research programmes, particular value should be attached to setting a common agenda with the partner countries.
- *Fourth:* Transformative research needs long-term and stable structures. For example, urban real-world laboratories that act independently of short-duration projects should therefore be set up worldwide. The formula of '50 global urban real-world laboratories in 50 years' stands for this idea. The idea behind it is that 50 globally distributed, urban real-world laboratories should be created to increase knowledge of the transformation processes in an urban context, to exchange this knowledge amongst themselves, and to make it internationally available to cities. The structure and the financing of these real-world laboratories should be initiated through a joint effort – involving national research funding, financing from foundations, development-cooperation funds, and European research funding – and could be coordinated under the umbrella of Future Earth. 50 years stands emblematically for the fact that, from the outset, such a task must at all costs have a long-term orientation (as regards its institutions and funding).
- *Fifth:* Capacity development should be used to empower developing countries and emerging economies in particular to engage in transdisciplinary research and to accompany urban transformation processes on site in close cooperation with cities. This is also necessary for the implementation of transformative research for urbanization on a global scale. Existing approaches of international research cooperation funded by the BMBF and other ministries could be expanded, combined with the requirements of transformative urbanization research, and developed accordingly.

As regards the implementation of these fundamental recommendations – as well as the other, more specific recommendations in the present report – the WBGU proposes a participatory roadmap process with national and international contributions under the lead of the BMBF.

8. Epilogue

The present report outlines the special challenges and opportunities faced in this century by cities from the perspective of the necessary transformation towards sustainability. One characteristic feature of the debate on the search for solutions is the enormous diversity of instruments and solution pathways. Consequently, there can be no blueprint for sustainable urban

Table 7
Major risks of the global urbanization surge: superordinate objectives and problem-solving measures with a large leverage effect.
Source: WBGU

Urbanization surge up to 2050 – six development risks of global change	Goals	Measures and approaches
Development within the planetary guard rails: Whether planetary guard rails can be complied with will be decided in the mature cities, as well as in the fast-growing new city districts of Asia and Africa. Only if low-carbon, sustainable cities are built there can dangerous global environmental change and an associated global threat to prosperity and quality of life be prevented.	› Replace all fossil CO_2 emission sources in cities with emissions-free alternatives by 2070 at the latest › Gear urban development towards limiting the demand for energy › Establish as complete a circular economy as possible in this century › Replace CO_2-emissions-intensive building materials (e.g. reinforced concrete) with low-carbon alternatives	› Compile decarbonization roadmaps for all cities › In the long term, plan new cities exclusively emissions-free and ensure sustainable management of materials and material flows › Build and develop mixed residential and working city districts, and always within walking distance of public transport (transit-oriented development) › Increase incentives for passive energy-saving in city-district development and construction › Building regulations: promote modular building and design methods, including making structures easy to dismantle or recycle, above all low-carbon building materials
Local environmental conditions as key dimensions of urban quality of life: Good local environmental conditions are a prerequisite for human quality of life. In particular, the quality of life of 2-3 billion people who are expected to be living in informal settlements in 2050 depends on effective local environmental policies.	› Reduce climate-change risks for urban societies › Substitute toxic or pollutant substances › In the long term, allow only emissions-free mobility in inner cities	› Integrate air-pollution control and mitigation of climate change › Gradually reduce motorized individual transport in inner cities › Promote responsible management of waste and recycling and stem illegal waste trade (Basel Convention) › Design cities in a way that promotes health, focusing on spaces for encounters and activity facilities › Integrate adaptation to climate change into urban planning as an iterative learning process: e.g. include scientific findings
Substantive inclusion and socio-economic dimensions: Socio-economic disparities and exclusion in cities are increasing worldwide and threatening the quality of life and stability of urban societies. Particularly threatened are the 2-3 billion people who might be living in informal settlements by 2050. Inequality and exclusion can trigger flows of refugees and thus pose a threat to international security.	› Initiate a paradigm shift: strengthen initiatives for the poorest 40% of the world's urban societies › Inclusive growth: ensure above-average growth for lower income groups › Secure access to basic infrastructure, education and health facilities for all › Implement inclusive urban mobility by 2030 (SDG 11, target 11.2 "Provide ... accessible and sustainable transport systems for all") › Ensure access to affordable, reliable, sustainable and modern energy for all by 2030 (SDG 7)	› Establish global initiative of UN-Habitat, UNDP, UNEP and World Bank for the additional 1-2 billion people expected to be in inadequate housing › Make the right to adequate housing a core element of bilateral and multilateral development cooperation › UN, development banks, other multilateral organizations: establish urbanization as a cross-cutting topic › Initiate a priority programme 'Adequate Housing for All' at the World Bank, focusing on regional and medium-sized cities › Stabilize health promotion by means of cross-sectoral city planning and development, and by strengthening municipal responsibility for planning › OECD-DAC: upgrade urbanization to a priority area

Urbanization surge up to 2050 – six development risks of global change	Goals	Measures and approaches
Political inclusion and participation as a prerequisite for quality of life and a goal of transformation: It will hardly be possible to realize political inclusion for the 2-3 billion people likely to be living in precarious, informal settlements by 2050. These urban communities will be dominated by hardship, often also by violence, sometimes by admirable self-organization as a reaction to the absence of basic public services. In the newly emerging, planned settlements, especially in Asia but also in Africa, new middle classes will demand political inclusion. Political instability threatens where this is not granted.	› Implement the right to adequate housing and secure political inclusion rights › Equip cities with the necessary decision-making powers or strengthen these powers › Integrate cities better into national and regional decision-making processes by giving them opportunities for consultation › Establish collaborative governance structures and integrate the entire urban population › Strengthen informal settlements and city districts and incorporate them into urban development › Support (transnational) civil-society networks › Improve connection to global issues	› Use strong instruments of participation where appropriate › Fight corruption and stem land grabbing › Stem land and property speculation › Secure right of first refusal or veto right for municipalities for plots of land › Establish sustainable investment standards worldwide › Develop and introduce innovative, socially compatible approaches to property taxes and real-estate transfer taxes › Institutionalize advocates of global issues
***Eigenart* as a dimension of urban quality of life and a resource of sustainability transformation – dependent on opportunities for inclusion:** *Eigenart* as a condition for quality of life and a resource for transformations is dependent on inclusion. In mature and newly planned cities/ city districts, *Eigenart* is undermined by social and political inequalities. In informal settlements, *Eigenart* is undermined by hardship and precarious inclusion opportunities. *Eigenart* is under threat for over 50 % of the world's population.	› Ensure that land use is oriented towards the common good › Provide buildings and spatial structures to create urban quality of life, e.g. easily accessible, safe spaces with niches for different user groups to allow interaction and relaxation	› Keep enough urban spaces in public or community hands › Introduce or strengthen social-impact analysis for land-use management › Strengthen rental markets with high standards of tenant protection › Create affordable housing
***Eigenart* in informal and newly planned cities – squaring the circle?** *Eigenart* – in the sense of creative and citizen-influenced urban development – is very difficult to realize for the 1-2 billion people who will probably be living in newly planned cities and city districts in Asia and Africa by 2050. Reasons: high speed of urban construction and the prevailing top-down planning. *Eigenart* will hardly be able to express itself in informal settlements where hardship – and more often than not violence – rule, where hardly any public institutions function, and where an additional 1-2 billion people could be living in precarious housing conditions by 2050.	› Decelerate urbanization surges; polycentric spatial design instead of conventional rural-urban migration › Improve quality of life in informal settlements › Place the lower 40 % of income groups at the centre of urban development › Create inclusive city districts (people-oriented, climate-compatible) › Provide buildings and spatial structures to create urban quality of life, e.g. easily accessible, safe spaces with niches for different user groups to allow interaction and relaxation	› Establish locally adapted planning systems › Initiate a paradigm shift: strengthen initiatives for the poorest 40 % of the world's urban societies › Counteract the growing concentration of property and land ownership › Win over relevant urban actors (e.g. local governments, architects, planners) for efforts to improve the quality of life of urban poverty groups; mobilize comprehensive public and private financial resources

development. Nevertheless, in Table 7 the WBGU dares to order, concentrate and emphasize the recommendations and prioritizes them in two ways:

1. Six key development risks can be identified in the global urbanization surge with its wide range of dynamics.
2. Necessary paradigm shifts, overarching goals, and appropriate measures with a particularly large leverage effect can be assigned to overcoming these major urban problems and managing the urban transformation towards sustainability. This is not only relevant for planning and governance issues, but also, in many ways, for the activation of the transformative potential of the urban societies themselves.

As a general measure, the WBGU recommends upgrading the topic of 'Urbanization and Transformation' to a permanent item on the agenda of the G20. Germany's Presidency of the G20 in 2017 should be used to put the topic onto the agenda. The WBGU also recommends that the federal government should advocate a reform of the UN-Habitat programme and the establishment of an international scientific panel on urbanization and sustainable urban development. Despite the broad portfolio of instruments that already exists, both international research and inter- and transdisciplinary methods should be strengthened in this field because, at the end of the day, the urban transformation towards sustainability also remains a societal search process.

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