**Building for Tomorrow's World**

Dear Herr Weibel, many thanks for inviting me to come and speak here today.

My dear Ladies and Gentlemen,

Dear Europeans,

Dear Herr Sloterdijk.

"Building for Tomorrow's World" is the title of my speech. Now, even before this architect and engineer has uttered a single word on this subject, not a few of you will already be expecting a wonderful image to appear on the screen. This is usually the case with lectures by architects and engineers. You will no doubt be imagining a number of scenes. Images of futuristic living capsules, their arctic white and metallic surfaces punctuated with horizontally aligned oval windows. Pictures of spaceship-like structures that almost look capable of flight. Illustrations of buildings with biomorphic, double-curved exteriors set against backdrops of magical, glowing skies, deep green thickets of rainforest or some decidedly extra-terrestrial terrain. Depictions of living pods made from innovative materials and stacked up into skyscrapers of unprecedented heights. Images that make words like 'carbon fibre' and 'titanium' spring to mind. Pictures of high-rises filled with greenery and fascinating spaces for social interaction, energy production and other activities that lie beyond our current experience and imagination. I could go on.

Images like these are almost the only ones we have of the built environment of tomorrow's world. And whenever we try to imagine what such a world would look like, it never even occurs to us to picture a scene filled with slums. But why ever not? Would we not be able to stomach all the years leading off into the future if this were the kind of vision we had to look forward to? But, then, what is our vision? And, furthermore, who will dream up this future world? Who will design it? Who will be able to build it? What kinds of people will live in the architecture of tomorrow? What do these people dream of?

We realise that the question of how we should build in the future is one that inquires into the very nature of the future itself. But, nevertheless, we need to ask: Why are the architectural utopias we dream of today still the same ones we dreamt up in the past? Why are they so poorly adapted to the problems we already see ahead of us? And why is a proper discussion about our future—one that anticipates the potential issues, scenarios and creative possibilities; one that attempts to talk about things yet unknown, yet unseen and yet unthought of—not actually taking place?

Of course, this kind of forward thinking always comes with the risk of failure, the risk of getting things wrong. Hegel presented us with a kind of advance justification for this potential failure when he stated that the fear of failure is a failure in itself. This should also apply to thinking and talking about the future. We need not quote former German Chancellor Helmut Schmidt's unfortunate utterance about visions here.[1] That would be too absurd. It would not help us move forward, even though many people gladly cite it time and again. No, our ambitions lie elsewhere. On the one hand, we need to uncover the technical and societal components of the future we want to create. And on the other, we need to find out who is planning this future—if anyone is indeed planning it at all. Or if we are simply letting the future emerge in a series of individual steps that, although perhaps still taken deliberately in and of themselves, are not part of a deliberate journey that arises from the sum of the steps we take.

In his work *The Spirit of Utopia*, Ernst Bloch stated that "… no one knows what he really wants in this oh so well-furnished world." Does this still apply today? And how justified are the accusations Bloch made in an interview with Iring Fetscher in 1967 about the "undernourishment of utopian ideas" and even the "anticipatory impotence" in our society[2]? Perhaps what we see ahead of us puts many people off thinking about the future at all. Paul Watzlawick pointed out again and again that we need to believe in a sensible, rational world for our own emotional survival: A life experienced as senseless would be unbearable. Does the "ultimate desperation" Bloch observes perhaps stem from the unbearability, the senselessness of what appears on the horizon? Is this why our affluent society prefers instead to follow the Japanese adage, "It is better to travel hopefully than to arrive"[3]?

If we examine the question of how to build in the future from a project manager's perspective instead of from the (usual) aesthetic point of view—if we look beyond archi-

tecture's appearance, its "fascia" (face), its façade—then we are granted certain insights into what lies before us, into the technical components of our future. I would therefore invite you to follow me into a world that is (most likely) unknown to you. Please picture the fact that each German citizen possesses 490 tonnes of building material. This amount can roughly be split into two halves: Each citizen owns approximately 250 tonnes of the built infrastructure and a share of around 240 tonnes of the buildings in our country.

I would like to introduce my further remarks at this point by asking two questions. The first is this: How much construction material would we need to supply right here, right now, if we wanted to make it possible—and which of us could find a moral argument not to do this?—for every single person currently alive on the planet to benefit from the same building standard we enjoy in the industrialised nations today? Gathering together the necessary economic facts and figures is a complex and time-consuming process, so the statistical reports always tend to lag a little behind the times. Let us therefore take the confirmed numbers from 2010. They show us that the average world citizen possesses just 11% of the amount of building material owned by an inhabitant of the industrialised nations. This kind of asymmetry is all too familiar to us. It also means that, if we were to grant all the world's inhabitants the same architectural standard, we would immediately have to produce a grand total of 2 billion tonnes of building material. This is equivalent to 2.6 times the amount of material that currently exists in the planet's entire built environment as a whole.

My second question asks: What about the future? Around 4.4 people are born every second. Approximately 1.8 people die during the same period of time. The net increase in the global population is thus around 2.6 people … per second. Assuming we aim to provide everyone with the German Federal building standard, this means that we would have to extract, process and supply approximately 1,300 tonnes of construction material every single second. Day and night. Year in, year out. We could attempt to shrink this monstrous figure down to something more manageable, but it is extremely difficult to reduce the number of births per unit of time by any significant degree (providing we abstain, of course, from such unnatural interventions as the wars and hunger crises that some of the states in our world orchestrate with well-practiced ease.)

Let us thus turn briefly to one of the societal components of our shared future. It is hugely difficult to reduce the number of people born in a given span of time to any noteworthy extent without interfering wholesale with human fertility. The reason for this lies in population dynamics, whose timescales are measured in generations rather than hours or seconds.

A simple example will explain a great deal here. In 1950, the total fertility rate in India stood at 5.8 (children per woman). That figure is 2.2 today. The value that indicates population stagnation (2.1) will be reached before 2020. This represents a great socio-political success. We need to remind ourselves, however, that achieving a value indicative of population stagnation is only meaningful for bringing about slow shifts in population size. This is true in India because of a simple fact: 59% of the 1.2 billion people living in the country today are younger than 25 years old. This means that—even at the reduced fertility rate of 2.1—around 350 million Indian women will give birth to a total of 735 million children during the space of the next generation alone. The number of deaths anticipated in the same period is relatively low: The life expectancy in India is increasing, and 59% of Indians are under 25, meaning that there are relatively few elderly people in the country. All of this indicates that, despite having an exemplary family policy, the Indian population will grow by around 550 million people by 2050, or in the space of just less than a single generation.

The similar situation we see in other countries like Nigeria, the Philippines and Brazil allows us to draw our first conclusion: It will not be possible for us to trigger any significant reduction in population growth, at least in the coming generation.

Let us now return to discussing some of the technical components of our future and, in particular, the availability of construction materials. Say we wanted to equip every single future inhabitant of India with the German Federal building standard. This would require the provision of a batch of building materials amounting to around 300 billion tonnes of wood, concrete and construction blocks of various kinds. And this just for a single generation of young Indians alone. Taking the population dynamics of all the other nations into account, if we wanted to give each and every world citizen the building standard of the industrialised nations by the year 2050, we would have to construct the entire built environment that exists on earth today three times over in the next 33 years. This is surely not possible with the methods and materials we currently use without inevitably forcing our planet into total ecological meltdown.

In order to examine this statement, let us first look at the availability of building materials and how they are distributed around the world. A whole range of raw materials is not obtainable in the amounts we just discussed. According to the figures published by the German Federal Ministry for Economic Affairs and Energy in 2005, this list of insufficient resources includes zinc and tin. At today's consumption levels, stocks of both metals will start to dwindle in the next 10-12 years. The same is true of lead and other important commodities. We also do not have enough of the alloy elements, including those we use to produce steel, even though they are neither in decline, nor found exclusively in politically instable regions of the world. We do not even have access to sufficient quantities of wood. If we take the exemplary management of Bavarian forests as our benchmark, we learn that approximately 6 tonnes of air-dried timber can be produced from a hectare of mixed woodland in southeast Germany every year. A total of around 4 billion hectares of forest exist on our planet. If all this were impeccably managed, then approximately 24 billion tonnes of air-dried timber could be produced at best every year. But let us not forget that half of the timber harvested in the world today is burned. And considerable quantities of wood go to create paper, cardboard packaging and cellulose fibres. It is often claimed that the mass-scale use of wood would solve our future building material woes. This can only be described as ill-considered wishful thinking, however: There is simply not enough wood to go round.

A further category of raw materials is not available everywhere in the world, a situation that creates material distribution flows that stretch around the planet. Take sand, for example. Central and Northern Europe are blessed with sand thanks to events that took place during the Ice Age. In contrast, other parts of the world—including states like Qatar and Dubai—often have to import sand. Desert sand is ground into a rounded shape due to abrasion. This makes it unfit for the production of concrete, which requires irregular chips of stone, not worn-down spheres. This means that a desert nation like Qatar has to import sand. From Australia, West Africa and other far-flung reaches of the globe. It would only take a shipping embargo to bring the entire construction industry in Qatar—the land with the highest per capita income in the world—to a standstill.

The conclusion to be drawn here is clear: We do not have enough of the construction materials we need to build for the next generation if we want to build in the same way that we ourselves have done in the past.

The second technical component that is essential for building tomorrow's world is energy. Whenever we talk about energy—or, more precisely, how people are supplied with energy—

we are struck nowadays by a mix of non-information, false information and a lack of interest in information the likes of which has rarely been seen in the entire history of humanity to date. Nevertheless, the facts are very easy to explain. Firstly, we do not have an energy problem. The sun shines around 10,000 times more energy down onto the earth than the human race requires for all of its needs. Secondly, the so-called "energy problem" is the result of decades of failure on the part of political and societal decision makers—including scientists—to convert our fossil-based energy supply to a solar-based system. And we are now realising that we neither have the tools nor the methods nor the time to make a rapid switch from a fossil-based to a solar-based supply of energy.

Mobility, the built environment and industry are each responsible for around a third of our total energy consumption. Using fossil fuels to generate energy for these three sectors leads to the following three consequences:

1) It creates political and economic dependency on a few oil-producing countries.
2) It produces combustion gases that are harmful to the climate and thus represent a central cause of global warming.
3) It rapidly depletes our remaining reserves of crude oil, a resource that could be used much more sensibly to manufacture high-value plastics, for example, instead of burning it away.

From a political point of view, the current situation leaves us with four courses of action:

1) Simply to lie about the facts. I will not name any names here, they are already sufficiently well known.
2) To introduce measures that do not adversely impact our daily lives, but which suggest that we are well on our way to solving the problem. This is the tactic currently adopted by many of the world's nations (including Germany) that see themselves as international leaders in the field.
3) To introduce the measures we actually need and that would undoubtedly have a dramatic impact on our day-to-day lives. This strategy seems politically unviable today.
4) Finally, to make our peace with the anticipated changes, almost welcoming global warming into our lives.

It is interesting to note that this latter position has been embraced by the Christian Democratic Union party's *Berliner Kreis* ("Berlin Circle"), a group composed of Members of the German Bundestag. In a written statement of 30th May 2017, they made the trailblazing declaration that it would be more sensible to enjoy the benefits of global warming—such as, for example, the more manageable maritime navigation of the Northeast Passage—than to continue with (and I quote) the "unregulated expansion of renewable energies in its current form" or to persist with (and I quote again) "condemning the modern, conventional (i.e. fossil-based) production of energy". Indeed.

It is clear today, however, that the course of action chosen by Germany (that is, the introduction of measures that do not significantly impact our daily lives) is not sufficient to reach our goal either. A few examples will suffice to explain this reasoning:

Firstly, the Energy Saving Directives (*Energieeinsparverordnungen*) for new buildings, which have been in force in Germany for around forty years now, limit the maximum amount of energy that can be consumed per square metre of living space per annum. With the help of substantial investments (we all remember the houses packed thick with insulating materials and kitted out with such features as super-efficient heating systems, airtight doors and triple-glazed windows that kept on getting smaller and smaller), these regulations have indeed managed to reduce the energy used per square metre in new homes by nearly half during the last four decades. A great political success. What no one mentions is that the amount of per capita living space has also doubled over the last forty years. This means that, despite all the effort, the per capita energy consumption has remained the same. We must admit that this is clearly no way to make progress.

Secondly, a scheme that has been in place since 2010 is currently attempting to refurbish the present stock of residential buildings in Germany by 2050 so that the amount of energy they use for central heating and warm water—again measured by square metre of living space per annum—will fall by 80%. This requires that 2% of the nation's buildings be renovated every year. The actual rate of renovation currently stands at 0.7%. If this present rate continues, we will need 120 years to carry out an energy overhaul on all the existing buildings in our Federal Republic. This takes us far beyond the year 2130. Again, we must concede that this is plainly not the way forward.

Thirdly, we have already spoken about the quantities of construction materials we need to provide for the next generation of our planet's inhabitants. The production and installation

of these building materials, semi-finished materials and finished goods all require energy. We call this energy "grey energy". To get an idea of the amount of grey energy built into a building, let us take the example of a single-family home constructed in the German region of Swabia in the 1990s. The quantity of grey energy involved in producing this type of building—almost all of which was consumed before the first inhabitants even moved in—was around thirty times higher than the amount subsequently used to run the house for a single year. This show that, if we really wanted to enact a truly meaningful law, we would have to minimise or even prohibit the use of fossil-based grey energy in every single construction project first, before we started sealing up our houses with costly external wall insulation systems that often end up being dumped along with other hazardous waste.

You may have already guessed that all this talk of "grey energy" puts me in mind of another key issue: The 2015 Paris Climate Agreement assumes that the energy supply can be fully decarbonised by 2050. This also assumes, by the way, that a considerable amount of the carbon dioxide that has already been emitted into the atmosphere will actively be removed by 2050.

If we build for the next generation in the same way that we in the industrialised nations have done for ourselves, then the current built environment will be multiplied fourfold in size by 2050. Even if we achieve the unlikely feat of fully decarbonising the energy supply by 2050, this will bring about a gigantic increase in $CO_2$ emissions over the years to come. Such a rise would undoubtedly make it impossible to attain the two-degree climate change target laid down to limit global warming in the 2015 Paris Agreement.[4] I could mention many more examples here, but even the little I have already said makes it clear that this is no way to carry on.

I am not interested in vilifying politicians. After all, politicians can only implement ideas that have previously been explained to them by so-called "experts". Indeed, it is far more important for us to realise that we will not be able to achieve the second technical component of building for tomorrow's world—the creation of an environmentally sustainable energy supply—with the approaches we are using today.

So here we sit on our planet earth. It is not a perfect orb. It is not even an ellipsoid. In fact, it is more like a potato-shaped geoid with an approximate diameter of just 12,700 km and a breathable atmospheric shell that stretches a mere couple of kilometres out above the sur-

face. If we were to shrink this planet down so that its diameter measured just 6 metres across—so small it would fit in this room—then the surrounding breathable layer would be less than 2 millimetres thick. This might give you an idea of the sensitivity and fragility of the conditions on which we depend.

So here we sit on our planet earth, racing through space at around 100,000 km an hour, and we have come to the realisation that the cushion of air that keeps us alive is getting warmer and warmer, that we cannot continue to build as we have done before, that we do not have enough construction materials for the ever-booming planetary population and that we, despite the overabundance of solar energy, are still using fossil fuels.

So here we sit as if on a spaceship (I will leave aside the image of Baron Munchhausen flying on a cannonball[5]) and—to echo Buckminster Fuller—we are still looking for the operating manual. We still do not know how the system works …

What should we talk about in this situation? Should we not change our topics of conversation, or at least shift the focus of our discussions? I fondly remind you of a sentence from Peter Sloterdijk's *Rules for the Human Zoo*[6]: "It is a fundamental human characteristic that people who are confronted with problems that are too difficult for them cannot leave them alone, despite their difficulty." My dear Ladies and Gentlemen, my dear Herr Sloterdijk: The questions "What now?" and "What next?" still stand. Unanswered.

Our goal is to create architecture or, more precisely, to create a built environment for tomorrow's world. My following two demands sum up the path we need to take and the technical objectives we need to strive towards if we want to realise this aim:

Firstly, we need to build for more people using less material. We must dramatically reduce our consumption of materials while substituting out those materials we use the most. This transition to building lightweight structures must also go hand in hand with the introduction of the recycling principle to the construction industry.

Secondly, we need to stop using fossil-based energy as soon as we possibly can.

These two calls to action encompass some of the major technical components of how we hope to live in tomorrow's world. To these we can add a third, namely: We have to change our mobility habits to favour autonomous, electric transportation.

Realising all of these objectives together will result in the creation of an emissions-free city that is largely liberated from the din of mechanically generated noise. An "electric city", as I like to call it. We have been driving these developments forward in our own work for many years now.

Nevertheless, we still urgently need to dream up far-reaching visions, methods and tools. We still need to formulate (potentially multifarious) macrosocial goals. But all of this outstrips the capacities of the mere handful of individuals who, like me, are tackling the problems I have described. No, it requires a huge communal effort. It requires "anticipatory potency". It requires us to view "utopian ideas as nourishment".

All of this means, Herr Sloterdijk, that you should simply not be allowed to retire! We are going to need you, your thought and your guidance for a very long time to come … Thank you.

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[1] "Wer Visionen hat, sollte zum Arzt gehen." ("Whoever has visions should go to the doctor").
[2] *Ernst Bloch im Gespräch mit Iring Fetscher. Philosophische Geschichten.* (hr-fernsehen, 1967). This television programme features Iring Fetscher conducting an interview with the philosopher Ernst Bloch. They talk about various stages of Bloch's life, including his long years in exile after 1933 and his return

to teach as a professor at Leipzig University from 1949. A recording of the conversation (in German) can be found online at https://www.youtube.com/watch?v=T4oXNBm29jA.

[3] Watzlawick, Paul: *The Situation is Hopeless, but not Serious*. New York: Newton, 1993. p.65.

[4] Krausmann, Fridolin; Wiedenhofer, Dominik; Lauk, Christian; et al.: "Global socioeconomic material stocks rise 23-fold over the 20th century and require half of annual resource use." In: *PNAS* vol. 114, no. 8 (2017), p.1880 ff.

[5] The 18th-century creation of writer Rudolf Erich Raspe, Baron Munchhausen's fantastical exploits included riding over the ramparts of an impregnable fortress on a cannonball. As he flies, he decides that his destination is too dangerous, and quickly hitches a lift back to friendly territory on a missile zooming in the other direction.

[6] Peter Sloterdijk: *Rules for the Human Zoo.* Speech made at Schloss Elmau (Upper Bavaria) on 17th July 1999. Available online (in English translation) at https://rekveld.home.xs4all.nl/tech/Sloterdijk_RulesForTheHumanZoo.pdf.